United States Virgin Islands

CDBG-Mitigation Action Plan

Virgin Islands Housing Fina

Version 6.0

Substantial Amendment No. 1

Public Comment Period: July 6, 2023 to August 7, 2023

Submitted to HUD: August 17, 2023

Approved by HUD: October 16, 2023

This page intentionally left blank

ACTION PLAN REVISION HISTORY

For Substantial and Non-substantial Changes

Version	Date	Description
Version 0.0	November 4, 2020	Initial CDBG MIT Action Plan
Version 1.0	January 4, 2021	Finalized CDBG MIT Action Plan HUD Submission
Version 1.1	February 25, 2021	CDBG MIT Action Plan with HUD requested Revisions
Version 1.2	June 14, 2021	CDBG MIT Action Plan with HUD requested Revisions
Version 2.0	August 17, 2023	CDBG MIT Action Plan Substantial Amendment for addition of Covered Project and Reallocation of funds submittal to HUD
Version 2.1	September 8, 2023	CDBG MIT Action Plan Substantial Amendment for addition of Covered Project and Reallocation of funds revised per HUD request
Version 3.0	March 26, 2024	CDBG MIT Action Plan Second Substantial Amendment for addition of Covered Project and Reallocation of funds submittal to HUD

Substantial Amendments will be available on the U.S. Virgin Islands CDBG-MIT Action Plan website (https://cdbgdr.vihfa.gov/programs/cdbg-mitigation/) for public review and comment for at least 30 days. More details about substantial and non-substantial changes are provided in Appendix B.

This page intentionally left blank

TABLE OF CONTENTS

Action Plan Revision History 2

Action Plan Executive Summary 12

1.0 Mitigation Needs Assessment (MNA) 21

1.1 Background 21
1.2 General Methodology 22
1.3 U.S. Virgin Islands Hazard Mitigation Plan 24
1.4 USVI Mitigation and Needs Assessment (MNA) 25
1.5 USVI History and Geography 26

1.5.1 Recent Hurricane Impacts 28

1.6 USVI Social Vulnerability and Distress Indicators 31
1.7 Hazard Context 38

1.7.1 Hazards of Concern 38

1.7.2 Methodology for Hazard Analysis 38

1.8 Critical Facilities and Lifelines 40

1.8.1 Safety and Security 41

1.8.2 Lifeline Locations 42

1.9 Risk Assessment Summary 46

1.9.1 Drought 46

1.9.2 Earthquakes 52

1.9.3 Flooding 59

1.9.4 Hurricane Winds 70

1.9.5 Rain-Induced Landslides 75

1.9.6 Tsunami 78

1.9.7 Wildfire 82

1.9.8 Disease Outbreak/Pandemic 85

1.10 Unmet Mitigation Needs 87
1.11 Risk Assessment Summary 88
1.12 CDBG-DR Considerations 90

1.12.1 Analysis of the Mitigation Housing and Public Facilities Needs 90

2.0 Long-Term Planning and Risk Mitigation Assessments 95

2.1 Building Code Standards 95

2.1.1 Vertical Flood Elevation Protection 96
2.2 Land Use and Zoning Policies 96
2.2.1 Coastal Zone Management 96
2.2.2 Land Development Regulations 97
2.3 Flood Mitigation Efforts 98
2.3.1 Elevation 98
2.3.2 Stormwater Management 99
2.3.3 Unified Watershed Assessment and Restoration Priorities 99
2.3.4 High Wind 100
2.3.5 Sea Level Rise 100
2.4 Local and Regional Planning Coordination 100
2.5 Flood Insurance Coverage 101
2.5.1 National Flood Insurance Program, Floodplain Management, and Building Codes 102
3.0 Connection of Mitigation Programs to Identified Risks 105
3.1 Infrastructure & Public Facilities 106
3.2 Housing 107
3.2.1 New Construction for Homeownership Opportunity and First Time Home Buyer Assistance 107
3.2.2 Public and Affordable Housing Development 108
3.2.3 Homeless and Supportive Housing 109
4.0 Low- and Moderate-Income Priority 111
4.1 Vulnerable Populations 111
4.2 Specific Impact on Vulnerable Populations and Protected Classes 112
4.2.1 Seniors 112
4.2.2 Special Needs 112
4.2.3 Homelessness 112
4.2.4 Natural Infrastructure 117
4.3 How Programs or Projects Increase Resiliency for Housing Serving Vulnerable Populations 118
4.4 Minimizing Displacement 119
5.0 Coordination of Mitigation Projects Leverage 121
6.0 Minimizing Displacement and Ensuring Accessibility 123
7.0 Allocation and Maximum Award Amounts, Necessary and Reasonable Assistance 125

7.0.1 Projected LMI Benefit 126
7.1 Program Allocations 127
7.2 Overall Method of Distribution and Delivery 130
7.3 Infrastructure and Public Facilities 130
7.3.1 Community Resilience Centers & Public Facilities Construction 131
7.3.2 Critical & Natural Infrastructure Resilience 133
Covered Projects 135
7.4 Economic Resilience & Revitalization 139
7.4.1 Commercial Hardening & Financing Program 140
7.4.2 Small Business Mitigation Improvements 142
7.5 Resilient Housing Programs 148
7.5.1 Single Family Resilient New Home Construction Program 148
7.5.2 Resilient Multifamily Housing Program 152
7.5.3 Homeless Housing Initiative--Permanent Supportive Housing Development 154
7.5.4 Innovative Resilient Housing 155
7.6 Public Services 156
7.6.1 Improved Access to Healthcare ..... **Error! Bookmark not defined.**
7.6.2 Allocation and Maximum Award ..... **Error! Bookmark not defined.**
7.6.3 Eligible Applicants ..... **Error! Bookmark not defined.**
7.6.4 Eligible Activities ..... **Error! Bookmark not defined.**
7.6.5 Priorities ..... **Error! Bookmark not defined.**
7.6.6 Projected Start and End Dates ..... **Error! Bookmark not defined.**
7.7 Territory Planning Program 156
7.7.1 Allocation and Maximum Award 157
7.7.2 Eligible Applicants 157
7.7.3 Eligible Activities 157
7.7.4 Priorities 157
7.7.5 Projected Start and End Date 158
7.8 VIHFA Administration 158
7.9 Timely Information on Application Status and Confidentiality 158

7.9.1 Confidentiality/Personally Identifiable Information (PII) 159
7.10 Exceptions to Maximum Award Amounts 159
7.11 Long-term Operation and Maintenance 160
7.12 Subrecipient Expenses, Program Income, and Timely Payment 160
8.0 Natural Infrastructure 164
9.0 Construction Standards 166
9.1 Sustainability 166
9.2 Accessibility 166
9.3 Green Building Standards 166
9.4 Broadband Infrastructure 167
10.0 Operation and Maintenance Plans 169
11.0 Cost Verification 171
12.0 Building Code and Hazard Mitigation Planning 173
Appendix A: Schedule of Expenditures and Outcomes 174
Appendix B: Amendments to the Action Plan 175
Appendix C: Certifications 176
Appendix D: Community Participation and Public Comment 180
D-1 Community Engagement 180
D-2 Links to Websites and PowerPoint Presentations 182
D-3 Screen Shots, Facebook Views, and Chat Discussions 185
D-4 Citizen Advisory Committee 195
D-5 Response to Citizen Complaints, and Appeals & Website Information 201
D-6 Copies/ Screenshots of Citizen Participation/Public Notice 204
Appendix E: References 210
Appendix F: Summary of VIHFA Outreach with Stakeholders to Align and Coordinate Efforts 215
Appendix G: Proposed Projects list for potential consideration under CDBG-MIT funding 223
Appendix H: Acronyms and Agencies 233
Appendix I: *Construction Information for a Stronger Home* 237
Appendix J: Covered Project (PR1) 347
I. Project Description and Eligibility 348
1.0 Project Scope 348

1.1.0 Virgin Islands Water and Power Authority Overview 348

1.1.1 WAPA Service Area – Territory-wide 348

1.1.2 Service Territory at High Risk for Natural Disasters 348

1.1.3 Overview of Power Generation Assets 349

1.1.4 New Generation Changing the Optimal Operating State and Fuel Mix on St. Thomas 350

1.1.5 Overview of Reverse Osmosis Water Production Assets 353

1.1.6 Propane Supply Infrastructure Overview 354

1.2 Activity Benefits 355

1.2.0 Owning the Propane Supply Infrastructure Mitigates Significant Risk 355

1.2.1 Owning the Propane Supply Infrastructure Supports FEMA Community Lifelines 355

1.3 Propane Supply Infrastructure Detail 365

1.3.0 LPG Pipeline from the Fuel Dock to the Storage Tanks 365

1.3.1 LPG Storage 366

1.3.3 LPG Pipeline from the Storage Tanks to the Vaporizer 366

1.3.4 Vaporizer 367

1.3.5 Offshore Mooring Buoy 368

1.4 Availability of Comparable Facilities 368

1.4.0 Local Resources 368

1.4.1 Alternative Fuel Import Options 369

1.5 Licenses and Permits 369

1.6 Project Milestones 370

1.6.0 Major Milestone I 370

1.6.1 Interim Milestones: 370

1.6.2 Major Milestone II 370

1.7 Project Location 371

1.7.0 St. Croix 371

1.7.1 St. Thomas 371

II. HUD Eligible Activity 372

2.1 Project Cost 372

2.3 Impacts to the Population 374
2.4 Resilient or Mitigative Elements 375
2.4.1 Owning the Propane Supply Infrastructure Mitigates Significant Risk 375
III. Consistency with Mitigation Needs Assessment 376
IV. Analysis of Energy Lifeline Mitigation 376
V. Compliance with National Objective for Covered Projects 377
5.1.0 Long-term Efficacy and Sustainability of the Project 378
5.1.1 Financial Resources to Pay Ongoing Operations and Maintenance Expenses 378
5.1.2 Changing Environmental Conditions 386
5.2.0 Demonstration of Benefit to Most Impacted and Distressed Area[5] 386
Benefit Cost Analysis 386
BCA Methodology 386
VI. Consistency with Other Mitigation Activities 389
VII. APPENDIX 1- Propane Supply Infrastructure Permits 389

This page intentionally left blank

Action Plan Introduction and Executive Summary

ACTION PLAN EXECUTIVE SUMMARY

The United States Virgin Islands (USVI or the Territory) are gems of the Caribbean with a rich culture influenced by hundreds of years of African, Danish, and French heritage. The Territory suffered the impacts of back-to-back category five Hurricanes Irma and Maria. The resulting aftermath can be briefly summarized as catastrophic destruction that resulted in the Territory experiencing the longest blackout in U.S. history according to the United States Government Accountability Office (United States Government Accountability Office, 2019); and in HUD qualifying the entire United States Virgin Islands, as a "Most Impacted and Distressed" (MID) area. Under Public Law 115-123 (The Appropriations Act), approved on February 9, 2018, Congress appropriated $28 billion in Community Development Block Grant disaster recovery (CDBG-DR) funds, and directed the United States Department of Housing and Urban Development (HUD) to allocate not less than $12 billion for mitigation activities proportional to the amounts that CDBG-DR grantees received for qualifying disasters in 2015, 2016, and 2017. The Unmet Recovery Needs Assessments and corresponding Action Plans for the Hurricanes Irma and Maria recoveries present the details of ongoing projects, programs, and restoration efforts specific to the CDBG-DR allocations for those disasters. Individuals seeking information on the recovery efforts from those disasters should refer to the Action Plans and subsequent amendments posted on the Virgin Island Housing Finance Authority's (the VIHFA) website (www.vihfa.gov) to review details of the full breadth of the ongoing recovery of the Territory.

HUD published 84 FR 45838 on August 30, 2019 (CDBG-MIT Main Notice) which allocated $6.875 billion in Community Development Block Grant – Mitigation (CDBG-MIT) funds, consistent with the Appropriations Act. No funding for USVI was included in that allocation. Subsequently, HUD published 84 FR 47528 (USVI Supplemental Notice) which allocated **$774,188,000** in CDBG-MIT funds to the USVI. The USVI Supplemental Notice provides specific guidance to the USVI that supplements the requirements outlined in the CDBG-MIT Main Notice.

The CDBG-MIT Main Notice describes an expanded CDBG disaster mitigation initiative referred to as CDBG-MIT. CDBG-MIT presents a new funding approach from Congress and HUD intended to protect lives and property through development of greater resilience to natural disasters. Thus, the CDBG-MIT Main Notice provides details on what is required by federal law to carry out such mitigation activities, including the requirements and expectations that HUD places on grantees that will administer CDBG-MIT funds. The CDBG-MIT Main Notice also provides an overview of the grant processes and requirements that are vital components to a CDBG-MIT Action Plan (Action Plan or "MIT-AP"). Submitted MIT-AP, this document, and implementation plan was approved; subsequently, VIHFA received and executed the grant agreement on April 25, 2023.

CDBG-MIT Action Plan (MIT-AP) was prepared by the Government of the U.S. Virgin Islands in consultation with local territorial government agencies, semi-autonomous agencies, authorities, and community stakeholders, plus US governmental representatives. The U.S. Virgin Islands has a Territorial Government that has organized various autonomous and semi-autonomous entities, including the Virgin Islands Housing Finance Authority (VIHFA), as these agencies and authorities perform vital roles within the Territory.

CDBG-MIT funds represent a unique and significant opportunity for the Territory to carry out strategic and high-impact activities to minimize, mitigate or eliminate risks and reduce losses from future disasters. In addition to mitigating disaster risks, the funds provide an opportunity to increase resilience through improved local planning protocols and procedures, within the parameters and guidelines

required by HUD. In following federal guidance, MIT-AP reviewed existing data to identify risks posed by natural hazards to identify the mitigation needs that can and should be addressed within the Territory, building on work done previously. The MIT-AP aligns with the Territory Hazard Mitigation Plan (THMP), which meets Federal Emergency Management Agency (FEMA) requirements. The MIT-AP considers decisions made and analysis done in the THMP, HUD requirements for this plan are distinct.

Pictured: Discussion with the public on mitigation planning at UVI on St. Croix.

This Action Plan details the Territory's strategy and proposed uses of the $774,188,000 in CDBG-MIT funding allocated in accordance with the USVI Supplemental Notice. The grantee agency, the Virgin Islands Housing Finance Authority (VIHFA), will be administering the grant on behalf of the USVI. References to the HUD grantee and to the Territory as a decision-making entity are construed to mean the VIHFA in all instances. The Action Plan includes the Mitigation Needs Assessment (MNA), which provides an analysis of the specific conditions that are present in USVI and presents weaknesses in the disaster recovery cycle. These mitigation needs are placed in context with "Community Lifelines critical parts of communities, that when damaged present a major obstacle to full recovery. The MNA explains the risks that are present in the Territory and identifies the Community Lifeline(s) which face the greatest risks. Further, the MNA provides a framework within which the Territory may determine projects that would be most effective in mitigating such risks.

This CDBG-MIT Action Plan's Mitigation Needs Assessment is intended to extract relevant data and information that has been previously analyzed to identify priority projects for HUD mitigation funding. During this process, and based on available information, the data utilized in the THMP may be enhanced to further quantify the risk of the most significant hazards. However, in accordance with federal guidance, while the MNA may identify further opportunities to improve the risk and vulnerability assessment for inclusion in updated THMP, U.S. Virgin Islands Hazard Mitigation Plan 2019 - Update (vi.gov), HUD expects the basis of MIT-AP analysis in the MNA to build primarily on the data and work done previously in the most recent THMP, in this way the MIT-AP focuses on how to apply these prior efforts and analysis to examine potential mitigation activities for the Territory based on risk, as well as input from the community.

The MNA is followed by a review of the long-term planning and risk mitigation considerations, to ensure that the forward-looking aspect of the CDBG-MIT allocation is not lost on temporary solutions to permanent problems. This review precedes a discussion on leveraging CDBG-MIT funds with other funds, the role of natural infrastructure in the mitigation plan, construction monitoring, and controlling costs in context with the MNA. The Mitigation Needs Assessment is based on the hazard analysis included in the THMP, U.S. Virgin Islands Hazard Mitigation Plan 2019 - Update, enhanced with newly available data to address key high-ranking hazards for the Territory. The THMP will provide an even better provide a tool for looking at continuing mitigation needs for the USVI.

In addition to completing the MNA, this Action Plan (MIT-AP) was developed through a strategic collaboration process with multiple federal agencies committed and actively involved in the territory's resiliency efforts, as well as with significant input from local agencies, local community members and key stakeholders to determine the territories most critical disaster mitigation needs. The VIHFA hosted three (3) separate "virtual" public engagements prior to publishing the MIT-AP and three (3) virtual public hearings following publication of the draft MIT-AP, using the most innovative technology available and the territory's most used social media platforms, the details of which are captured later in this Action Plan. After the draft MIT-AP was published, the public had more than forty-five (45) days of review time in which to submit public comments to the VIHFA. The VIHFA reviewed data and feedback from several sources and stakeholders on the proposed uses of the funds. Separately, impacted agencies and individuals participated in a stakeholder survey and provided feedback that has informed this Action Plan as well, with additional coordination meetings held to ensure alignment with the Territory's most recent Federal Emergency Management Agency Hazard Mitigation Grant Program (HMGP).

Due to its unique location, the Territory is at risk of experiencing a variety of hazards including tropical winds, storm surge, flash flooding, sea level rise, coastal erosion, extreme heat, drought, earthquakes, wildfires, tsunamis, and pandemics. As the direct HUD recipient of CDBG-MIT funds, the VIHFA is committed to maximizing the impact of available funds for the Territory by encouraging and leveraging public-private partnerships and coordinating with other Federal and local programs. This is based on the understanding that CDBG-MIT recipients are expected to take steps to set in place policies and fund projects that will enhance the impact of HUD investments in the territory.

The VIHFA is focused on implementing data-informed investments through high-impact projects that will reduce risks, suffering and hardship attributable to natural disasters, with particular attention to repetitive loss of property, critical infrastructure, and economic hardening in the Territory. The USVI also supports funding of projects and the adoption of policies that reflect local priorities that will have long-lasting effects on community risk reduction.

The USVI MIT-SP document clearly specify the proposed hazard mitigation projects and budget estimates. To truly realize the potential of this "once in a generation" funding opportunity it is important to understand the meaning of hazard mitigation, and examples of mitigation measures and their benefits. Hazard mitigation is defined as any action taken to reduce or eliminate the long-term risk to human life and property from man-made or natural hazards. A hazard is any event or condition with the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, environmental damage, business interruption or other structural or financial losses.

Hazard mitigation seeks to make human development and the natural environment safer and more resilient. The mitigation process generally enhances resiliency to significantly reduce risks and vulnerability to hazards. Mitigation can also include removing the built environment from disaster prone areas and maintaining natural mitigating features, such as wetlands or floodplains. Hazard mitigation makes it easier and less expensive to respond to, and recover from, disasters by breaking the damage and repair cycle.

Examples of hazard mitigation measures include, but are not limited to, the following:

- Development of mitigation standards, regulations, policies, and programs;
- Land use/zoning policies;
- Strong building code and floodplain management regulations;
- Dam safety programs, seawalls, and levee systems;
- Acquisition of flood prone and environmentally sensitive lands;
- Retrofitting/hardening/elevating structures, roadways, and critical facilities;
- Public awareness/education campaigns;
- Improvement of warning and evacuation systems; and
- Other measures that may prove to be effective means of mitigation.

Benefits of hazard mitigation include, but are not limited to, the following:

- Saving lives and protecting public health and the environment in the Territory;
- Preventing or minimizing property damage;
- Minimizing social dislocation and stress;
- Reducing economic losses;
- Protecting and preserving infrastructure;
- Reducing legal liability of government and public officials; and
- Protection of the environment and green infrastructure.

In final consideration of available data from the MNA, ongoing disaster recovery needs, community and stakeholder input, and regulatory requirements, the VIHFA has determined that several key investments in long-term hazard mitigation will be required.

Based on conversations with local communities, selected CDBG-MIT projects will be paired, to the greatest extent possible and feasible, with resilient affordable housing solutions to ensure that individuals have a safer place within which to live and thrive. Funding will be allowed for planning activities and other pre-award costs, which will include necessary plans and studies that will provide data to inform the building of a more resilient community. The VIHFA will also continue to partner and coordinate with the territorial entities in its planning activities; and will continue to execute public engagement to drive a planning process that is both strategic and responsive to the needs of impacted communities.

Due to limitations placed upon the CDBG-MIT funds, it will be crucial to understand the relevant data and analyses which reflect narratives that clearly support and justify any long-term mitigation approaches that will be sourced with this funding within the Territory. The VIHFA will ensure that all programs will be chosen and implemented based on proven data and analysis to ensure that the optimum actions are undertaken to increase resilience in the Territory. Should additional CDBG-MIT funds become available, the Territory will consider other infrastructure mitigation projects outlined on its project list that have been ranked according to priority but would be eclipsed by lack of funding considerations hereunder. A summary of the allocations is found on the following page:

Table 1: CDBG-MIT Allocations

Activity Category	Project/Program	Project Costs	VIHFA Project Delivery Costs	Total Allocations	% of Total	% LMI Projection
Infrastructure & Public Facilities	Community Resilience & Public Facilities	$93,500,000	$6,500,000	$100,000,0000		
	Resilient Critical & Natural Infrastructure	$353,505,000	$14,495,000	$368,000,000		
	Total Allocation	$447,005,000	$20,995,000	$468,000,000	**60%**	**65%**
Economic Resilience & Revitalization	Commercial Hardening & Financing	$12,000,000	$988,935	$12,988,935		
	Small Business Mitigation	$7,000,000	$863,935	$7,863,935		
	Entrepreneurship Resilience and Innovation Program	$8,000,000	$1,008,935	$9,008,935		
	Workforce Development Mitigation Program	$8,000,000	$1,008,935	$9,008,935		
	Total Allocation	$35,000,000	$3,870,739	$38,870,739	**5%**	**70%**
Housing	Multifamily Housing	**$100,000,000**	**$2,500,000**	**$102,500,000**		
	VIHFA New Home Construction (Home Ownership)	**$60,000,000**	**$1,500,000**	**$61,500,000**		
	Homeless Housing Initiative	**$23,000,000**	**$575,000**	**$23,575,000**		
	Innovative Resilient Housing	**$5,000,000**	**$125,000**	**$5,125,000**		
	Total Allocation	**$188,000,000**	**$4,700,000**	**$192,700,000**	**26%**	**80%**
Public Services		**$15,000,000**	**$400,000**	**$15,400,000**	**2%**	**100%**
Planning		$9,750,000	$877,861	$10,627,861	1%	**70%**
Administration		**$38,709,400**	**$0**	**$38,709,400**	**5%**	
Totals		$733,464,400	$40,723,600	**$774,188,000**	**100%**	**≥70%**

Finally, the affordable housing component of the Action Plan will empower the Virgin Islands Housing Finance Authority (VIHFA) to assist in hardening, rehabilitating, and developing new resilient affordable housing stock, creating homeownership opportunities and first-time home buyer assistance. For new construction, building in the floodplain is never a first consideration; however, if there is insufficient land available in the Territory that is outside of floodplain areas, then in an effort to mitigate the cost of satisfying the eight-step approach that allows floodway building, the Territory would conduct a land survey/plan (or use one that may already be in existence) to determine availability, including instances where eminent domain may be an option. If the results of the survey/plan were to support the perceived limitation, VIHFA would then consider other available options and plan for specific floodplain mitigation, among its proposed activities. VIHFA will also continue to review and consider options to mitigate risks to existing developments or to perform one-for-one replacement for units outside of the floodplain, as necessary, and as may be available.

The U.S. Virgin Islands will use established criteria to prioritize funds to initiatives that benefit LMI individuals and households. All CDBG-MIT activities will be routinely monitored for its benefit to LMI individuals and communities. At all times, it is VIHFA's primary objective to serve the greatest identified mitigation need of residents and protect low-and-moderate income individuals, while building a more resilient Territory.

In addition to the above statements of facts, the substantial amendment to the Action Plan brings forth a covered project. Per 84 FR 45851, this amendment is the addition of a covered project under the Infrastructure and Public Facilities activity category, Appendix J entitled "Covered Project – PR1 Vitol Acquisition".

Covered Project Addition

The Virgin Islands Water and Power Authority
The Virgin Islands Water and Power Authority (VIWAPA) acquisition of the Propane Supply Infrastructure (VITOL) projects address the Energy, Fuel, and Electric Grid Community Lifeline. The acquisition benefits the community with lower costs of fuel and transportation, fuel redundancy and security, drinking water security, including improved reliability and environmental profile.

The Department of Public Works (DPW)
The United States Virgin Islands (USVI) Department of Public Works (DPW) plans to implement a series of transportation infrastructure and pedestrian improvements along the Island of St. Thomas's primary east-to-west highway, Veterans Drive (Route 30), in the capital city of Charlotte Amalie. This project is intended to increase the resilience and reliability of the transportation system during and following hurricanes and other disaster events to mitigate risks of loss of life and injury. The proposed project will provide improvements to public infrastructure to mitigate risk to transportation lifelines and reduce the risk of storm water runoff erosion, and flood exposure as identified in the Mitigation Needs assessment and USVI Hazard Mitigation Plan.

Reallocation of Funds

Funding allocations have been redistributed to reflect program needs. From Economic Resilience and Revitalization, $40,000,000 was removed and added to Infrastructure and Public Services. An additional $20,000,000 was added to the Infrastructure and Public Services category from the Planning allocation. This reallocation allows the US Virgin Islands to prepare for mitigation opportunities within the Infrastructure while continuing to meet the needs of our small businesses and entrepreneurs favorably.

Activity categories and reallocated funding are listed below.

Reallocation of Funds

Activity Category	Substantial Amendment I Allocation	Change	Substantial Amendment II Allocation	Total (%)	LMI Projection (%)
Infrastructure and Public Facilities	$408,000,000	(+) $60,000,000	$468,000,000	60	65%
Housing	$202,580,000	-	$202,580,000	26	80%
Economic Resilience and Revitalization	$78,870,739	(-) $40,000,000	$38,870,739	5	70%
Public Services	$15,400,000	-	$15,400,000	2	100%
Planning	$30,627,861	(-) $20,000,000	$10,627,861	1	70%
Administration	$38,709,400	-	$38,709,400	5	
Total	$774,188,000	-	$774,188,000	100	≥ 70%

Eligible Activities

Eligible activities were removed and added based on HUD's guidelines for activities within categories, project needs, and allowance for future mitigation opportunities that meet the needs of the Territory that is in alignment with the US Virgin Islands Action Plan.

- Removals:
  - Housing:
    - Single Family Resilient New Home Construction Program
      - HCDA Section 105(a)(8) Public Services
    - Resilient Multifamily Housing Program
      - HCDA Section 105(a)(8) Public Services
      - HCDA Section 105(a)(12) Planning
      - HCDA Section 105(a)(14) Activities Carried Out through Private or Public nonprofits
- Additions:
  - Infrastructure and Public Facilities:
    - HCDA Section 105(a)(3) Code Enforcement
    - HCDA Section 105(a)(11) Relocation
    - HCDA Section 105(a)(19) Technical Assistance
    - HCDA Section 105(a)(25) Construction of Tornado-Safe Shelters
    - HCDA Section 105(a)(26) Lead-based Paint Hazard Evaluation and Reduction
  - Economic Resilience and Revitalization:
    - Commercial Hardening
      - HCDA Section 105(a)(3) Code Enforcement
      - HCDA Section 105(a)(26) Lead-based Paint Hazard Evaluation and Reduction
    - Small Business Mitigation
      - HCDA Section 105(a)(3) Code Enforcement

        - HCDA Section 105(a)(26) Lead-based Paint Hazard Evaluation and Reduction
    - Housing:
        - Resilient Multifamily Housing Program
            - HCDA Section 105(a)(18) Rehabilitation or development of housing
            - HCDA Section 105(a)(26) Lead-based Pain Hazard Evaluation and Reduction
        - Homeless Housing Initiative – Permanent Supportive Housing Development
            - HCDA Section 105(a)(18) Rehabilitation or development of housing
            - HCDA Section 105(a)(26) Lead-based Pain Hazard Evaluation and Reduction

Additional Programs

To improve economic resiliency and further support the MNA, an Entrepreneurship Resilience and Innovation Program and a Workforce Development Mitigation Program were added to the Economic Resilience and Revitalization category. This provides economic resilience to the Territory's community of entrepreneurs, while fostering small business innovation and risk management guidance. It addresses and identifies business innovation activities which allows the applicant to whether natural or manmade disasters.

This page intentionally left blank.

1.0 Mitigation Needs Assessment (MNA)

1.0 Mitigation Needs Assessment (MNA)

1.1 Background

According to HUD guidance in the CDBG-MIT Main Notice, the CDBG-MIT funds represent a unique and significant opportunity for grantees to use this assistance in areas impacted by recent disasters to carry out strategic and high-impact activities to mitigate disaster risks and reduce future losses. HUD guidance further specifies that CDBG-MIT funds should be closely aligned with the current Federal Emergency Management Agency (FEMA) approved local or state Hazard Mitigation Plan, which for the USVI is called the U.S Virgin Islands Hazard Mitigation Plan 2019-Update (THMP). To align closely with FEMA guidance and best practices, as well as the CDBG-MIT specific requirements, the Territory has reviewed the following resources required by HUD in the CDBG-MIT Main Notice:

- The Federal Emergency Management Agency Local Mitigation Planning Handbook
- The Department of Homeland Security Office of Infrastructure Protection Fact Sheet
- The U.S. Department of Housing and Urban Development CPD Mapping Tool

The approximate $6.875 billion dollars in CDBG-MIT funds allocated in the CDBG-MIT Main Notice after appropriations made in Public Law 115-123 are specifically associated with Hurricanes Irma and Maria. However, Section V.A.5.b of the USVI Supplemental Notice permits the United States Virgin Islands (USVI) to use CDBG–MIT funds for the same activities, consistent with the requirements of the CDBG–MIT grant, in the most impacted and distressed areas related to Hurricanes Irma and Maria in the USVI. The entire Territory of the USVI has been declared a most impacted and distressed area or most impacted and distressed (MID) area under 84 FR 47528.

At the time of the 2010 Census 106,405 people,[1] all of which fall within the HUD-designated MID area for the Territory, as detailed further in Table 2 below.

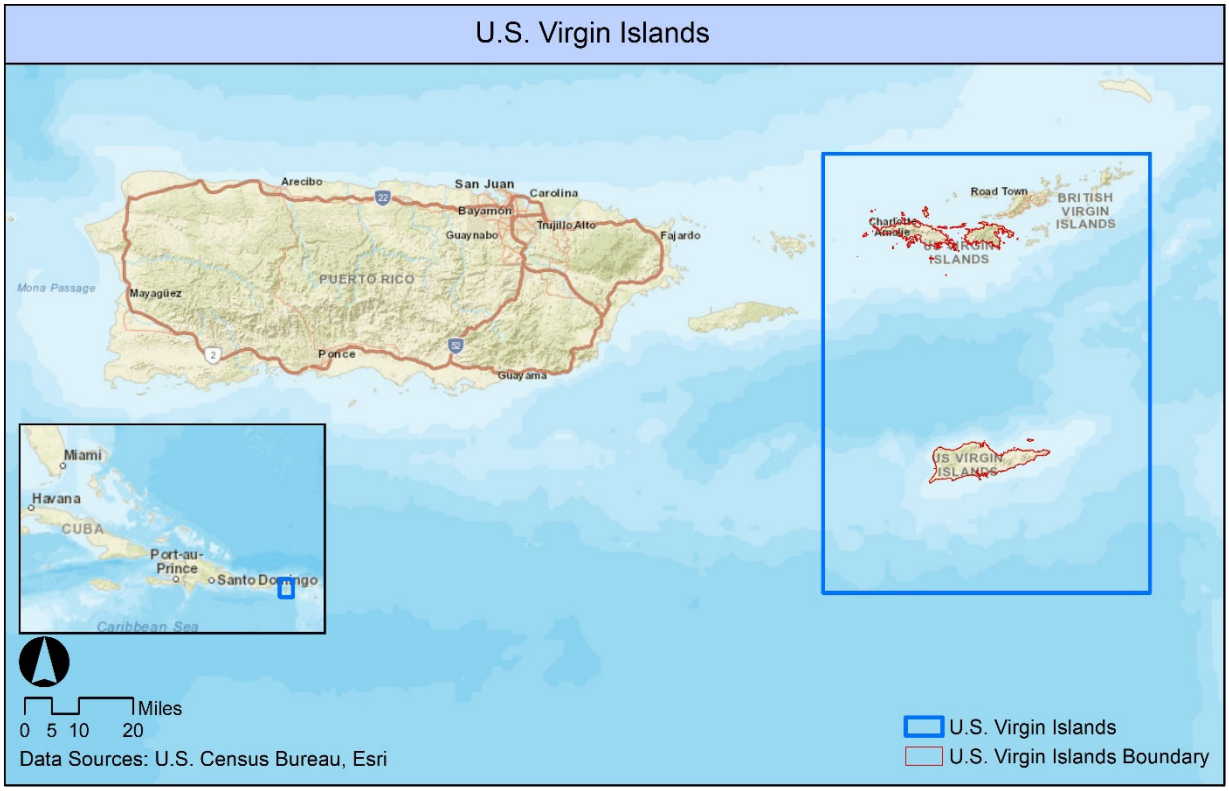
Table 2. Population of USVI MID Areas for Hurricanes Irma, and Maria per 2010 Census

MID Areas - Hurricanes Irma,	Population
St. John	4,170
St. Thomas	51,634
Water Island	182
St. Croix	50,601
Total	106,405

Figure 1 shows the location of the US Virgin Islands, which was directly impacted by both Hurricane Irma and Hurricane Maria, leading to the HUD MID designation for the entire Territory. The Territory's entire population of over 100,000 residents was impacted by the devastation brought on by these storms.

[1] 2010 Census: https://www2.census.gov/programs-surveys/decennial/tables/cph/cph-t/cph-t-8/table4a.pdf

Figure 1. US Virgin Islands Location



Although the funding allocation from HUD is specific to hurricane recovery, the CDBG-MIT Main Notice requires CDBG-MIT funding be used to address many types of risks, based on a risk-based mitigation needs assessment, which begins in the next section. The assessment that follows addresses current and future risks, including hazards, vulnerability, and impacts of disasters to identify appropriate mitigation actions to reduce the highest risks faced in the Territory.

1.2 General Methodology

The risk assessment methodology utilized in this Mitigation Needs Assessment (MNA) builds on the approach that was utilized in the 2019 Territorial Hazard Mitigation Plan (THMP), enhanced by incorporating some additional risk data in key areas. For example, additional data for certain prioritized hazards (i.e. flooding and sea level rise) that have been indicated in the THMP and in documented impacts of recent disaster events to provide the most significant risk are included within the MNA analysis. This approach is consistent with the process and steps presented in FEMA Publication 386-2 (Federal Emergency Management Agency, 2001), and utilizes a risk assessment methodology that is similar to FEMA's Hazards U.S. Multi-Hazard (HAZUSMH) to ensure that the MNA aligns with the current THMP for the Territory while also taking into account HUD requirements for a CDBG-MIT Action Plan.

The below MNA aligns with the prior hazard identification and work done previously for the 2019 THMP, which was compiled by investigating the various natural hazard occurrences and building further on analysis done in the 2014 THMP. As hazards that occurred previously in the Territory may be experienced in the future, the hazard identification process in the prior THMP documents involved

extensive discussions with Virgin Islands Territorial Emergency Management Agency (VITEMA), its Hazard Mitigation Steering Committee, experts with the University of the Virgin Islands (UVI), the Long-Term Recovery Group (LTRG) and the general public. Approved in 2019, the most recent HMP identifies hazards that could potentially affect the Territory. The THMP also identifies actions to potentially reduce the loss of life and property from a disaster across the Territory. Past hazards information came from historical hazard assessment documents, plus hazard specific plans and reports developed by experts over the past two decades. The most recent THMP also considered the frequency of occurrence and/or estimated the magnitude of historical events to accurately determine vulnerability and losses (i.e. future impacts).

Guidance issued in the CDBG-MIT Main Notice specifies how to approach the MNA for this Action Plan, with the goal of taking existing data and information and looking at it with a goal of identifying how to better prepare the Territory for future disaster events. Mitigation needs identified in the prior THMP have been supplemented by an analysis of the impacts of current and future hazards, as well as available data developed in the analysis of impacts of Hurricane Irma and Hurricane Maria. This MNA's approach focuses on providing a current understanding of the actual risks to the Territory and its people that are created by hazard events. In this MNA some revised hazard models or maps have been developed to align the present analysis with prior work done in preparing the most recent THMP and what is needed under HUD regulations for CDBG-MIT. However, per 84 FR 45840 and 86 FR 561 the MNA shall use the most current risk assessment completed or currently being updated though FEMA's own Hazard Mitigation Planning (HMP) process. Specifically, "grantees are …required to reference the applicable FEMA HMP in their action plan and describe how the HMP has informed the CDBG-MIT action plan." Therefore, in alignment with the intent of this MNA to use the current approved THMP and to ensure the best available data is used for ongoing mitigation analysis, the plan includes enhanced analysis for flood and sea level rise using available information and incudes inherent recommendations regarding the use of improved available data for the current THMP update to quantify the magnitude of potential risk and impacts of hazards affecting the Territory more accurately.

As outlined below, this MNA seeks to combine the institutional knowledge contained in the THMP, lessons learned from previous disaster recovery (specifically Hurricane Irma and Maria recovery efforts), and the local knowledge from citizens and stakeholders in disaster-impacted areas. These three sources are the primary source of hazard, risk, and mitigation information for the MNA. For each of the three primary sources contributing to the MNA, the risks are quantitatively assessed according to their potential impacts on seven critical service areas, also known as the Community Lifelines, identified in V.A.2.a.(1) of the CDBG-MIT Main Notice, as outlined below:

1. Safety and Security
2. Communications
3. Food, Water, Sheltering
4. Transportation
5. Health and Medical
6. Hazardous Material (Management)
7. Energy (Power and Fuel)

Analyzing relative risk and how it likely will impact the seven critical service areas by hazard type informs a mitigation approach to most effectively use CDBG-MIT funds. An important product of this exercise is a risk assessment that assigns values to risks informing decisions on prioritizing potential activities and projects. By assessing the risks to the Community Lifelines and looking at the likely impact of each potential risk based on current data, will then inform decision making in the CDBG-MIT

context so that funds can be used on activities that mitigate the risks that are identified as most troublesome.

The foundation of the MNA is the THMP drafted by The U.S. Virgin Islands Territory Emergency Management Agency (VITEMA). The THMP includes the following components as mandated in the Disaster Mitigation Act of 2000: Planning Process, Risk Assessment, Mitigation Strategies, Coordination of Local Plans, Plan Maintenance, and Plan Adoption and Assurances. Requirements for each component are further defined in 44 CFR §201.4, the FEMA Territory Plan Review Guide and the FEMA Territory Plan Review Tool and can be leveraged to provide a roadmap for mitigating hazards of concern to increase the resiliency of the Territory.

The MNA is a snapshot in time of the current mitigation needs, and subject to change as shifting priorities and risks are discovered by the Territory. As new risks are identified, or as previously identified risks are sufficiently mitigated, the Territory will update the MNA as necessary, using the mandated format and tools. The Mitigation Needs Assessment section of this Action Plan is incorporated hereunder in its entirety.

1.3 U.S. Virgin Islands Hazard Mitigation Plan

This CDBG-MIT Action Plan ("Action Plan" or "MIT-AP") is a functionally separate document informed by the Territory's Disaster Mitigation Act of 2000-compliant Hazard Mitigation Plan. The US Virgin Islands has an adopted the U.S. Virgin Islands Hazard Mitigation Plan 2021-Update (THMP), which identifies strategies and actions that can be taken before a disaster strikes and that can greatly reduce the human suffering, damage to property, and the long-term economic impact of natural hazards.

An assessment of the most recent hurricane events in context adds perspective to the THMP. In September 2017, an unprecedented event occurred where two catastrophic Category 5 hurricanes tore through the Territory within 14 days of each other. The storms crippled the Territory, impacting communications systems, both USVI power grids, numerous roads, drinking water, and wastewater facilities. They disrupted the food supply, compromising medical services, contributed to surpassing landfill capacity, and caused significant detriment to the environment and public health in various routes such as the release of waste and hazardous material into oceans and watersheds. Analysis shows that safety and security; food, water, shelter; health and medical; energy; communications systems; and the transportation lifelines were all impacted. The destruction of USVI lifelines following the storms hampered response after the storm and the Islands' recovery. Many homes and businesses were demolished beyond repair. As the Territory rebuilds, hazard and risk assessments have been analyzed to determine the adequate mitigative efforts to prevent similar destruction from happening again with future storms. Capacity building and collaborative community efforts have also been incorporated into the THMP update to facilitate initiatives where the Territory can ultimately become self-sustainable (USVI Office of Disaster Recovery, 2019).

This MNA considers the THMP as it relates to the entire Territory, as it has been declared in its entirety a MID area under the implementing authority. While the MNA acknowledges the many hazards faced by the residents and property in the Territory, the focus will remain on risks which can be mitigated using CDBG-MIT funding to align the Action Plan with existing activities planned through the THMP.

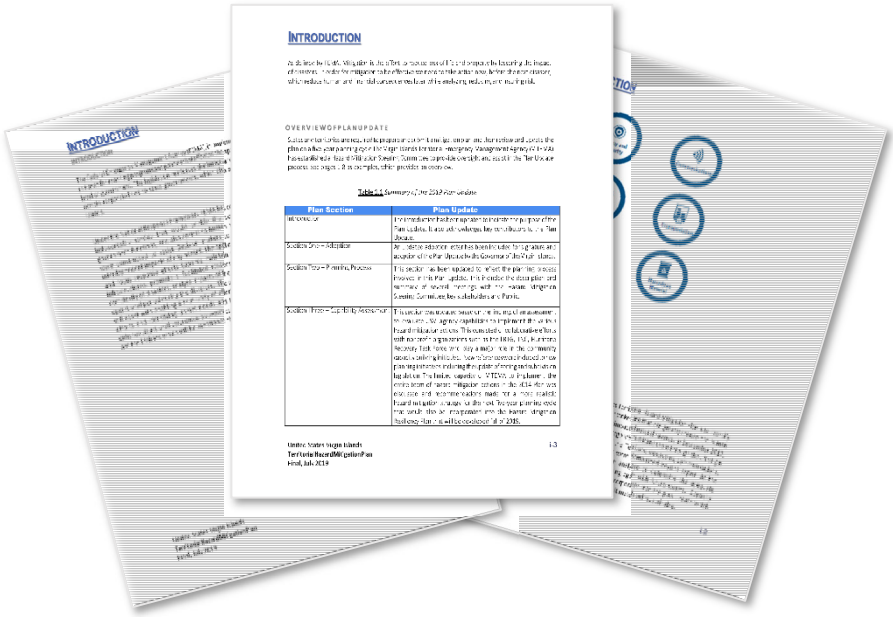
1.4 USVI Mitigation and Needs Assessment (MNA)

This MNA has been prepared pursuant to 84 FR 47528 to support the development of a Community Development Block Grant Mitigation (CDBG-MIT) Action Plan for the USVI. The Federal Register notice dated 9/10/2019 allocated $774,188,000 to the USVI for mitigation activities. Use of the appropriate funds is to be informed by this MNA. This document informs the identification of mitigation actions to be funded by the CDBG-MIT funds by:

- Identifying and analyzing all significant current and future disaster risks
- Providing a substantive basis for activities proposed in the Action Plan
- Consulting with jurisdictions and stakeholders for FEMA mitigation funding alignment
- Using the most recent adopted THMP to inform hazard mitigation actions

This wide-reaching and inclusive planning process has yielded both the MNA, and this Action Plan reflects the range of hazards impacting the Territory, and the needs of residents most vulnerable to these hazards. This plan seeks to advance actions that reduce or eliminate human casualties and mitigate damage to the Territory's infrastructure, property, and economy.

Figure 2. 2019 Hazard Mitigation Plan



The MNA builds upon the foundation of the USVI's 2019 THMP Plan. The THMP was updated in 2019 for the following purposes:

- Promote interagency coordination of programs, policies, and practices regarding hazard mitigation opportunities;
- Enhance public awareness and understanding of hazards that affect communities and actions the public can take to make themselves safe;
- Identify, evaluate, and prioritize a range of mitigation actions that are specific to St. Thomas, St. Croix, and St. John;
- Comply with federal program requirements regarding eligibility for disaster recovery and mitigation grant funding;
- Incorporate assessment findings to incorporated post disaster data to identify capability deficiencies and risks that were not identified prior to Hurricane Irma and Maria; and
- Expand on Mitigation efforts which would be crucial in the implementation of mitigation efforts for the Territory

Upon a review of the full range of natural hazards suggested under the FEMA planning guidance, it was necessary to generate some supplementary risk assessment analysis to incorporate best available data for drought and flood hazards. Other resources reviewed in developing this assessment included the USVI CDBG-DR Action Plan, "Conducting a Mitigation Needs Assessment for CDBG-

MIT" webinar materials, FEMA Local Mitigation Plan Handbook, and supplementary HUD materials, with invaluable input from many experts who are intimately familiar with the THMP.

1.5 USVI History and Geography

The U.S. Virgin Islands, previously inhabited by Taino and Island-Carib indigenous groups prior to European settlement, were under control by various European powers until 1672. By 1733, the Danes also controlled St. Croix and St. John, having established control of St. Thomas in 1672. The United States first agreed to buy the islands from Denmark in 1867, though the United States did not assume control over the islands until 1917. Since that time, the economy in the Territory has shifted, with tourism as an industry assuming a larger role (Austin, 2018). The Territory's location continues to attract many visitors tourists who contribute to the local economy.

The USVI is an archipelago located in the Greater Antilles east of Puerto Rico as shown in **Figure 1**. With many islands and cays, the three largest islands – St. Croix, St. John, and St. Thomas – are home to approximately 105,000 people. St. Thomas is comprised of approximately 27 square miles in area, St. John is 19 square miles in area, and St. Croix is approximately 82 square miles in area. St. John and St. Thomas are separated by three miles of Pillsbury Sound, whereas St. Croix is approximately 35 miles south of both St. John and St. Thomas.

The Territory consists of three districts and 20 sub-districts for Census purposes. The three districts (county equivalents) are comprised of the three largest islands: St. Croix, St. Thomas, and St. John. Subdistricts on each island are treated like county subdivisions for the Census, even though the Territory is also divided into estates. These estates are typically smaller than Census subdistricts and are derived from boundaries of agricultural plantations in existence when the United States received the islands from Denmark in 1917 (United States Census Bureau 2019). Groups of adjacent estates comprise Census Tracts. However, meaning that the estates do not nest within subdistricts.

As of the 2010 Census, the Territory is home for well over 100,000 people, comprising 134.3 square miles of land area, with over 55,900 housing units (United States Census Bureau 2013). Approximately three percent of the Islands' for-sale housing stock and 15 percent of its rental housing stock is vacant (U.S. Department of Housing and Urban Development, 2017), of which much of the vacant housing stock is intended for higher-priced single-family vacation rentals for tourists or temporary visitors, as outlined in the 2015 Housing Demand Study. Indeed, given HUD definitions that extend up to 80 percent of Area Median Income, the totals shown for current single family homes for sale that would fall within the affordability range on each of the major islands were inadequate to service the low-income to moderate-income segment that may seek a homeownership alternative, with St. Croix at 18%, St. John at 0%, and St. Thomas at 30% (Community Research Services, LLC, 2015). Figure 3**.** through Figure 5 shows the US Virgin Islands planning area.

Figure 3. St. Thomas Planning Area

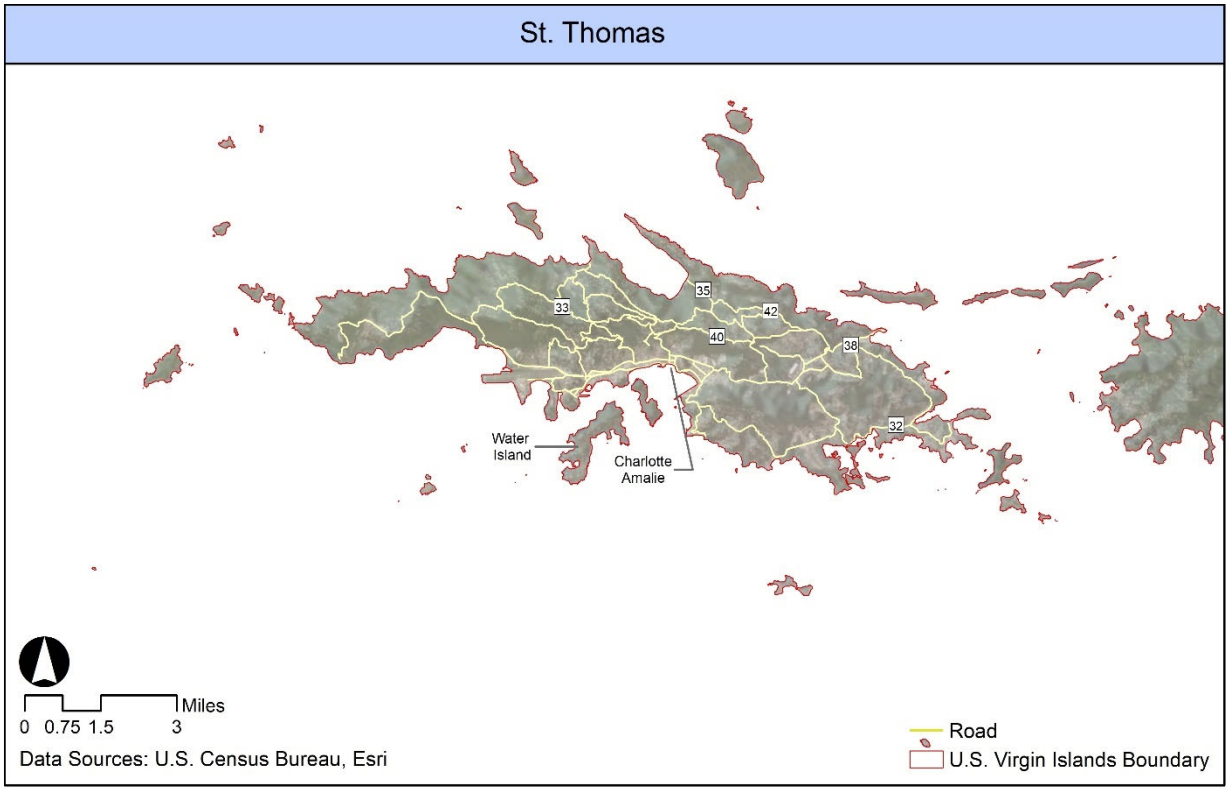


Figure 4. St. Croix Planning Area

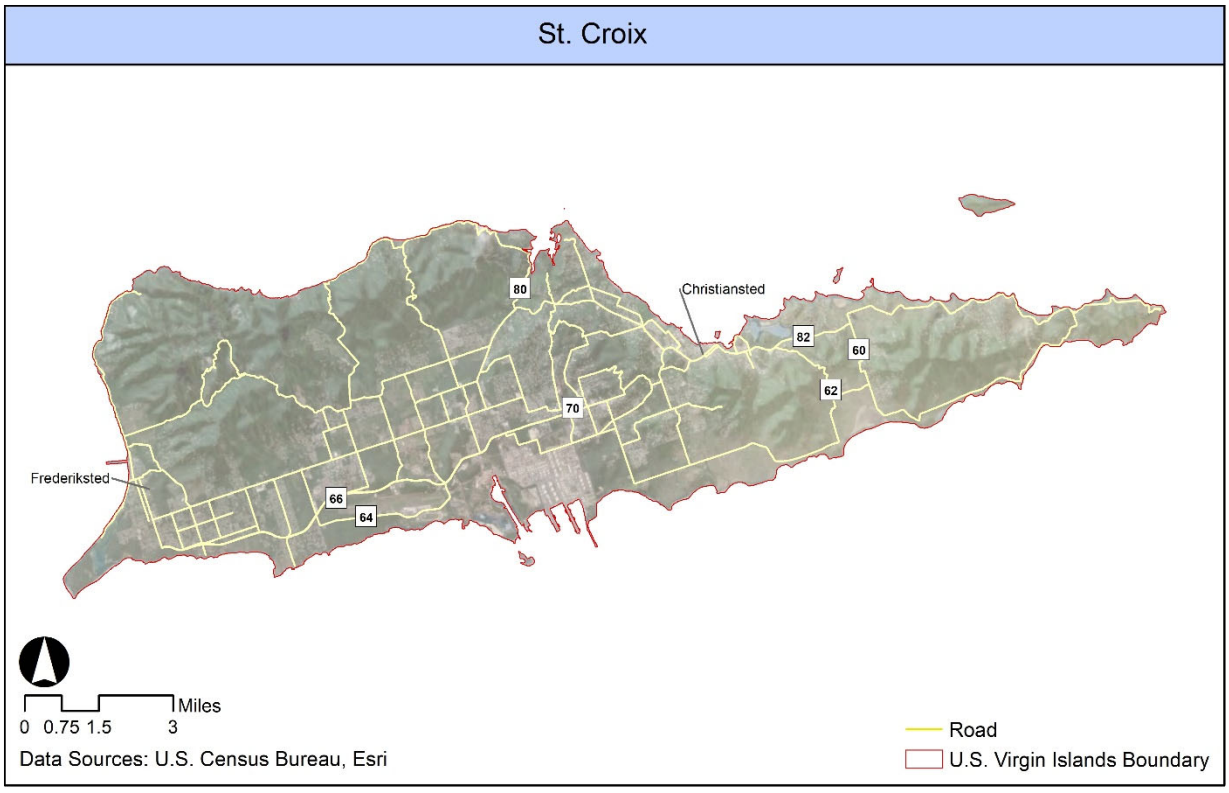
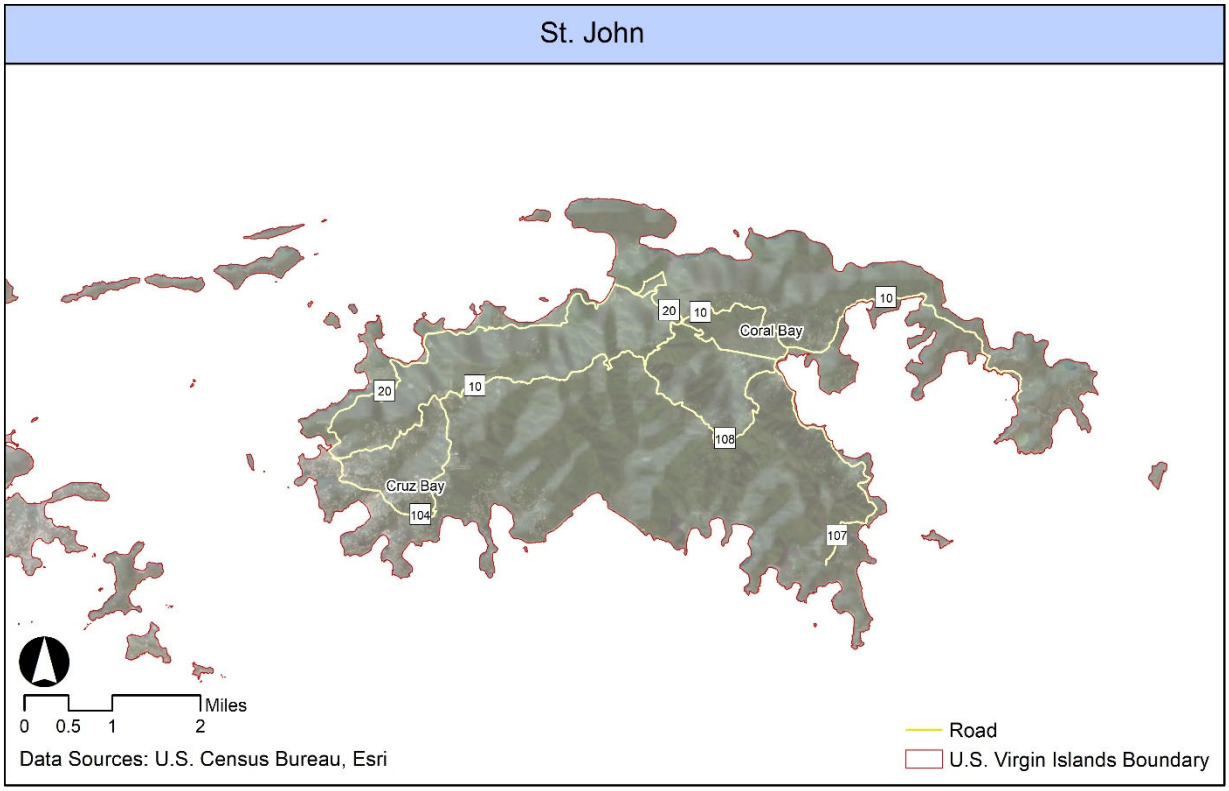


Figure 5. St. John Planning Area



1.5.1 Recent Hurricane Impacts

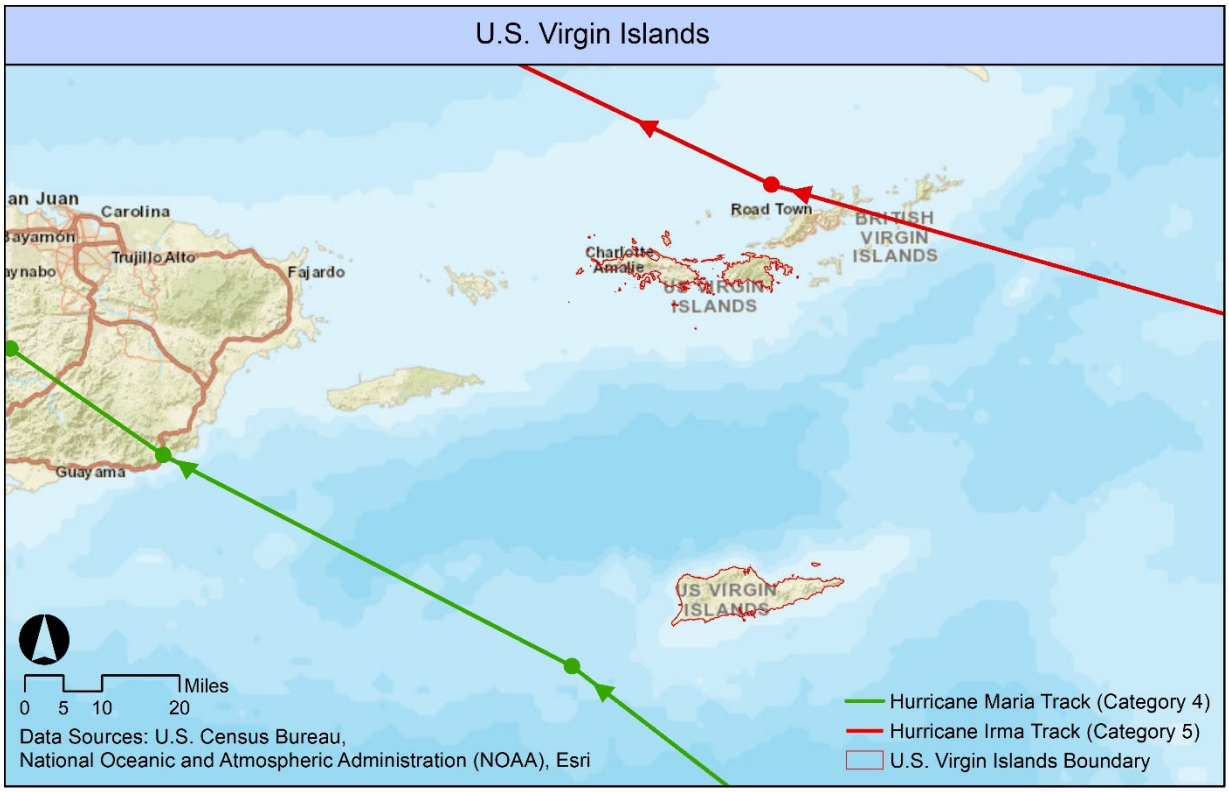
Although the Territory has long been exceptionally vulnerable to natural hazards such as hurricanes and tropical storms, the Islands' readiness and resilience were tested during the 2017 hurricane season. This Mitigation Needs Assessment arises from the unprecedented damage and lasting impacts of Hurricanes Irma and Maria. The impacts from these storms, which made landfall in late September 2017, continue to be felt to this day both in the Virgin Islands and other islands in those hurricanes' path.

On September 6, 2017, Hurricane Irma passed just north of St. Thomas and St. John as a Category 5 storm, yielding 4-10 inches of rainfall and wind gusts up to 160 mph in St. Thomas and St. John. Hurricane winds extended more than 50 miles from the eye, with tropical storm force winds extending up to 185 miles from Irma's eye. On September 20th, just two weeks later, Hurricane Maria passed south of St. Croix as a Category 5 storm and struck Puerto Rico. Hurricane Maria brought 8-12 inches of rain to the islands and directly impacted Hurricane Irma. Hurricane Irma resulted in wind gusts up to 140 mph, and hurricane-force winds extended 60 miles from the eye. Tropical storm-force winds were experienced up to 150 miles from Hurricane Maria's eye, meaning that the Territory encountered extremely high winds as both storms passed. Storm surges were relatively minor (up to three feet) owing in part to the presence of the Territory's geography, though higher localized flooding may still have occurred in many locations (National Centers for Environmental Information, 2019). **Figure 6** indicates the hurricane tracks of these events. **Table 3** compares the impacts of the two hurricanes.

Hurricanes Irma and Maria together are currently regarded as the second-most costly storms in American history, totaling $147 billion in damage. Individually, the storms ranked third and fifth most

damaging in terms of cost. Hurricane Maria was the deadlier of the storms, causing 2,981 deaths in its path (National Centers for Environmental Information, 2019).

Figure 6. Hurricane Irma and Hurricane Maria Tracks



Pictured: Storm destruction on St. John near the school in Cruz Bay.

Table 3. Comparative Hurricane Impacts.

	Hurricane Irma	Hurricane Maria
Category	5	5
Landfall date	September 6	September 20
Landfall location	St. Thomas / St. John	St. Croix
Worst affected areas	St. Thomas / St. John District	St. Croix District
Maximum measured sustained wind speeds	106 mph*	107 mph*
Maximum measured wind gusts in the USVI	137 mph*	137 mph*
Rainfall	Data not available*	5 in.+*
Storm surge	0.60 – 2.28 ft.+*	1.48 – 2.85 ft.+*
Storm tide	0.50 – 1.7 ft.+*	1.61 – 3.17 ft.+*
Direct deaths	3	2

*Precipitation and tide measuring instruments were knocked off-line or destroyed

Source: USVI Hurricane Recovery and Resilience Task Force

Enormous devastation resulted from the impact of these two hurricane events. In 2018 the total damage to the Territory from both storms was estimated to be $10.8 billion, including $6.9 billion in damage to infrastructure, $2.3 billion in damage to housing, and $1.5 billion in economic damage. Five direct deaths were attributed to the Hurricanes, though a December 2019 article published in the *American Journal of Public Health* reports that there may be several hundred excess deaths not reflected in official counts (Chowdhury, 2019).

Hurricane damage to the Territory was crippling and wide-reaching for many sectors on the island. The USVI Hurricane Recovery and Resilience Task Force reported the following damages:

- More than 90% of above-ground power lines were damaged and more than half of all poles were knocked down. Power outages persisted for months after the storm. By January 2018, more than three months after the storm, power was restored to most customers.
- The hurricanes disabled cell service on St. John and took 80% of cell sites out of service in St. Croix and St. Thomas. Government telecommunications, radio, and television stations were knocked out of service.
- The airports on St. Croix and St. Thomas were closed for over two weeks after the storms.
- Ports were closed for more than three weeks and more than 400 vessels were sunken or grounded with over 300 containing hazardous substances.
- The storms disabled reverse osmosis water facilities for two days in St. Croix and 10 days in St. Thomas, reducing potable water reserves to a three-day volume. Storage tanks and pumping stations were severely damage. Raw sewage was discharged into streets and coastal waterways, and the Islands' landfill exceeded full capacity
- More than half (52%) of housing stock was damaged. 12% of homes were damaged severely.

- The territory's hospitals were rendered non-operational for most services, with inpatient capacity reduced by 50% and resulting in evacuations of patients from the Islands.
- More than half of the territory's schools were damaged by more than 50%.
- The territory lost 8% of jobs in the aftermath of the two Hurricanes (USVI Hurricane Recovery and Resilience Task Force, 2018).

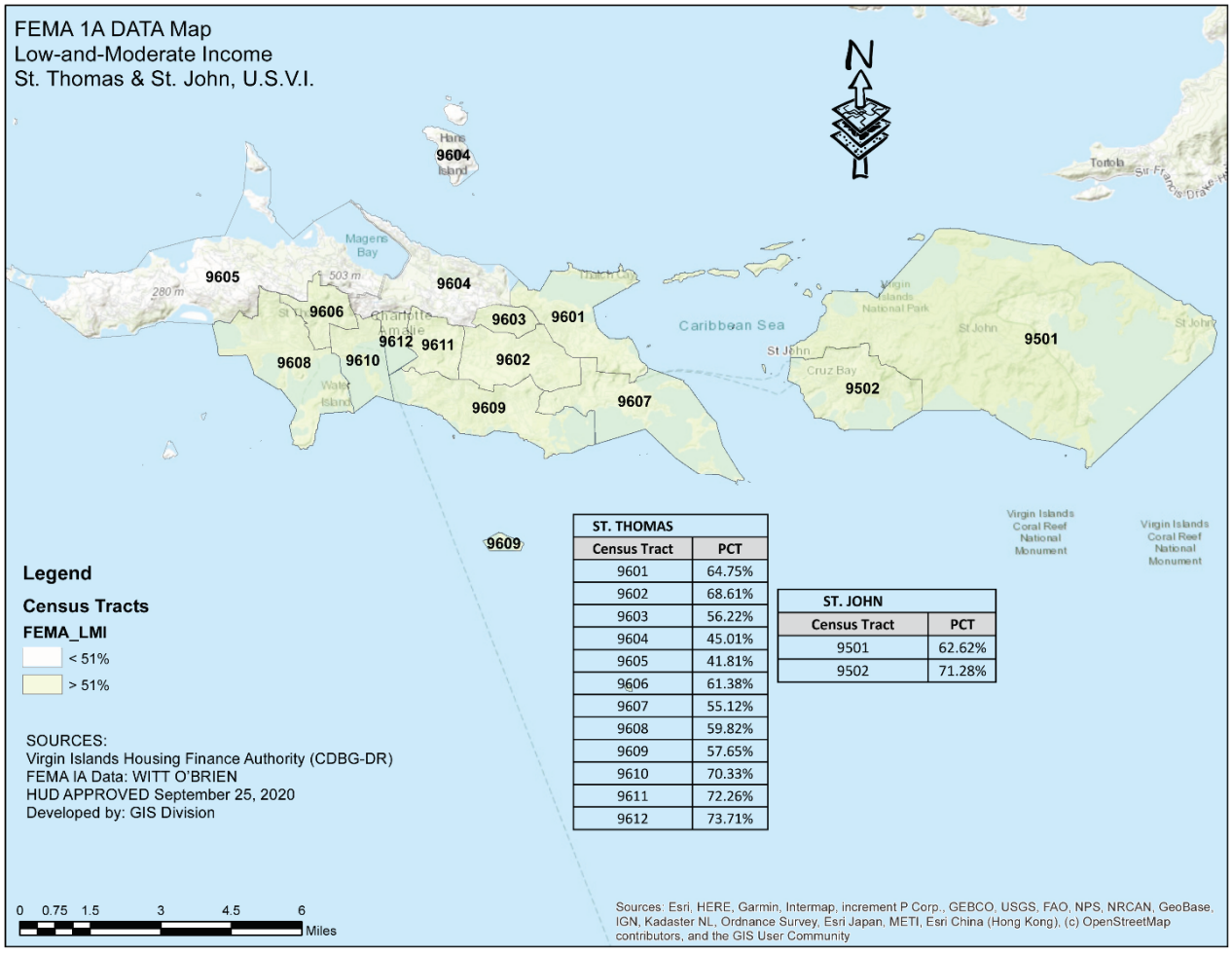
The US Virgin Islands' recovery from these devasting storm events continues to the present day. The intention of the Mitigation Needs Assessment and Mitigation Action Plan is to reduce vulnerability and mitigate damages and losses to future hazard events by looking at the impact of prior events, including hurricanes.

1.6 USVI Social Vulnerability and Distress Indicators

The anticipated benefits from the projects and activities described in this CDBG-MIT Action Plan will accrue to LMI residents in the Territory, as mandated by HUD regulations. Data from the 2010 U.S. Census provides the dataset used for analyzing the demographic profile for the Territory, as the census tract level given that the American Community Survey is not conducted in the Territory. However, to ensure a more accurate and comprehensive view of the socioeconomic characteristics of the U.S. Virgin Islands' population, 2010 data were supplemented with insights from the most recent U.S. Virgin Islands Community Survey conducted by the University of the Virgin Islands (available at the island level) and various U.S. Virgin Islands government agencies, including the Bureau of Economic Research and the Department of Labor, including the most recently available FEMA Data Maps, which are included below. Taken together, the three main islands show a relatively similar demographic profile, with high percentages of Low to Moderate Income (LMI) Individuals. In 2020 HUD approved the USVI use of FEMA IA data to determine LMI residents on an area basis under a survey methodology as set forth in the CDBG regulations under 24 CFR 570.483(b)(1)(i).

The anticipated benefits from the projects and activities described in this CDBG-MIT Action Plan will accrue to LMI residents in the Territory, as mandated by HUD regulations. The median household income in the Territory is 25% lower than the national median ($37,254 compared to $51,914), and 22% of the population is below the poverty level (compared to 14.4% nationally). Of the three principal islands, St. Croix faces the more severe economic vulnerability with 26% of residents living below the poverty line, with an island-wide median household income of $36,042. The poverty rate is 7% higher than in St. Thomas and 11% higher than in St. John (United States Virgin Islands Housing Finance Authority, 2018). According to the US Virgin Islands Community Survey, approximately 25% of all persons in the Islands live in poverty, and income per capita is $20,156. The following table shows the percent of low and moderate income (LMI) households for each Census Tract based on 2010 Census data. Just over half (52%) of households in the Virgin Islands are LMI households, though this figure varies slightly between the Islands and more significantly between Census Tracts. In the process of analyzing prior census data, the VIHFA previously encountered findings that did not align with pre-storm and current conditions within the Territory. Specifically, the data utilized for income designation of households was not indicative of the current economic and income profile of residents of the U.S. Virgin Islands. Given discrepancies between the high costs of living in the U.S. Virgin Islands (including the fair market rents that do not align with the wages, the higher construction costs, and the exceptionally high average costs of electricity paid by Territory residents, and the income limits set by HUD), the VIHFA developed an alternative method of documenting income using information from the FEMA Individual Assistance income data that more accurately represents incomes in the Territory. The VIHFA received a waiver from HUD in 2020 that permitted use of that more recent data to more accurately capture Virgin Island residents' income status, which is reflected in Figure 7 and Figure 8 on the following pages.

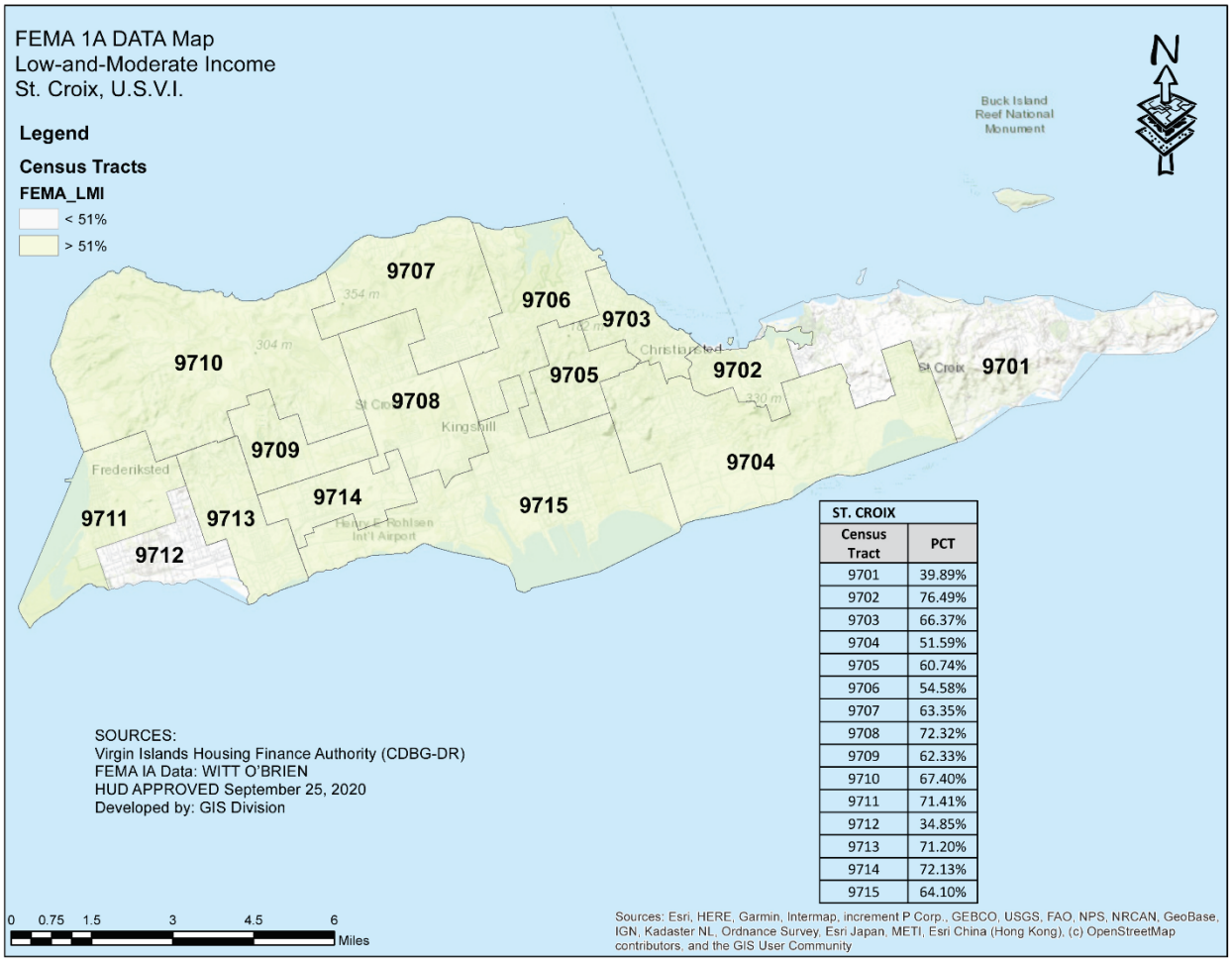
Figure 7. St. Thomas & St. John LMI



ST. THOMAS	
Census Tract	PCT
9601	64.75%
9602	68.61%
9603	56.22%
9604	45.01%
9605	41.81%
9606	61.38%
9607	55.12%
9608	59.82%
9609	57.65%
9610	70.33%
9611	72.26%
9612	73.71%

ST. JOHN	
Census Tract	PCT
9501	62.62%
9502	71.28%

Figure 8 St. Croix LMI



ST. CROIX	
Census Tract	PCT
9701	39.89%
9702	76.49%
9703	66.37%
9704	51.59%
9705	60.74%
9706	54.58%
9707	63.35%
9708	72.32%
9709	62.33%
9710	67.40%
9711	71.41%
9712	34.85%
9713	71.20%
9714	72.13%
9715	64.10%

While the use of 2010 Census Bureau data for evaluating the projected income status of the beneficiaries within the existing established geographical boundaries unfairly represents the pre-storm and current community characteristics of the U.S. Virgin Islands, utilizing the FEMA IA data collected immediately after the storm provides a more comprehensive and representative income data set. To address the extent of U.S. the storms' impact, it is necessary to examine their effects first on LMI populations and the most vulnerable households, given the planned scope of the MIT-AP, with a high LMI population existing in the Territory even before the two storms made landfall, as shown in the 2010 Census data and reflected below:

Table 4. Percent of Low- and Moderate-Income Households in the USVI

Census Tract (Subdistrict)	% of LMI Households	Census Tract	% LMI Households
USVI	**52%**		
St. Croix	**46%**		
9701 (East End)	29%	9709 (Northwest)	69%
9702 (Christiansted)	59%	9710 (Northwest)	42%
9703 (Sion Farm)	58%	9711 (Frederiksted)	56%
9704 (Anna's Hope Village)	32%	9712 (Southwest)	44%
9705 (Sion Farm)	37%	9713 (Southwest)	50%
9706 (Sion Farm)	31%	9714 (Southcentral)	48%
9707 (Northcentral)	42%	9715 (Southcentral)	40%
9708 (Southcentral/Northcentral)	59%		
St. John	**55%**		
9501 (Central/Coral Bay)	54%	9502 (Cruz Bay)	55%
St. Thomas	**58%**		
9601 (East End)	59%	9607 (East End/Red Hook)	55%
9602 (East End)	59%	9608 (Charlotte Amalie West)	60%
9603 (Tutu)	56%	9609 (Southside)	58%
9604 (Northside)	42%	9610 (Charlotte Amalie)	70%
9605 (Northside/West End)	38%	9611 (Charlotte Amalie East)	72%
9606 (Northside/Charlotte Amalie)	61%	9612 (Charlotte Amalie)	74%

Source: US Census – 2010. Cited in 2018 CDBG-DR Action Plan.

Figure 9 illustrates the distribution of low-income households (those earning less than $30,000 per year) across the islands. Both Frederiksted and Christiansted on St. Croix see higher proportions of low-income households. Charlotte Amalie on St. Thomas is similarly comprised of low-income households, with approximately one-third earning less than $30,000.

Figure 9. St. Croix Low-Income Household Percentages

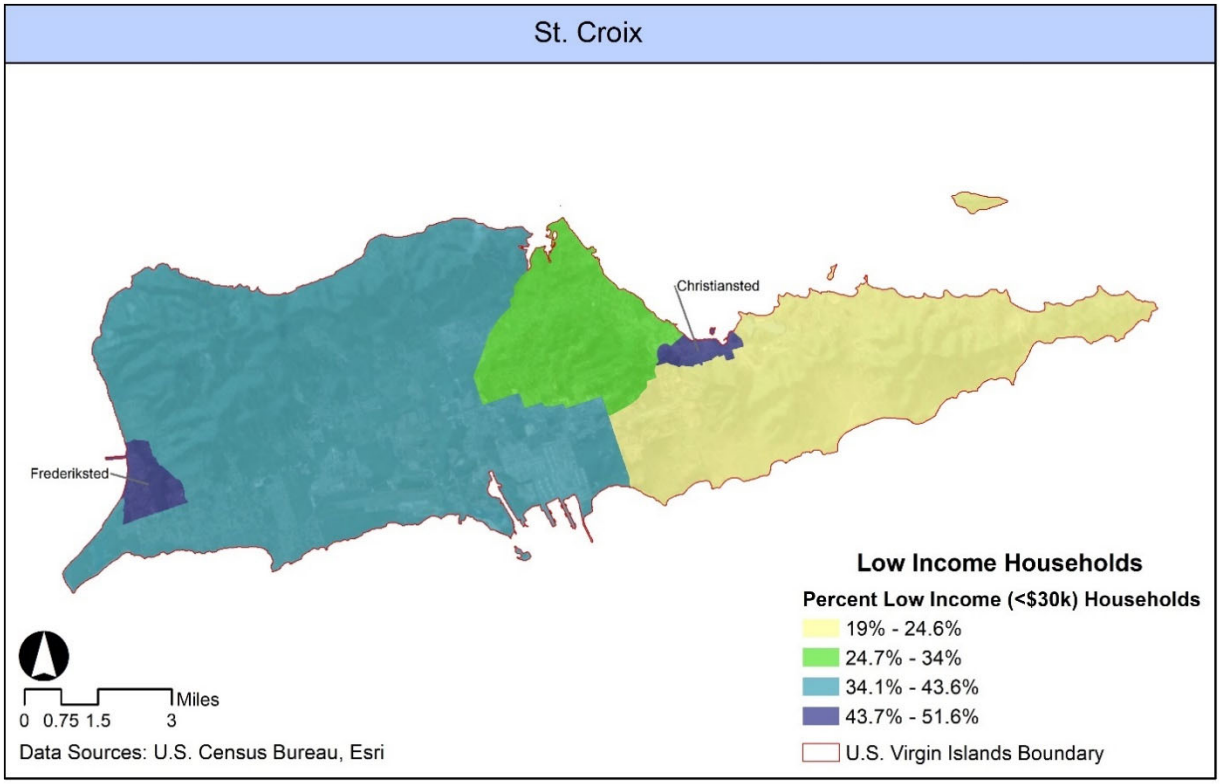


Figure 10. St. Thomas Low-Income Household Percentages

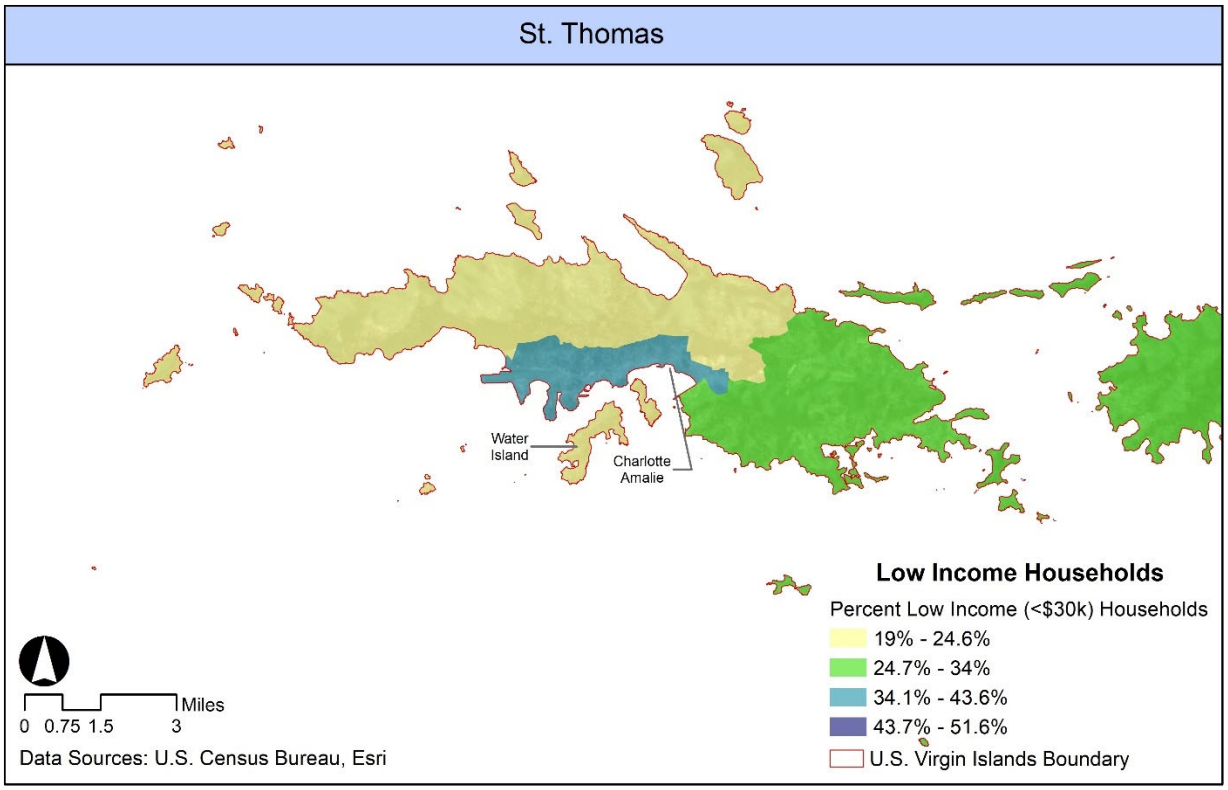
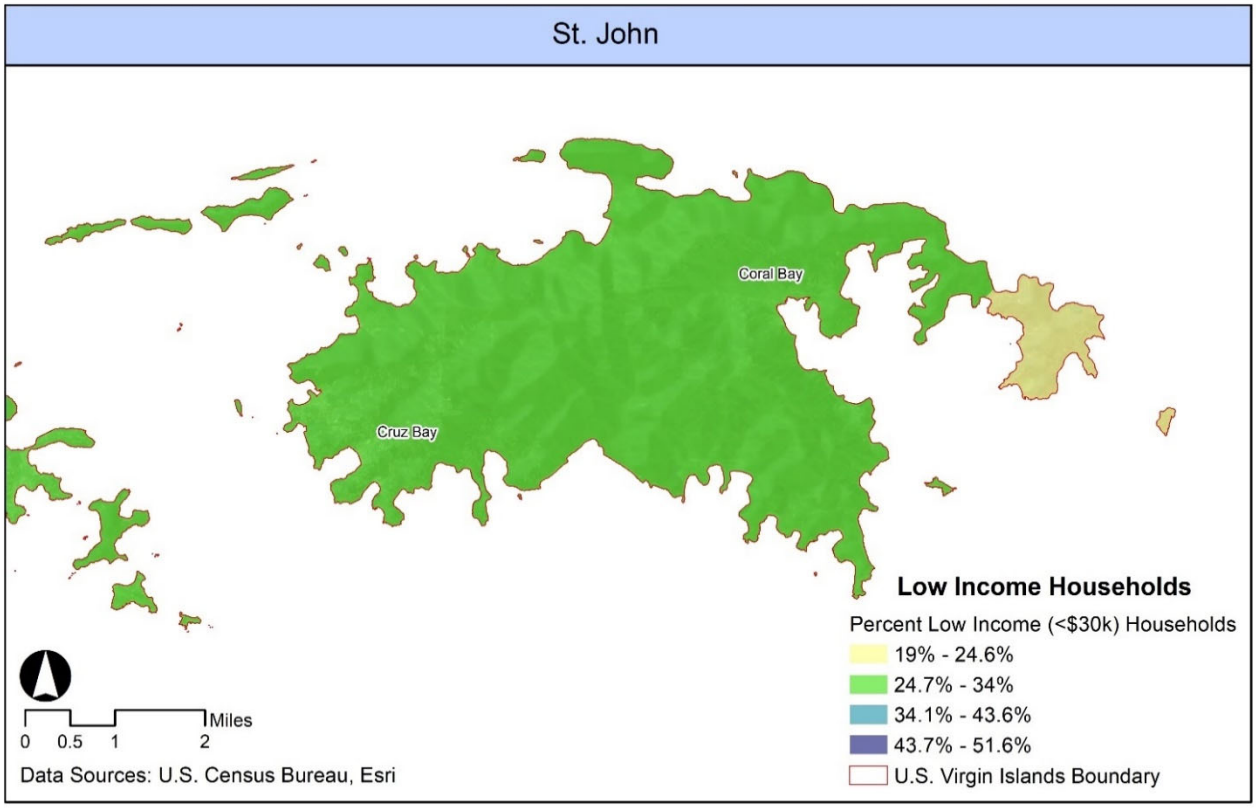


Figure 11. St. John Low-Income Household Percentages



Pursuant to Federal Register Notice 83 FR 40314, all subdivisions of the territory are considered "most impacted and distressed" (MID) for Community Development Block Grant-Disaster Recovery allocations (United States Government Publishing Office, 2018). Pursuant to Appendix A of the CDBG-MIT Main Notice, "most impacted and distressed" are those that meet three standards:

(1) Individual Assistance/IHP designation. HUD has limited allocations to those disasters where FEMA had determined the damage was enough to declare the disaster as eligible to receive Individual and Households Program (IHP) funding.

(2) Concentrated damage. HUD has limited its estimate of serious unmet housing need to counties and Zip Codes with high levels of damage, collectively referred to as "most impacted areas". For this allocation, HUD defines the most impacted areas as either most impacted counties—counties exceeding $10 million in serious unmet housing needs—and most impacted Zip Codes—Zip Codes with $2 million or more of serious unmet housing needs. The calculation of serious unmet housing needs is described below.

(3) Disasters meeting the most impacted threshold. Only 2017 disasters that meet this requirement for most impacted damage are funded:

a. One or more most impacted county

b. An aggregate of most impacted Zip Codes of $10 million or greater

The 2019 THMP, as noted in the prior section, analyzed hazards for potential dollar loss for the given facility as well as the social impact in terms of the population of those under the age of 18 and over the age of 65 in the hazard area.

Vulnerability Classifications for MNA derive from the THMP. The THMP ranked vulnerability for structures and critical facilities on the following scale:

- Very Low, (no, or negligible damage)
- Low, (easily repairable damage mainly to part of components and/or contents)
- Moderate, (considerable, yet repairable damage to mainly non-structural components)
- High (considerable damage to both structural and non-structural components), and
- Very High (the extent of damage is too much to be repaired; the facility must be demolished and replaced)

1.7 Hazard Context

1.7.1 Hazards of Concern

The 2019 THMP Plan identified eight hazards of concern for the Territory for which vulnerability assessments were conducted. Following the vulnerability assessment, these hazards were ranked by potential dollar loss in the table below, with 1 being the highest. Although vulnerability estimates were not previously conducted for rain-induced landslides or wildfires within the most recent THMP, current analysis showed that hurricane and riverine flooding were top-ranked hazards for the Territory. In preparing the MNA, the Project Team examined recent disaster data and undertook new risk assessments for flooding as described in the subsequent section while also bringing pandemic into the mix because of recent world events related to the spread of the coronavirus commonly called COVID-19. The results from these analyses resulted in the ordinal re-ranking of hazards. Table 5 shows the new results of the hazard ranking for each of the major three islands within the Territory.

Table 5. Adjusted 2020 Hazard Ranking by Dollar Loss

Hazard	St. Thomas	St. Croix	St. John
Hurricane	1	1	1
Riverine Flooding	2	2	2
Earthquake	3	3	4
Tsunami	4	4	7
Drought	5	5	5
Coastal Flooding	6	6	3
Rain-Induced Landslide	7	7	6
Wildfire	8	8	8
Pandemic/Disease Outbreak	*Unranked*	*Unranked*	*Unranked*

Source: 2019 Territorial THMP – Includes adjusted 2020 vulnerability assessment results

1.7.2 Methodology for Hazard Analysis

This MNA was developed with data and findings from the 2019 Territorial Hazard Mitigation Plan (THMP), which while in the process of being updated is the most recently adopted plan. As noted within the prior section, the 2019 Plan examined each hazard of concern and analyzed hazards for potential dollar loss for community lifelines, plus residential and commercial structures. The Plan also

examined the social impact in terms of affected population of residents under the age of 18 and over the age of 65. Explanations of the methodologies used to conduct the risk assessment and vulnerability can be found in the 2019 Territorial Hazard Mitigation Plan (THMP). For the Mitigation Needs Assessment, which is to build on the most recent THMP, hazard exposure and consequence have been reclassified by also factoring in the risk to lifelines and structures in the Territory. For these hazards, the most recent Hazard Mitigation Plan classified relative risk to specific hazards.

Consequence classification components are adapted from the 2019 Territorial Hazard Mitigation Plan, which had classified risk exposure into five categories rather than three. Lifelines and structures consequence classifications were classified based on high, moderate, or low impacts, building on data analysis and work done in developing prior THMP analysis, with Table 6 below showing impact classification.

Table 6. Exposure Classification and Consequence

Consequence Classification	Classification Definition	Hazard
High Impact	Hazard impacts result in substantial damage to structural and non-structural components and/or building destruction.	Earthquake; Hurricane Wind
Moderate Impact	Hazard impacts result in apparent structural damage to both structural and non-structural components.	Drought; Tsunami; Coastal Flooding; Riverine Flooding
Low Impact	Hazard impacts result in no or negligible damage to non-structural components and no damage to structural components. Damage, if any, is easily repairable with minimum resources.	Rain-Induced Landslide; Wildfire

During the development of the Mitigation Needs Assessment (MNA), the need to update the assessments of the flood and drought hazards was identified by the Project Team. The Project Team re-assessed impacts for lifelines and general building stock for the Flood, Sea Level Rise, and Storm Surge hazards using best available data[2] and HAZUS analysis. This will account for discrepancies in the buildings and lifelines for which the risk was assessed. The 2019 Territorial Hazard Mitigation Plan utilized a list of critical facilities developed by VITEMA with updates identified through site visits and assessments. Lifeline consequences for all hazards except flooding were determined by damage ratios calculated for the 2014 and 2019 Territorial THMP. Consequence classifications for lifelines impacted by flooding-related hazards (including sea level rise and storm surge) were determined by a lifeline's location in the hazard zone.

General building stock and community lifeline exposure and vulnerability analyses for the 1%-annual-chance (100-year) flood hazard were also conducted using GIS and HAZUS software. The flood hazard was represented by Advisory Flood Zone data provided by the Federal Emergency Management Agency (FEMA), which represents the best available data for this hazard. Exposure analyses for the storm surge and sea level rise hazards were conducted using GIS software. The storm surge hazard was represented by the inundation area modeled by the National Oceanic and Atmospheric Administration (NOAA) utilizing the hydrodynamic Sea, Lake, and Overland Surges from

[2] 8/2018 Advisory Base Flood Elevation dataset provided by FEMA/STARR II (2018 Advisory Base Flood Elevation data).

Hurricanes (SLOSH) model. The sea level rise hazard was represented by mapping the inundation area (including low-lying, hydrologically "unconnected" areas that may flood) from a 2 foot and 4 foot of sea level rise as modeled by NOAA, representing the projected 2050 high and 2100 high scenarios, respectively. The general building stock data is the individual structure inventory used by FEMA to update the HAZUS default data in 2019. The community lifeline data is the HAZUS (version 4.2) critical facilities default data, which was also recently updated by FEMA.

The drought risk and vulnerability assessment from the 2019 Hazard Mitigation Plan was not retained for the MNA due to the Project Team's concerns that the Islands' vulnerability to the drought hazard was not adequately captured by the assessments undertaken in the 2019 Plan Update. Additionally, recent drought events were not described in the 2019 plan. This Mitigation Needs Assessment does not include spatial analyses and damage assessments owing to the nature of the drought hazard. The findings from the drought re-assessment elevated the hazard's ranking.

1.8 Critical Facilities and Lifelines

FEMA has defined Community Lifelines for incident response, to provide the federal government a better understanding of the impacts of hazards and disasters in local jurisdictions. The 2019 THMP identified three types of critical facilities and infrastructure: Critical Facilities, Transportation Infrastructure, and Utilities. For the purposes of this Mitigation Needs Assessment, these facilities have been cross-referenced with FEMA lifelines to assess vulnerability based on lifeline categories. A matrix describing this crosswalk is found in **Table 7**. Lifeline exposure to each hazard is described in subsequent sections.

Table 7. FEMA Lifelines and Identified Critical Facility Crosswalks

USVI-THMP Critical Facility	FEMA Lifeline Category	USVI THMP-Transportation Infrastructure	FEMA Lifeline Category	USVI THMP – Utilities	FEMA Lifeline Category
Police Stations	Safety & Security	Marine Ports	Transportation	Electrical Power Generating Plants	Energy
Fire Stations	Safety & Security	Airport	Transportation	Water System	Food, Water, Shelter
Hospital/Medical Clinic	Health and Medical			Desalinization Plant	Food, Water, Shelter
Government Buildings	Safety and Security			Desalination Plant	Food, Water, Shelter
Shelters/Special Needs	Food, Water, Shelter			Water Distribution System	Food, Water, Shelter

For this MNA, the Territory's impacted lifelines were assessed on a hazard-by-hazard basis. Each lifeline category was classified with a Consequence Classification as shown in Table 4. The classification is informed by damage assessments and modeled damage estimates calculated for the 2019 Territorial Hazard Mitigation Plan and the Mitigation Needs Assessment.

1.8.1 Safety and Security

Safety and Security lifelines include various law enforcement, emergency services, and government services facilities. Disruption to these services can significantly hamper the territorial government's ability to provide public safety services and critical government functions. In the wake of Hurricanes Maria and Irma, these lifelines saw major impacts, and facilities saw significant damage. In the Islands, schools, police stations, US Coast Guard facilities, the Readiness Center, fire stations, libraries, and daycares are all considered Safety and Security Lifelines.

Pictured: Innovative model shelter on St. Thomas owned by the VIHFA.

Food, Water, Shelter

Food, water, and shelter lifelines provide basic needs such as housing, the commercial food supply chain and programs, and water systems. These lifelines are critical for sustaining life prior to, during, and following storm events. In the US Virgin Islands, these facilities include wastewater facilities, potable water facilities, desalinization facilities, shelters, and some residential buildings. Shelter facilities were stressed and damaged during and following the hurricanes as residents stayed at the shelters due to damage to homes. WAPA water facilities were damaged and impacts to the food supply chain resulted in delays to residents receiving food.

Health/Medical

Health and medical lifelines include facilities that comprise the medical supply chain, perform public health services, fatality management, patient movement, and medical care. This includes home care, pharmacies, and raw materials needed to produce medicine. Impacts to medical facilities were profound during the hurricanes of 2017, necessitating the evacuation of 800 patients from the Territory to facilities in Puerto Rico and the American mainland. Medical facilities in the Territory also suffer from workforce shortages, inadequate funding, and infrastructure limitations (USVI Hurricane Recovery and Resilience Task Force, 2018).

Energy

Energy lifelines power the US Virgin Islands and include facilities that produce and distribute electric power, with two separate electricity grids managed by the Water and Power Authority (WAPA). The residential sector consumes over one-third of WAPA's electricity, and just under one-third is consumed by large power users that each use more than 25 kilowatts (U.S. Energy Information Administration, 2020). Primary WAPA generating facilities include the Harley Generating Station near Charlotte Amalie on St. Thomas and the generating facility at Estate Richmond near Christiansted on St. Croix. These facilities also contain large storage tanks that bunker the fuel consumed by the generators in order to produce power in the territory.

Communications

Communications lifelines include communications infrastructure such as data centers and cell towers, in addition to LMR networks, payment-processing systems, 911/emergency dispatch facilities, and emergency alert systems. The 2017 hurricanes substantially damaged cellular, landline, and radio-based telecommunications systems. Following the storms, cell phone availability decreased by between 80 to 90 percent for several weeks. The loss of cell phone coverage disrupted communications among residents as well as to responding agencies. St. John was noted to have been hard-hit, with landline and public safety radio communications destroyed between Coral Bay and Cruz Bay. Following the storm, amateur radio resources were used to relay information.

Transportation

Transportation lifelines facilitate the movement of people and goods throughout the Islands. Following the 2017 hurricanes, seaports in the Territory did not open for three weeks and both major airports remained closed for approximately two weeks as well (USVI Hurricane Recovery and Resilience Task Force, 2018). As relatively remote landmasses, the Islands rely on imports for many goods. The Islands' port facilities are particularly important for this reason, as well as due to their connection to the regional economy. Throughout the islands, ferry terminals, airports, and heliports connect the Islands to each other and to the global economy.

1.8.2 Lifeline Locations

The maps on the following page show the location and distribution of lifeline locations across the three islands. Note that the lifelines shown on these maps are those identified in the most recent Hazus dataset. This dataset was used for the risk assessment of flood-related hazards. Vulnerability assessments for other hazards used a separate critical facilities dataset developed for the Territorial THMP. The following maps show the distribution of community lifelines in St. Croix. Safety and Security lifelines are most prevalent, and are found near the population centers of Frederiksted, Christiansted, and Golden Grove. Energy and transportation lifelines are heavily concentrated in the vicinity of the former HOVENSA refinery (now West Indies Petroleum Limited and Port Hamilton Refining and Transportation, LLLP), where petroleum storage, refining, and transportation facilities are located. WAPA water facilities were damaged and impacts to the food supply chain resulted in delays to residents receiving food.

On St. Thomas, safety, and security lifelines (mostly school facilities) are predominately clustered near Charlotte Amalie and at the University of the Virgin Islands, located west of Charlotte Amalie. Transportation facilities can be found clustered along the shore, including at the cruise ship ports, ferry terminals, and at the Cyril King Airport. Energy lifelines are found south of the airport near the WAPA desalinization plant.

St. John is the smallest in both population and population density of the three main islands of the USVI. Most of the safety and security and transportation lifelines are clustered near Cruz Bay with a few scattered across the Island.

Figure 12. St. Croix Community Lifelines (Map 1 of 2)

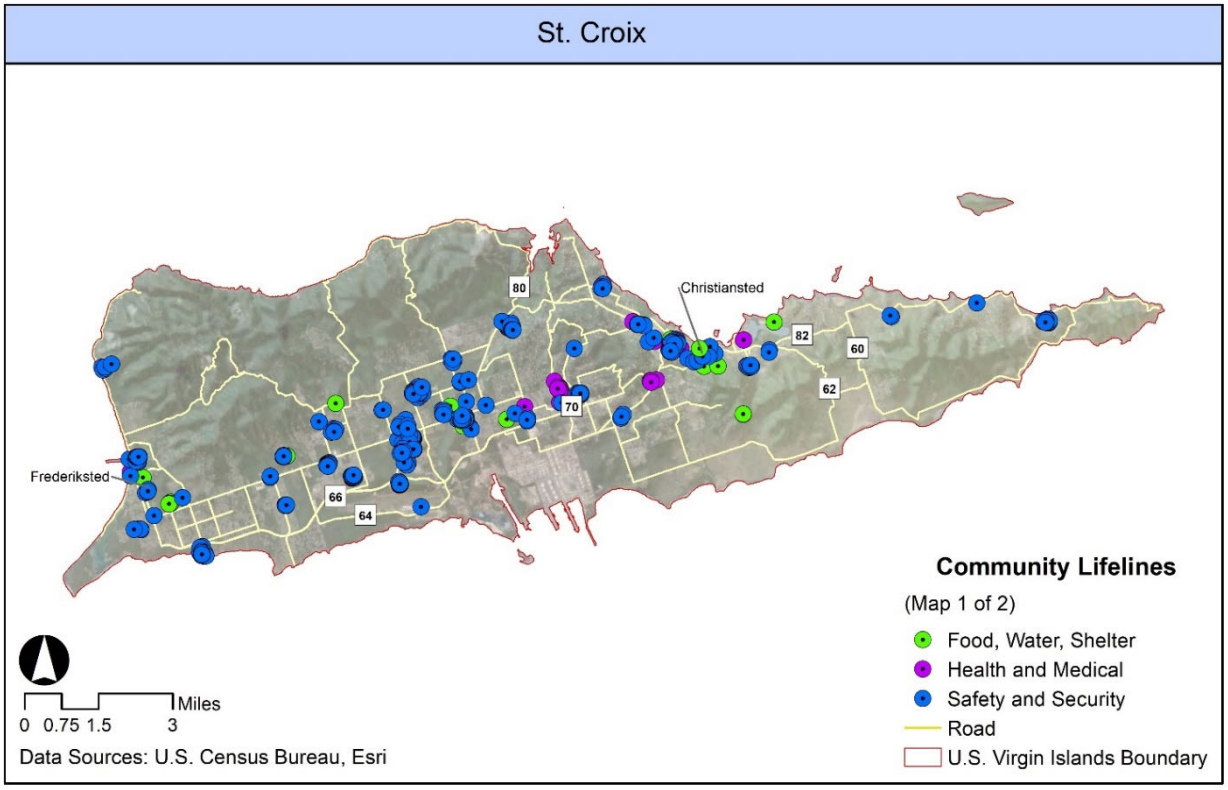


Figure 13. St. Croix Community Lifelines (Map 2 of 2)

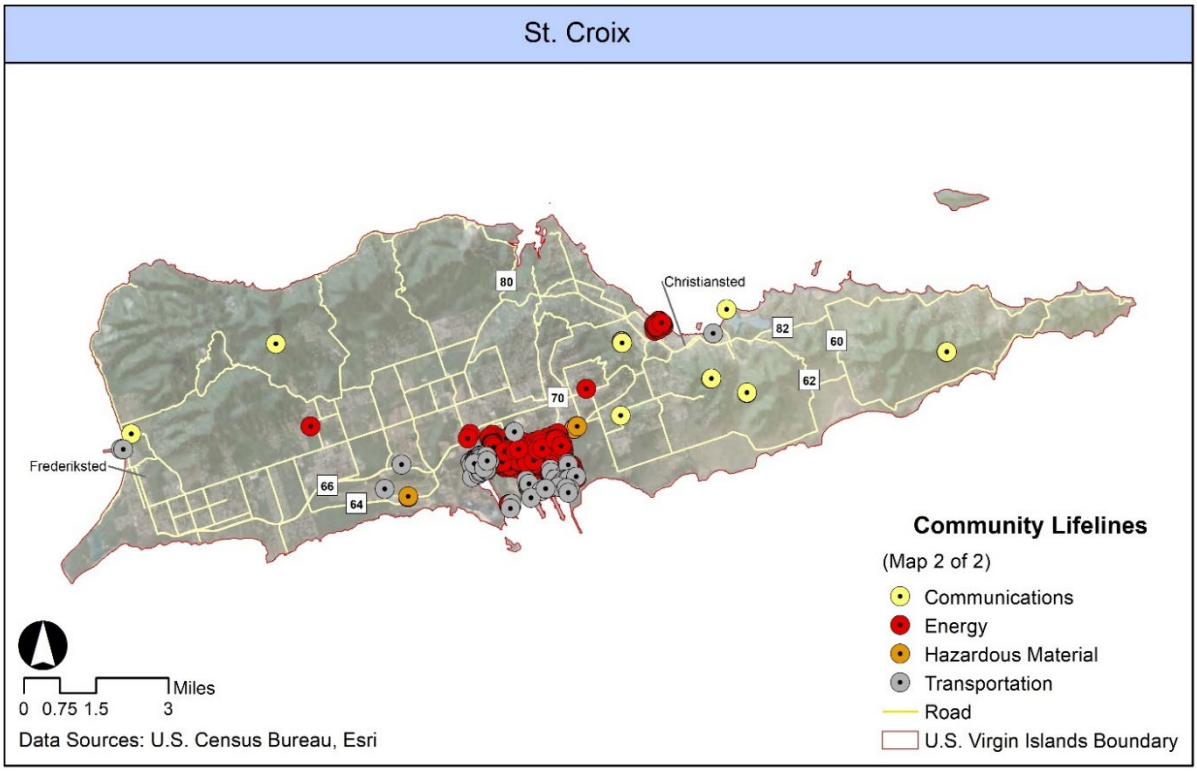


Figure 14. St. Thomas Community Lifelines (Map 1 of 2)

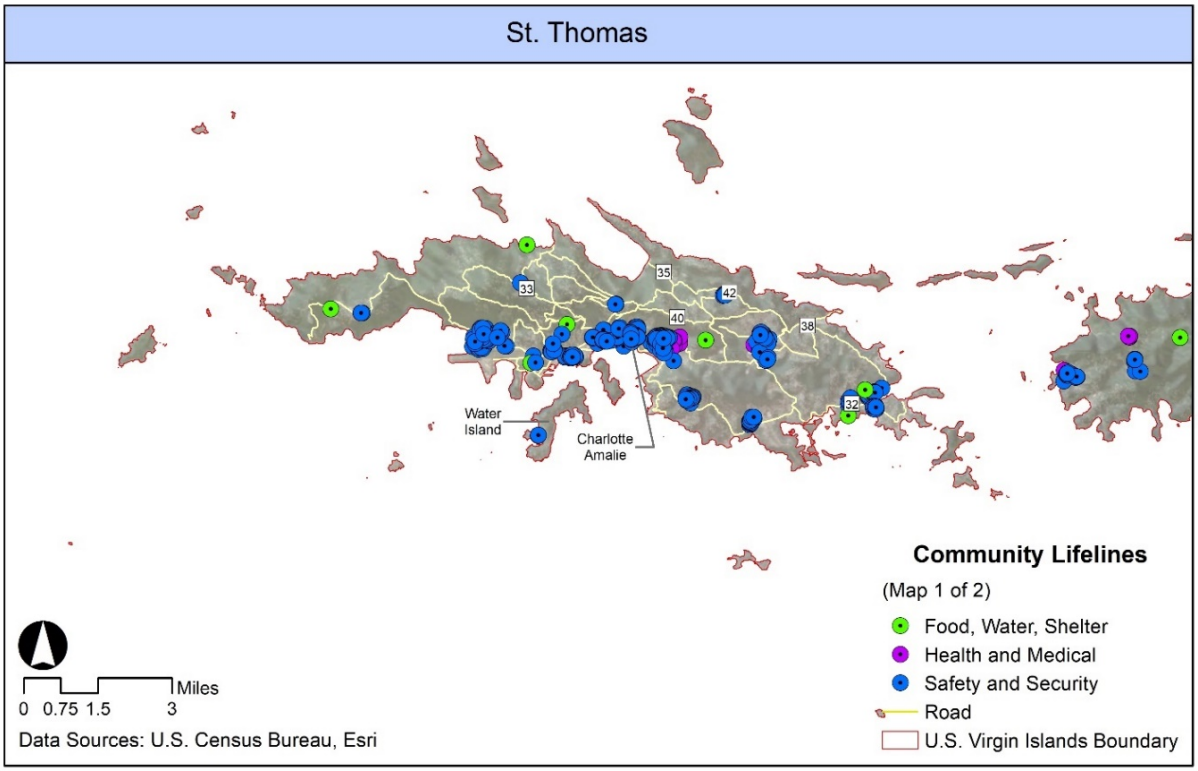


Figure 15. St. Thomas Community Lifelines (Map 2 of 2)

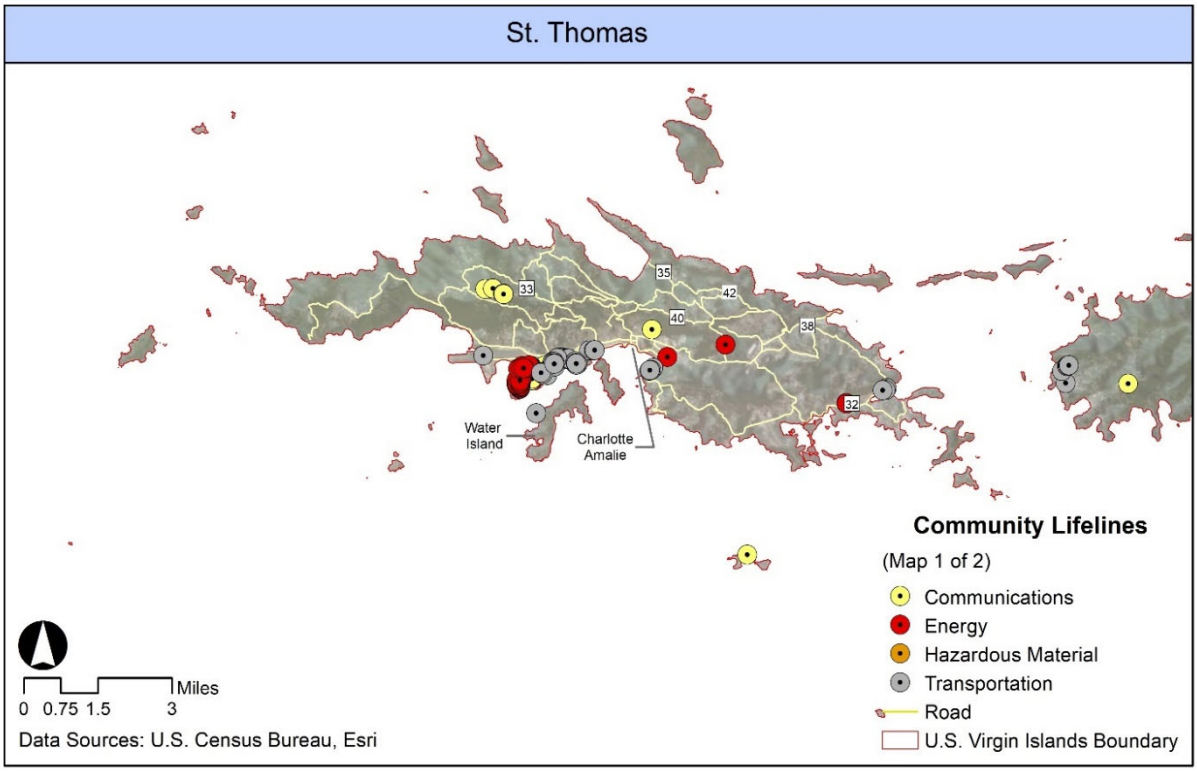


Figure 16. St. John Community Lifelines (Map 1 of 2)

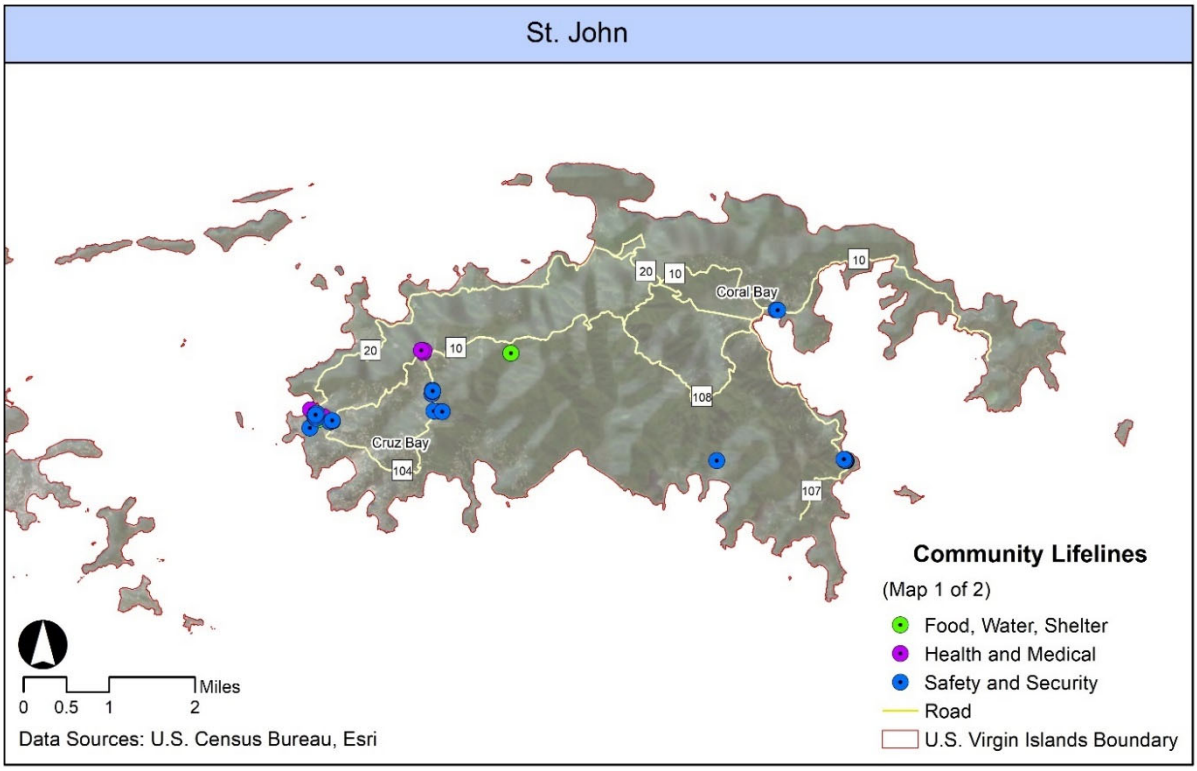
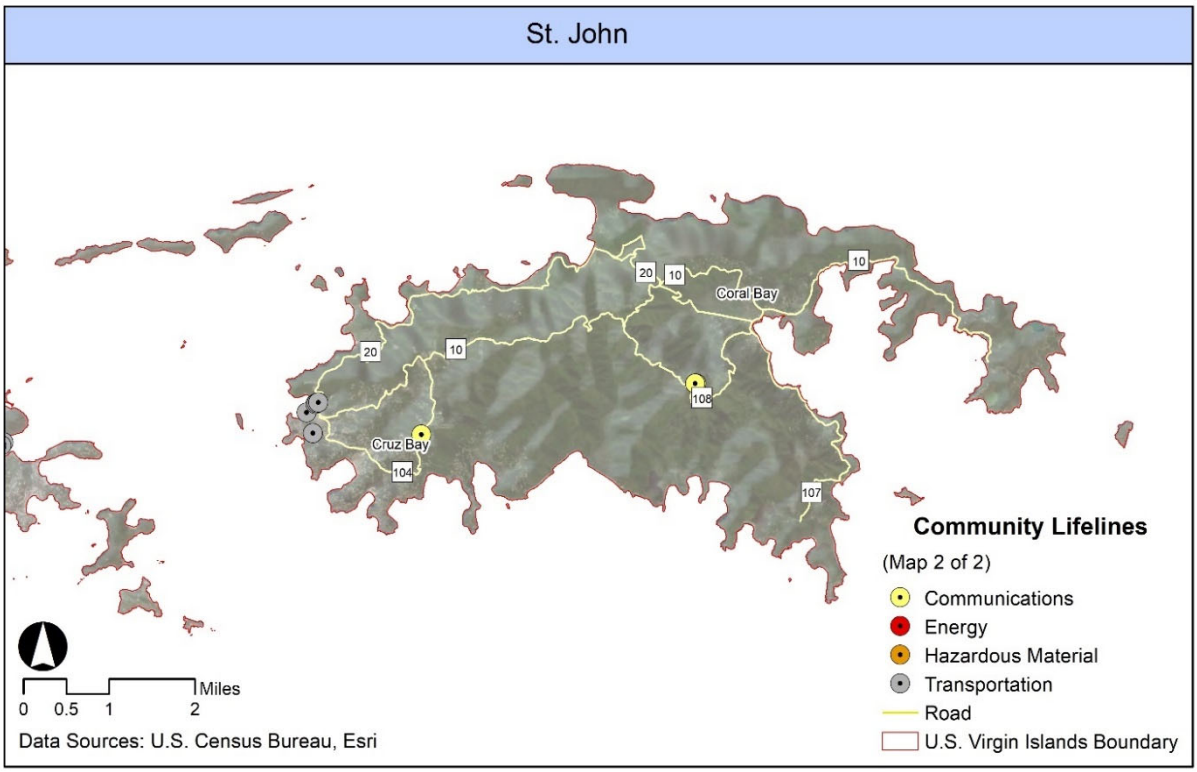


Figure 17. St. John Community Lifelines (Map 2 of 2)



1.9 Risk Assessment Summary

1.9.1 Drought

A drought is a period of abnormally dry weather. Drought diminishes natural stream flow and depletes soil moisture, causing social, environmental, and economic impacts. The term "drought" typically refers to periods of moisture deficiency that are relatively extensive in both space and time. Droughts originate from decreased precipitation amounts relative to normal weather patterns. They can be both short-term (lasting over the course of weeks or a month) or long-term (lasting the course of a season or years). Droughts can impact an array of economic, environmental, and social activities. The demand that society places on water systems and supplies – such as expanding populations, irrigation, and environmental needs – also contributes to drought impacts.

Droughts can be categorized as follows:

- Meteorological drought (degree of departure from expected precipitation),
- Hydrologic drought (Effects of precipitation shortfalls on waterbodies and groundwater),
- Agricultural drought (Soil moisture relative to agricultural/plant needs), and
- Socioeconomic drought (Demand of water exceeding supply due to a weather-related shortfall).

How vulnerable an activity may be to the effects of drought is usually linked on its water demand, how the demand is met, and what water supplies are available to meet the demand. The impacts of drought vary between sectors of the community in both timing and severity:

- Water supply—The water supply sector encompasses urban and rural drinking water systems that are affected when a drought depletes ground water supplies due to reduced recharge from rainfall.
- Agriculture and commerce—The impact of drought on the agriculture and commerce sector includes the reduction of crop yield and livestock sizes due to insufficient water supply for crop irrigation and maintenance of ground cover for grazing, absent purchase of water to supplement water derived from rainfall.
- Environment, public health, and safety—The environmental, public health, and safety sector focuses on wildfires that are both detrimental to the forest ecosystem and hazardous to the public. It also includes the impact of desiccating streams, such as the reduction of in-stream habitats for native species.

The four types of droughts would likely have disparate impacts throughout the Territory. Although cisterns are common for USVI residents, the territory experiences a dry season that typically lasts from January to April. There is often a shorter dry season in June and July. Only one quarter to under a half of residents in the Territory are connected to the Territory's public water system that the Water and Power Authority (WAPA) operates, which means that many residents rely heavily on collected rainfall for water.[3] For those connected to the central water system, WAPA's water derives from reverse osmosis desalinization processes. Most residents in the Territory rely on cisterns for water supplies, with some households also attached to WAPA water. Households attached to WAPA water are less impacted by periods when less rain falls as they have access to water from WAPA to readily meet

[3] A 2019 RA Briefing indicates that WAPA provides drinking water service to nearly half of the population of the Territory.

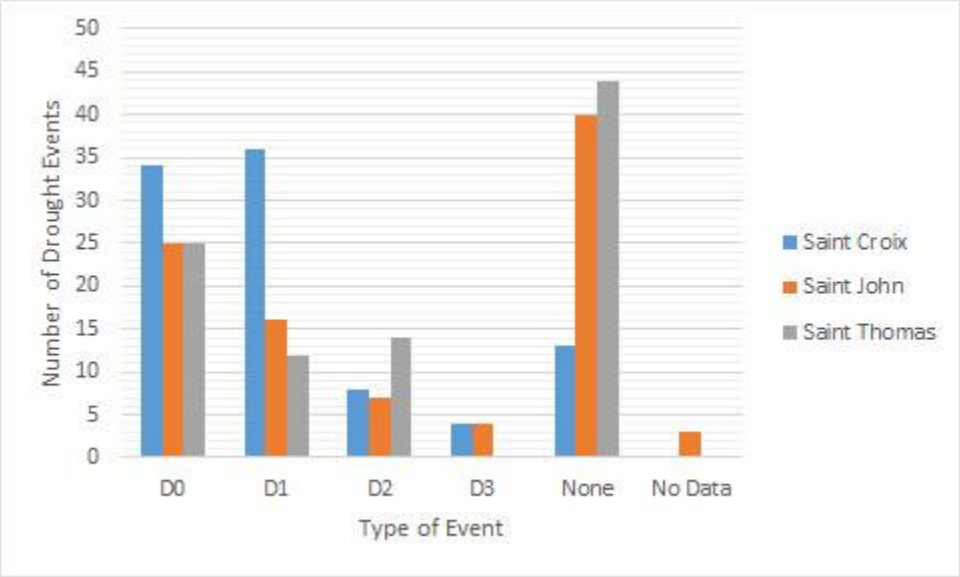
water needs. For those who are not connected to WAPA water droughts can lead to empty cisterns, requiring residents to purchase water for essential daily use. While potential drought impact in the Territory lends itself to further study, the LMI population in the Territory would be more adversely affected by the need to purchase water to fill empty cisterns.

Droughts have been experienced throughout the Territory's history but have only been documented by United States Drought Monitor system (https://droughtmonitor.unl.edu/) since June, 2019. Although records are limited, historic droughts have been noted in 1733, the 1920s, 1964, early 1970s, and 2002. According to the 2019 THMP, the National Climate Data Center reports no new drought events since 2002. However, a review of records indicated the presence of a historic drought in 2015, causing a water deficit in 86% of Puerto Rico and the US Virgin Islands (NRCS). In 2016, the US Department of Agriculture reported that Puerto Rico and the US Virgin Islands had experienced uncommonly dry weather over the course of the previous three to five years (NRCS). The 2015 drought caused major agricultural impacts for the region, resulting in the declaration of agricultural disaster S3874 for St. Croix. The Islands also received 53 payments totaling nearly $30,000 between 2014-2015 from the USDA Livestock Forage Program owing to drought-related losses to livestock (United States Department of Agriculture).

In July 2020, St. Thomas recorded a severe drought and St. John and St. Croix recorded extreme droughts. On St. Croix, this drought was characterized by year-to-date rainfall that is 3.2 inches below normal and year-to-date rainfall approximately one inch below normal on St. Thomas and St. John (Southeast Climate Adaptation Science Center, 2020). In August 2020, the Territory received a "severe drought" designation that was lifted in early September. At the time of this report's drafting, the Territory remains under abnormally dry conditions (Virgin Islands Source, 2020).

In June 2019, the National Oceanic and Atmospheric Administration added the US Virgin Islands to the United States Drought Monitor. The Virgin Islands' participation in the program is expected to enhance data collection and build a better understanding of drought and precipitation changes in the Virgin Islands. Limited drought data available for analysis at the time of this Mitigation Needs Assessment included weekly island wide drought classification as summarized in Figure 18. Climate change is expected to decrease the amount of annual precipitation in the region by between five and fifteen percent, with much of the change occurring between June and August. This is expected to increase the frequency of drought conditions in the future.

Figure 18. Weekly Drought Category Data for USVI (June 4, 2018 through 3/23/2021)



Source: US Drought Monitor

1Drought Categories as well as correlation with related indices is provided in Figure 19.

Figure 19. Description of Drought and Related Indices

			Ranges				
Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: ▪ short-term dryness slowing planting, growth of crops or pastures Coming out of drought: ▪ some lingering water deficits ▪ pastures or crops not fully recovered	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	▪ Some damage to crops, pastures ▪ Streams, reservoirs, or wells low, some water shortages developing or imminent ▪ Voluntary water-use restrictions requested	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	▪ Crop or pasture losses likely ▪ Water shortages common ▪ Water restrictions imposed	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	▪ Major crop/pasture losses ▪ Widespread water shortages or restrictions	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4	Exceptional Drought	▪ Exceptional and widespread crop/pasture losses ▪ Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2

Source: US Drought Monitor

Due to a lack of spatial data for drought on the Islands, drought impacts to lifelines and general building stock were not calculated and maps from the 2019 THMP were not used to inform this assessment. Structures typically are not directly affected by drought conditions, although certain structures can become vulnerable to wildfires, which become more likely following prolonged droughts. Droughts can also have significant impacts on landscapes, which could cause a financial burden to property owners and certain businesses. However, these impacts alone are not considered critical in planning for impacts from the drought hazard. Economic impact will be largely associated with industries that use water or depend on water for their business. Most residents in the territory reside in places with a cistern that is filled via rainwater, and some are connected to WAPA water as well. Private companies in the Territory sell water to fill cisterns and support farmers' water needs in periods with little to no rain. The following map shows areas in the US Virgin Islands with prime agricultural soil, with most prime farmland located on St. Croix.

Figure 20. Farmland Classification Map for St. Croix

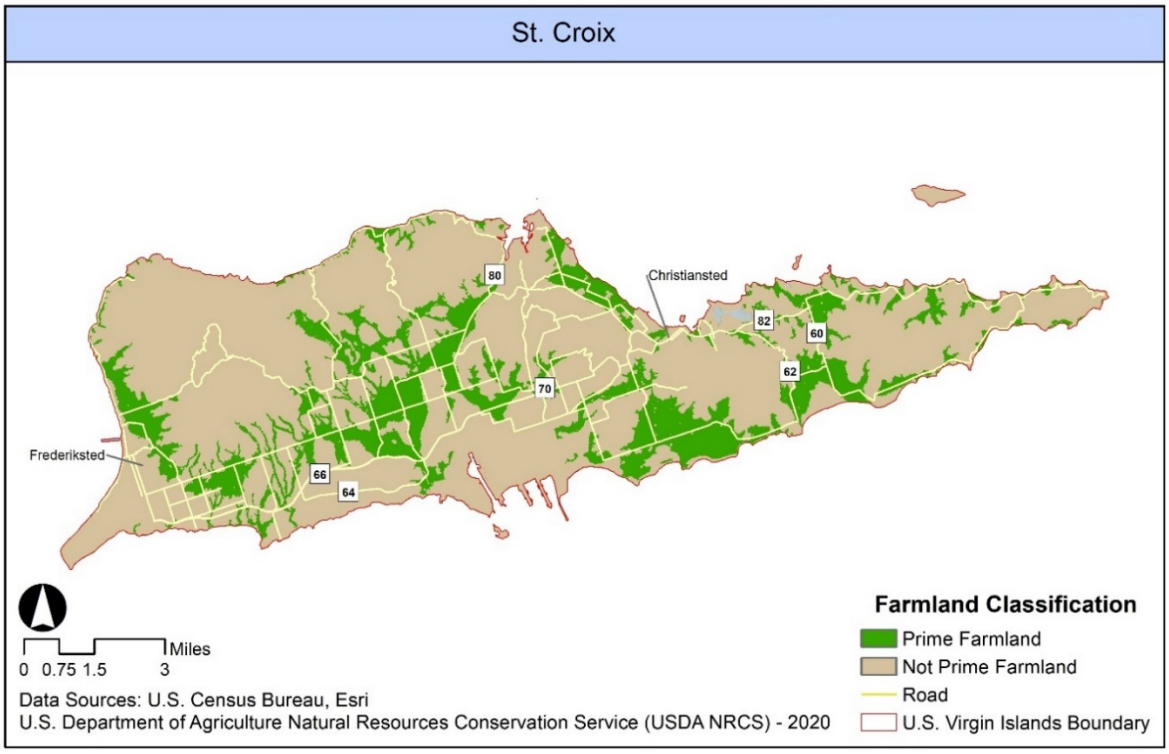


Figure 21. Farmland Classification Map for St. Thomas

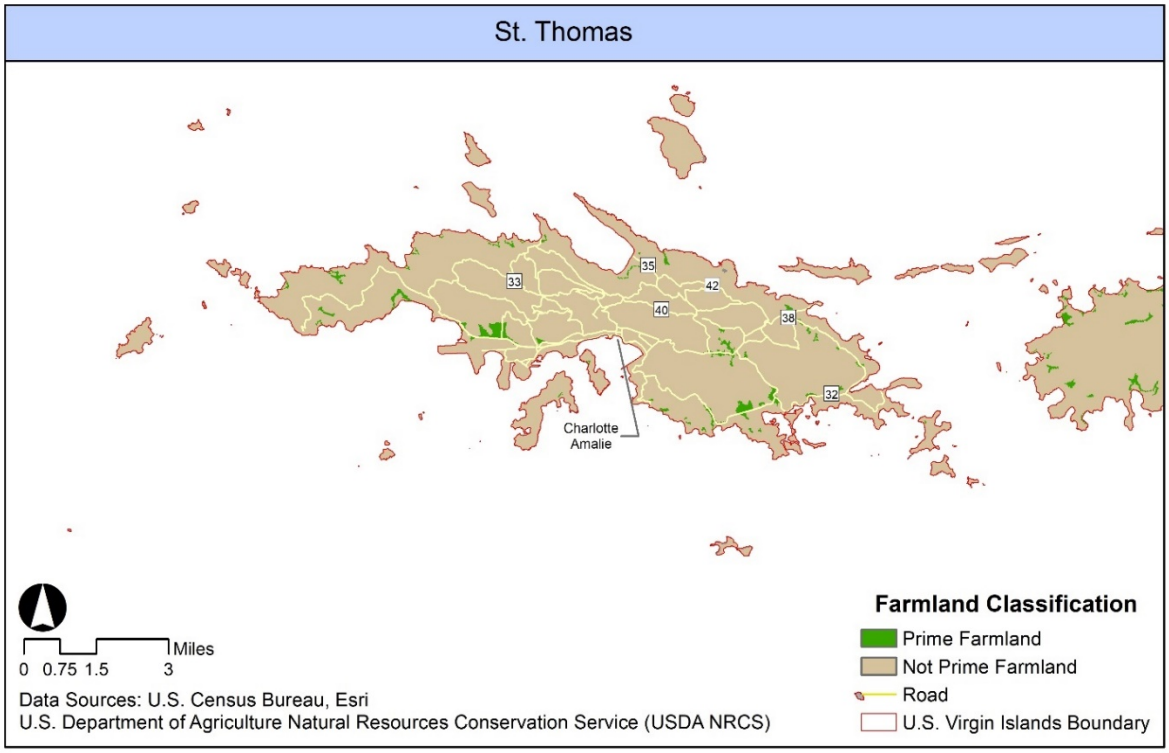
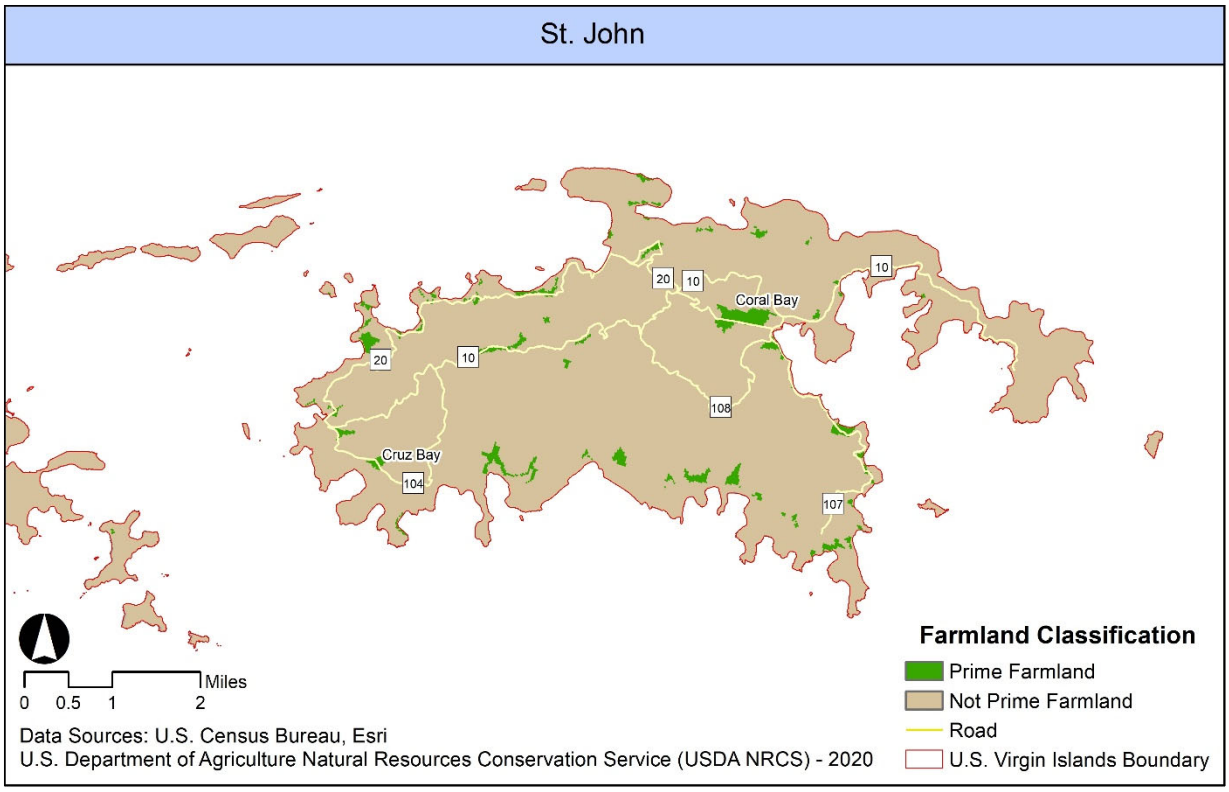


Figure 22. Farmland Classification Map for St. John



Lifelines as defined for this plan will continue to be operational during a drought, but for LMI individuals the cost of purchasing water to fill cisterns and support agriculture has an impact that would benefit from additional study. For the many residents who are not also connected to WAPA water, purchasing water in periods of drought is part of providing food, water, and shelter Given the economic stress that the COVID-19 pandemic has already caused within the Territory, having a reliable and inexpensive water source is a key priority that impacts day-to-day life and potentially even health as well, given the necessity of good water to healthy individuals.

Table 8. Consequence Classification for Lifelines Impacted by Droughts

Lifeline	Consequence Classification St. Croix	Consequence Classification St. John	Consequence Classification St. Thomas
Communications	Low Impact	Low Impact	Low Impact
Energy	Low Impact	Low Impact	Low Impact
Food, Water, Shelter	Moderate Impact	Moderate Impact	Moderate Impact
Hazardous Material	Low Impact	Low Impact	Low Impact
Health and Medical	Low Impact	Low Impact	Low Impact
Safety and Security	Low Impact	Low Impact	Low Impact
Transportation	Low Impact	Low Impact	Low Impact

Based on the data examined in this Mitigation Needs Assessment and in consideration of the low to moderate consequence risk ranks of lifelines, the drought hazard is considered a moderate risk. This is predominantly due to the reliance on rainwater collection in cisterns by the majority of residents and impacts to water services following the 2017 hurricanes, but careful analysis of future data will be important too as many LMI individuals work to ensure continued access to food, water, and shelter in the territory, especially if global environmental trends indeed lead to less rain and more drought in the Territory.

1.9.2 Earthquakes

Earthquakes are caused by the sudden release of stored energy from shifting blocks of earth. Several Caribbean Islands have a significant vulnerability to earthquake hazards. These Islands are located on the northeastern edge of the Caribbean Plate, which is considered a seismically active region with an active plate boundary. The North American tectonic plate and the Caribbean tectonic plate are converging, resulting in the potential for significant and frequent ground movements and associated impacts. The seismic region in the vicinity of Puerto Rico and the US Virgin Islands is complex and poorly understood (US Geological Survey, 2020).

Despite these vulnerabilities, the US Virgin Islands has not experienced major earthquakes in recent history, and none have produced a federal disaster declaration. However, the US Virgin Islands have been significantly impacted by earthquakes in the longer-term. This includes more than 200 events experienced since 1530, and 170 individual events between the first recorded incident on the islands in 1777 and 1977. The most significant earthquake on record occurred on St. Thomas and St. Croix in 1867, which had an intensity of VIII on the Modified Mercalli Intensity (MMI) scale, with VIII constituting severe.

As described in the 2019 Hazard Mitigation Plan, earthquake risk is varied throughout the Territory's islands and data from this plan provides the basis for the exposure and vulnerability analysis. Future THMP updates will benefit from including Hazus-MH v5.0, which recently has included modelling and

datasets for the USVI and can provide an updated impact assessment. Additionally, to illustrate the earthquake risk, for this plan a series of Shake Maps are for the Territory are provided below. Figure 23 to Figure 25 indicate the intensities of an M.7 scenario earthquake event in the USVI based on the MMI scale of VII and VIII based on a range of I to X were categorized VII and VII are defined as follows:

- VII - Very Strong is defined to be an event whereby damage is negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; and considerable in poorly built structures, and
- VIII - Severe is defined as slight damage in specially designed structures; considerable in ordinary substantial buildings with partial collapse; and great in poorly built structures. (US Geological Survey, 2020)

The Modified Mercalli Intensity value assigned to a specific site after an earthquake has a more meaningful measure of severity to the nonscientist than the magnitude because intensity refers to the effects experienced at that place.

The lower numbers of the intensity scale generally deal with the way the earthquake is felt by people. The higher numbers of the scale are based on observed structural damage (US Geological Survey, 2020).

Figure 23. Earthquake Intensity Shake Map for St. Croix

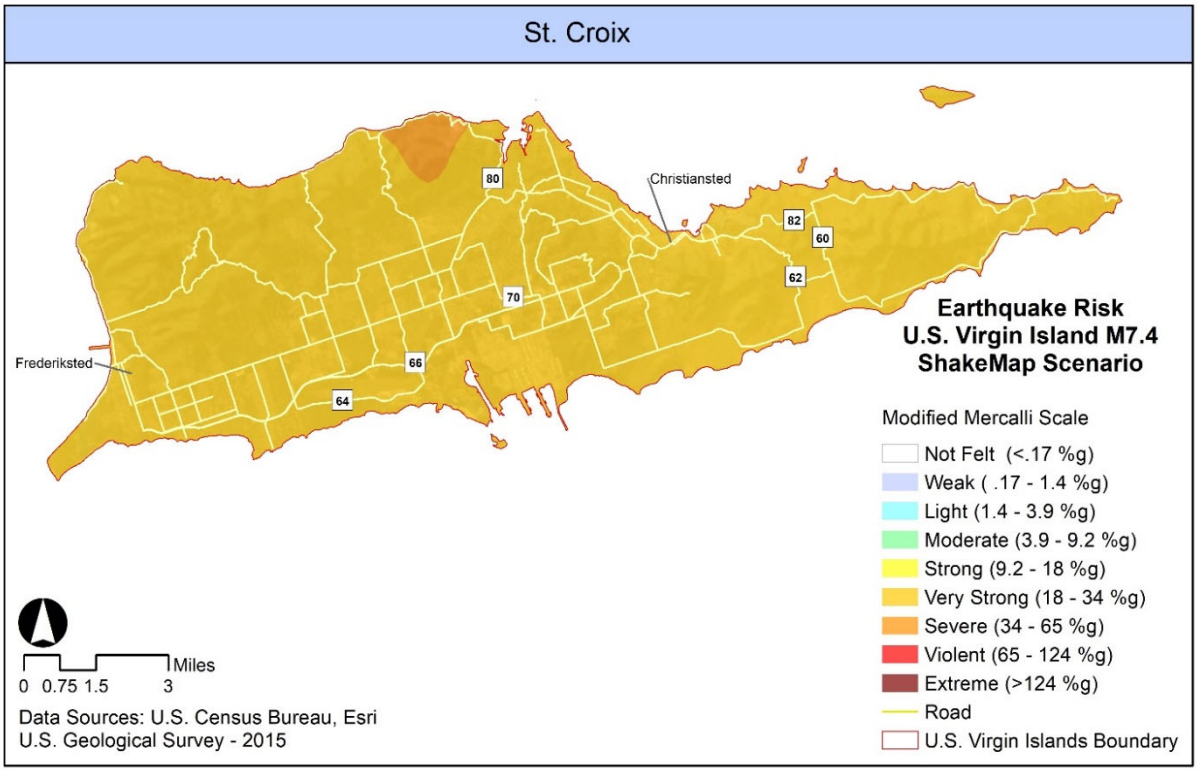


Figure 24. Earthquake Intensity Shake Map for St. Thomas

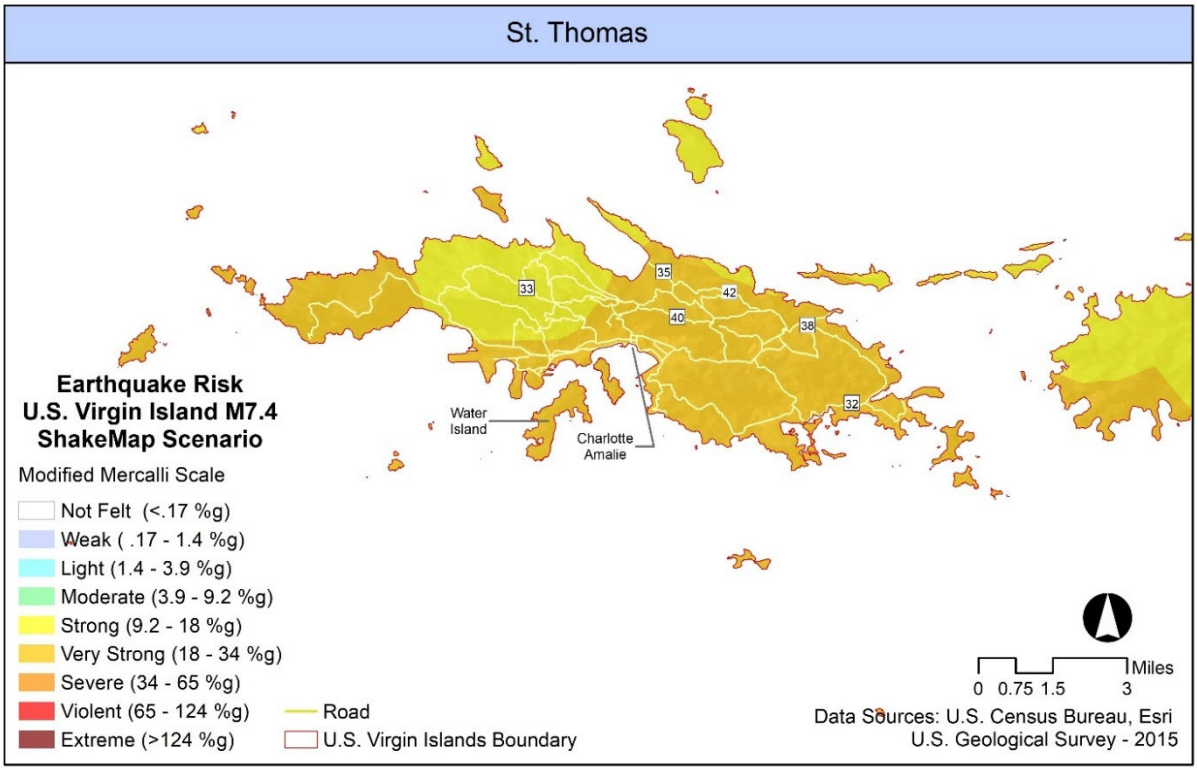
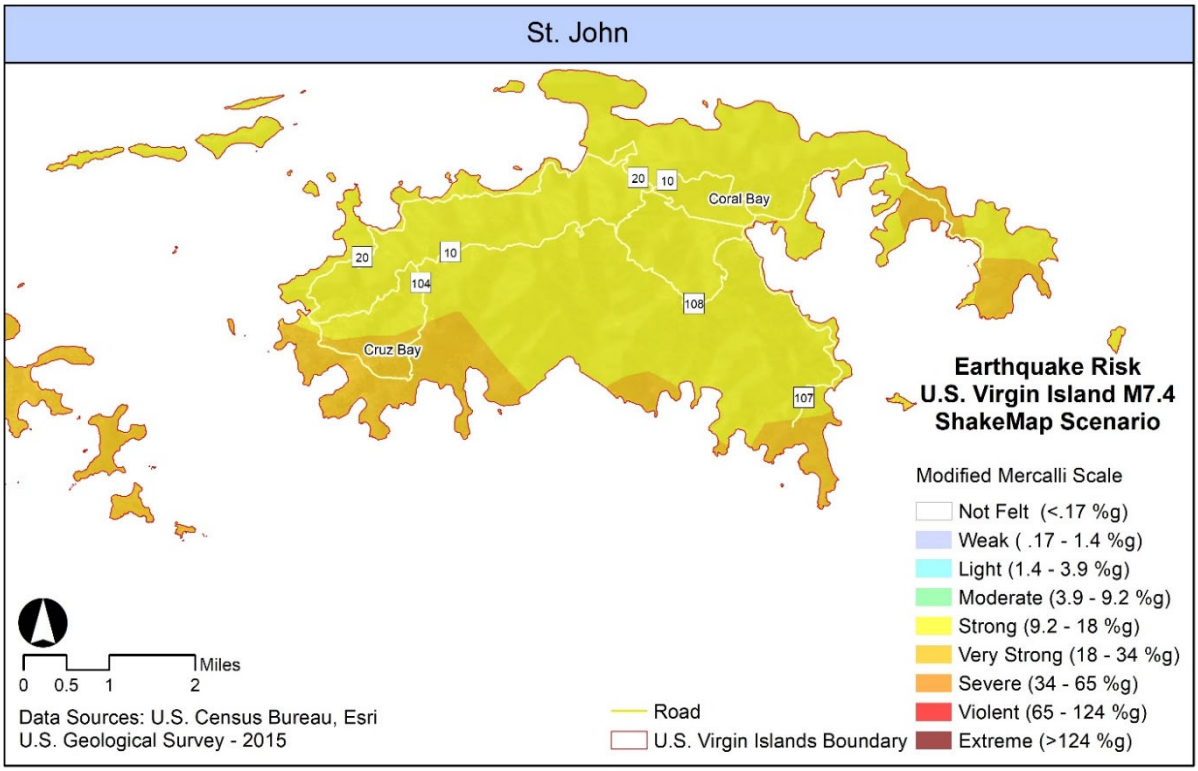


Figure 25. Earthquake Intensity Shake Map for St. John



To indicate assets exposed to this hazard, results from the 2019 THMP are provided, which indicate the results of an analysis of a designed earthquake based on the 1,000-year probabilistic ground shaking map. This indicates that the Territory has a 0.1% annual probability of experiencing losses shown in the 2019 Hazard Mitigation Plan.

An exposure analysis indicates that many structures on St. Croix have a moderate consequence classification for earthquakes, and most structures on St. Thomas have a high exposure to earthquakes. On St. John, most commercial buildings have a high exposure whereas most residential buildings have exposure characterized as Moderate. According to the 2019 Territorial Hazard Mitigation Plan, St. Thomas has a wider distribution of soil types at higher risk for earthquake compared to St. Croix and St. John.

Table 9. Building Exposure to Earthquake

Island	Type	Percent of Total Buildings in Category Exposed	High Exposed Buildings Impact Percentage	Moderate Exposed Buildings Impact Percentage	Low Exposed Buildings Impact Percentage
St. Croix	Commercial	84%	27%	73%	0	0
	Residential	70%	25%	75%	0	0
St. John	Commercial	85%	68%	32%	0	0
	Residential	71%	30%	71%	0	0
St. Thomas	Commercial	96%	100%	0	0	0
	Residential	91%	100%	0	0	0

Source: 2019 Territorial Hazard Mitigation Plan

The results of an analysis of the location of identified lifeline facilities with the earthquake hazard location mapping is provided in Table 10 which shows lifeline exposure to the earthquake hazard. Most lifeline facilities across the islands (including all energy lifelines) have high exposure to earthquakes. St. Thomas, where there is a wider breadth of exposure, has the highest percentage of lifelines with a higher exposure, followed closely by St. John.

Table 10. Lifeline Exposure to Earthquake Hazards

	High	Moderate	Low
St. Croix	**28**	**26**	**15**
Energy	1	0	0
Food, Water, Shelter	14	13	8
Health and Medical	1	3	0
Safety and Security	12	9	2
Transportation	0	1	5
St. John	**15**	**4**	**4**
Energy	1	0	0
Food, Water, Shelter	7	2	0
Health and Medical	3	1	1
Safety and Security	4	1	2
Transportation	0	0	1
St. Thomas	**30**	**7**	**5**
Energy	1	0	0
Food, Water, Shelter	7	1	1
Health and Medical	5	1	0
Safety and Security	15	4	2
Transportation	2	1	2

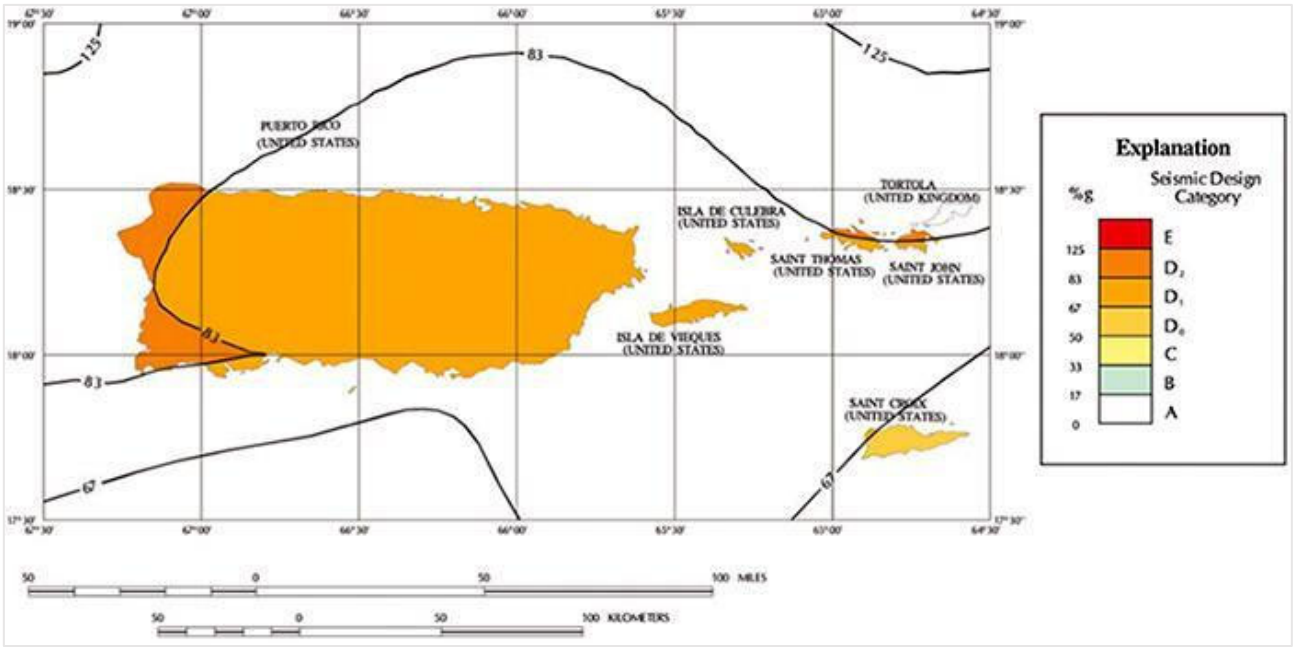
Source: 2019 Territorial Hazard Mitigation Plan

Table 11. Consequence Classification for Lifelines Impacted by Earthquakes

Lifeline	Consequence Classification St. Croix	Consequence Classification St. John	Consequence Classification St. Thomas
Communications	Low Impact	Low Impact	Low Impact
Energy	High Impact	High Impact	High Impact
Food, Water, Shelter	High Impact	High Impact	High Impact
Hazardous Material	High Impact	High Impact	High Impact
Health and Medical	High Impact	High Impact	High Impact
Safety and Security	High Impact	High Impact	High Impact
Transportation	Low Impact	Low Impact	Low Impact

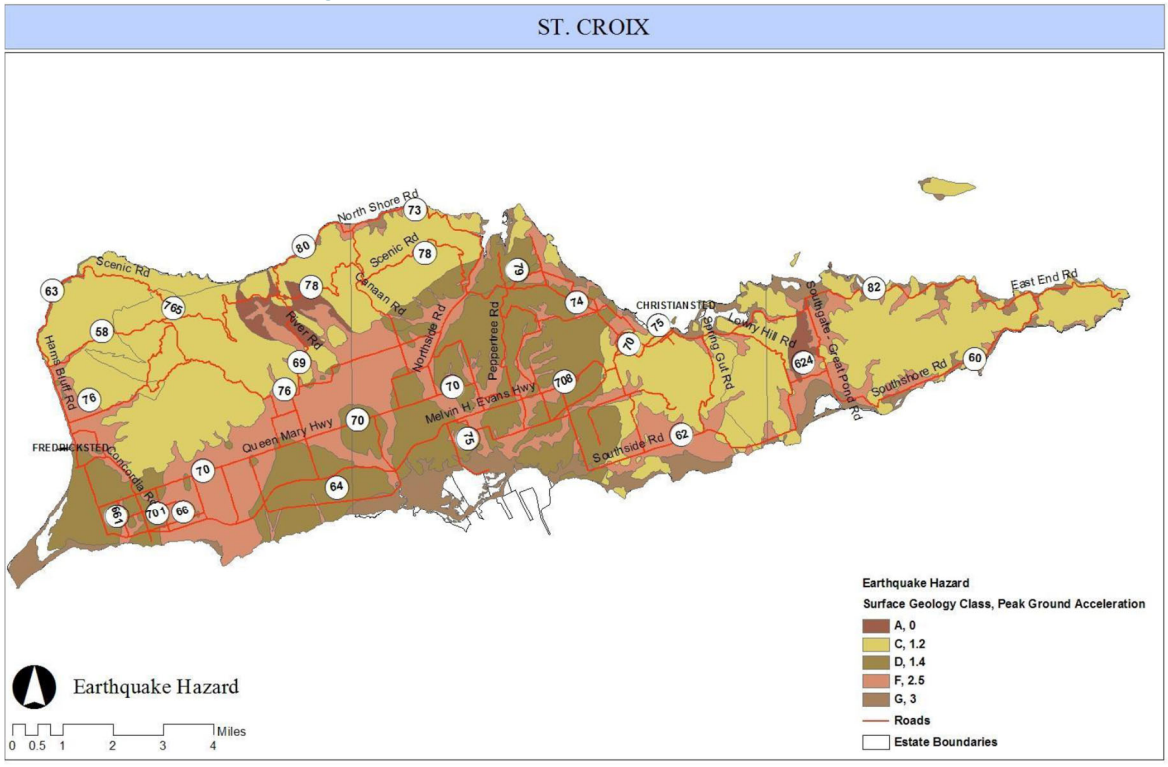
Figure 26 displays earthquake exposure indicating the relative seismic design categories for the Islands. St. John and St. Thomas, of volcanic origin, have variable earthquake risk that is more pronounced along steep slopes. St. Croix, formed by sedimentary processes, is at particular risk for liquification due to alluvial soils in Frederiksted and Christiansted.

Figure 26. Earthquake Exposure



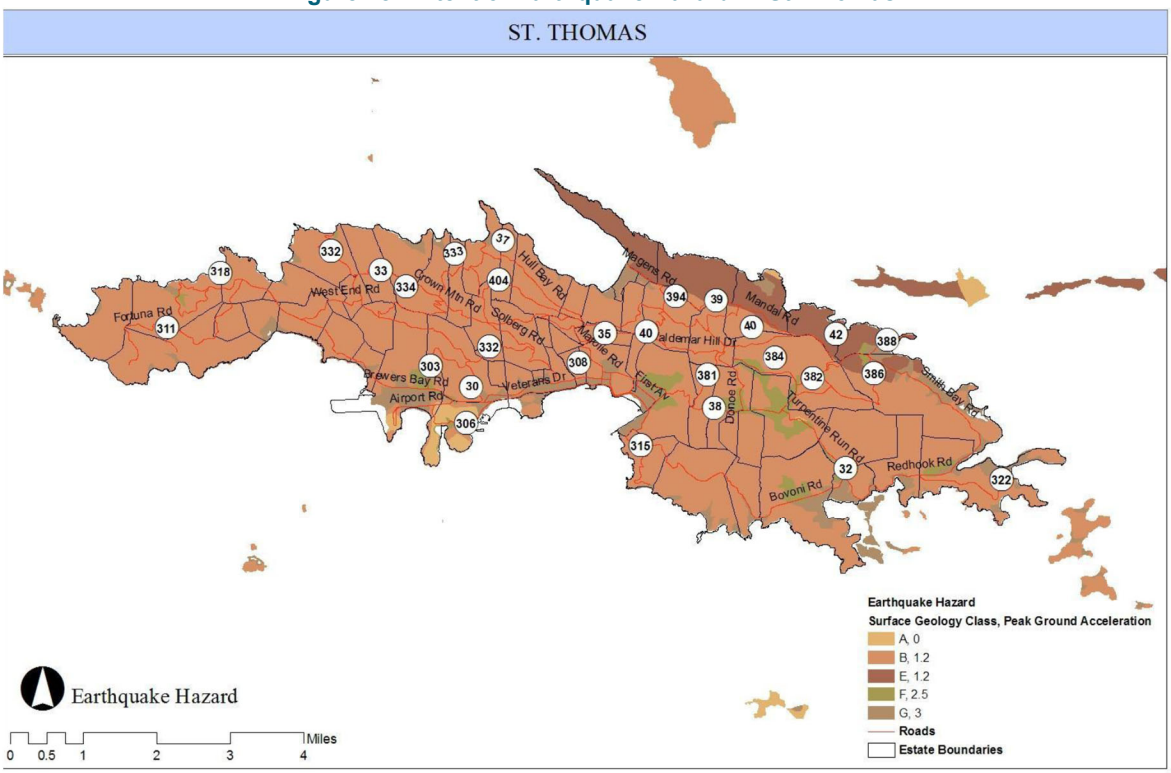
Source: 2019 Territorial Hazard Mitigation Plan

Figure 27. Extent of Earthquake Hazard in St. Croix



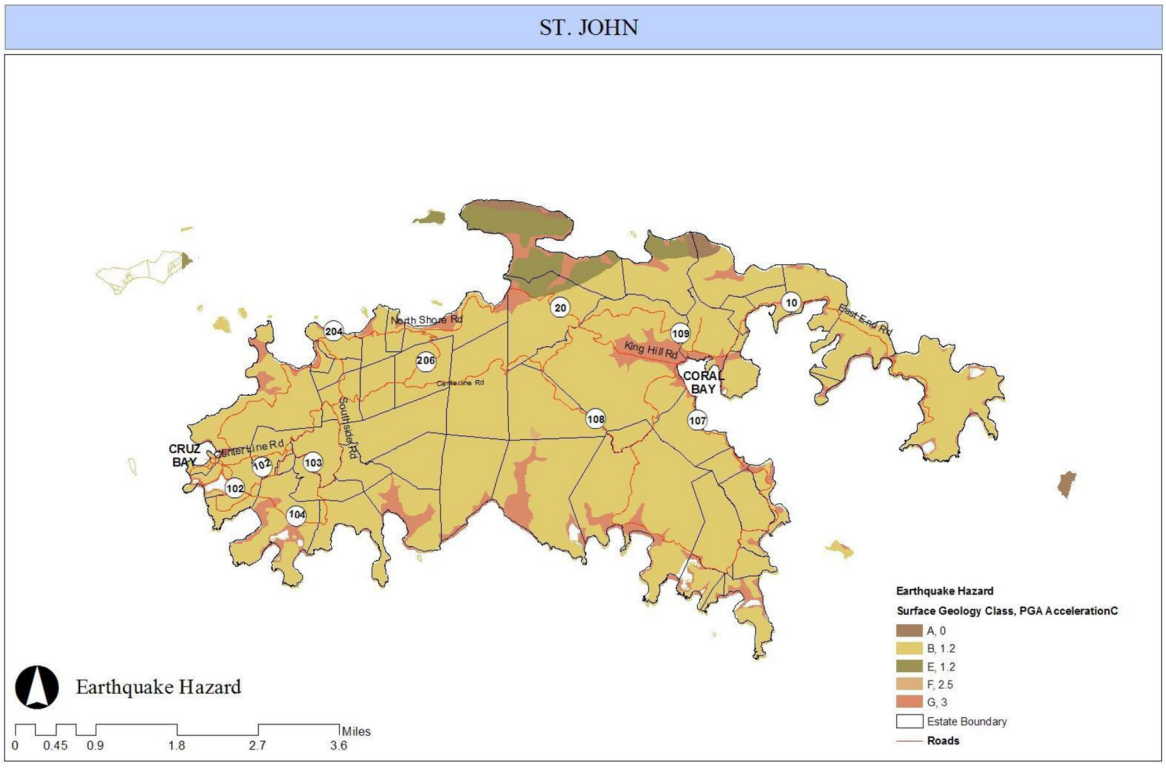
Source: 2019 Territorial Hazard Mitigation Plan

Figure 28. Extent of Earthquake Hazard in St. Thomas



Source: 2019 Territorial Hazard Mitigation Plan

Figure 29. Extent of Earthquake Hazard in St. John



Source: 2019 Territorial Hazard Mitigation Plan

1.9.3 Flooding

The 2019 Territorial Hazard Mitigation Plan (THMP) examined riverine flooding and coastal flooding and erosion as separate hazards. For the purposes of this Mitigation Needs Assessment, riverine flooding and coastal flooding and erosion risks will be examined together. The term Riverine Flooding refers to flooding that occurs from excess precipitation or other factors that cause water to be displaced onto floodplains, as explained further herein.

According to data cited in the 2019 Territorial THMP, no significant change in frequency of hurricanes and associated storm surge due to climate change is anticipated in the future. Coastal flooding is a year-round concern in the Territory, with impacts expected during hurricane season as well as between October and April when swell waves from mid-latitude storms in the North Atlantic can cause storm surge. The 2019 Territorial THMP also explored the coastal erosion hazard, whereby erosive wave forces cause decreases in land area. Erosive forces can be impacted by coastal storm events, beach replenishment and construction, and geological changes. Coastal erosion can be measured by assessing rates of shoreline loss and can be highly variable from year-to-year or from season-to-season. The 2019 Territorial THMP did not independently assess the impact of sea level rise upon the Islands.

As a likely worst-case scenario and to inform this report, potential exposure, and damages to structures due the following conditions were considered.

- Category 5 storm surge event
- 2100 high scenario sea level rise (4 feet), to consider long-term implications,
    - 2050 high scenario sea level rise mapping provided for information
- Advisory Base Flood Elevation (ABFE) base flood elevation (STARRII, 2018)

Again, Riverine Flooding occurs from excess precipitation or other factors that cause water to be displaced onto floodplains. Such flooding can be caused by a combination of human and natural factors, including intense precipitation events or modifications to the passage of water due to encroachments, the installation of impervious surface, or debris blockage, for example. The 2019 THMP reports that tropical weather patterns (including hurricane seasons) create heavy rainfall conditions that cause flooding in the Territory, particularly outside of urban areas. The steep topography in the Virgin Islands and non-porous substrata can exacerbate runoff conditions that cause flooding. Although the Territory lacks rivers, the technical term used riverine flooding that is frequently used in evaluating risk is a fit for the most common form of flooding seen in the USVI, especially during severe rain.

Although the USVI Flood Insurance Study maps flood zones for both inland and coastal areas, the 2019 THMP notes that the principal flooding cause is stormwater run-off. The runoff flooding can exceed delineated flood zones on flood insurance rate maps or may not be mapped at all. According to the FEMA Mitigation Assessment Team Report issued in the wake of Hurricanes Irma and Maria, flood damage from the Hurricanes was predominantly caused by localized ponding and runoff. Over the years, encroachments into historic flood zone have displaced flood water to unanticipated locations. Increased development, undersized culverts, impervious surface installation following development, combined sewer systems for stormwater and wastewater, insufficient preventative maintenance of sewer infrastructure, improper engineering design for drainage of constructed surfaces, inadequate use of green infrastructure, and functionally obsolete stormwater management infrastructure contribute to the pervasiveness of runoff and riverine flooding in the Territory.

Exposure to riverine flooding varies throughout the Virgin Islands. St. John generally experiences less pervasive flooding owing in part to the comparative lack of development, when compared to the other major islands. Flooding does occur in Cruz Bay and Coral Bay near the bottom of steeper hills, for example. St. Thomas is more heavily developed with documented, more serious flooding in certain areas, sometimes due to ineffective draining that causes localized flood damage to nearby structures. This phenomenon has been documented in Charlotte Amalie on St Thomas, for example, resulting in shallow flooding to its business district. St. Croix is somewhat less susceptible to sudden riverine flooding although certain developments experience shallow flooding due to the inadequacy of existing drainage infrastructure, but flood risk impacts the residents on all three major islands in the Territory.

Coastal Flooding, Storm Surge, and Erosion

Coastal flooding is a significant aspect of hurricanes and tropical storms. Coastal flooding during a storm event is characterized by storm surge, whereby displaced water from winds and barometric pressure "piles up" and increases in height as it approaches land. This causes local water levels to rise, resulting in overland inundation that can be exacerbated by wind conditions that cause waves, sea level rise, or by astronomical tidal patterns (National Oceanic and Atmospheric Administration, 2013). The storm surge data shows potential storm surge vulnerability for all areas and incorporates varying landfall locations, local bathymetry and topography, varying storm sizes, forward speeds, tracks, approach angles, and tide levels. This is accomplished by performing thousands of different SLOSH simulations for a given area and then compositing the results into a worst-case snapshot, by Saffir-Simpson Category, indicating storm surge vulnerability.[4] In the 2019 Territorial THMP, the SLOSH (Sea, Lake, and Overland Surges from Hurricane) model was used to determine the extent of coastal flooding in the US Virgin Islands from a variety of storm scenarios. These scenarios are classified by the SLOSH categories, which is reproduced in the table below.

Table 12. SLOSH Categories for Storm Surge

Category	Storm Surge (feet above sea level)
1	4-5 feet
2	6-8 feet
3	9-12 feet
4	13-18 feet
5	> 18 feet

Source: Blake, et al.

Hurricanes Irma and Maria caused small or moderate recorded storm surges (up to three feet) despite the intensity of the storms. This may be attributed to the bathymetry of the waters surrounding the Virgin Islands as not conducive to the generation of significant storm surges. Puerto Rico and the Virgin Islands are surrounded by a narrow and steep shelf that diminishes storm surge effects (USVI Office of Disaster Recovery, 2019). Though coastal flooding from these storms caused minor structural damage, wave action and surge destroyed beaches due to erosion by powerful waves and surges. The Territorial THMP associates erosion with hurricane systems but did not include an independent assessment of the erosion risk.

[4] To help reduce public confusion about the impacts associated with the SLOSH and various hurricane categories as well as to provide a more scientifically defensible scale, the storm surge ranges have been removed from the Saffir-Simpson *Wind* Scale and only peak winds are employed in that scale (National Oceanic and Atmospheric Administration, 2013).

Sea Level Rise

Sea level rise is the increase in relative sea level and was discussed as an ancillary to the coastal flooding and erosion hazard in the 2019 Territorial THMP. Long-term sea level rise has been observed in the US Virgin Islands at an annualized average rate of 0.08 inches per year. According to the 2018 National Climate Assessment, these rates have been slowly accelerating since the early 2000s, with the rate tripling in 2010-2011. Future sea level rise will be dependent on the discharge of greenhouse gas emissions that contribute to sea ice melting and thermal expansion. Intermediate-low, intermediate, and extreme emissions scenarios are anticipated to cause 0.8 feet, 1.2 feet, and 2.8 feet (respectively) of relative sea level rise in the US Virgin Islands compared to 2000 levels by 2050. By 2100, the rise is anticipated to be 1.6 feet, 3.6 feet, and 10.2 respectively (U.S. Global Change Research Program). For the purposes of this Mitigation Needs Assessment, four feet of sea level rise is modeled which aligns with the 2100 scenario presented in the 2018 USVI Hurricane Recovery and Resilience Task Force Report (USVI Hurricane Recovery and Resilience Task Force, 2018).

According to the 2018 Task Force Report, the continued rise of sea levels around the Territory will cause inundation and coastal erosion on all three primary islands. This might have consequences for tourism at popular places like Magens Bay and Smith Bay on St. Thomas, Sandy Point on St. Croix, or Maho Bay on St. John. The built environment will also suffer consequences, as Charlotte Amalie, Red Hook, Bovoni, Coral Bay, Christiansted, Salt River area, and Limetree Bay area will experience significant flooding.

Sea level rise will increase the impact on flooding. In addition to aggravating nuisance flooding and causing inundation of low-lying areas, the relative sea level rise will increase the impact of storm surges and coastal flooding events, resulting in inundation of areas that historically have not been inundated with flood waters.

Exposure Impacts

The following tables describe impacts to buildings resulting from flood hazards. Approximately 20 percent of the Islands' residents of St. Croix and St. Thomas are in the Special Flood Hazard Area, compared to approximately seven percent of residents of St. John. Only a fraction of Island residents exposed to flooding are also exposed to Storm Surge and Sea Level Rise, indicating that the preponderance of flood hazard and exposure is due to inland/riverine flooding. However, building exposure values in St. Thomas for storm surge and sea level rise are significantly higher than those on St. Croix and St. John, and similarly higher than exposure values for the Special Flood Hazard Area. For more detailed data, please see the attached Appendix and the maps at the end of this section.

The tables below show flood-related exposures for US Virgin Islands lifelines. This Mitigation Needs Assessment used an updated critical facilities and lifelines dataset from the dataset used for the 2019 Territorial THMP.

There is significant flood exposure for the US Virgin Islands' lifelines. The Islands' energy lifelines are particularly exposed owing to vulnerabilities to refinery operations on St. Croix. Transportation lifelines are exposed to flooding owing to their waterfront locations. On St. Croix, Health and Medical lifelines such as the VA Clinic and Nesbitt Clinic are also exposed, alongside various Safety and Security lifelines such as police substations and educational facilities. The Ann E. Abramson Marine Facility is also exposed, in addition to the Anguilla Wastewater Treatment Facility. On St. John, various marine facilities, the deCastro Clinic, and VIERS Eco Education facility are in the Special Flood Hazard Area. On St. Thomas, marina facilities, the Airport, WAPA Power Plant, and various schools and police

stations are also within the Special Flood Hazard Area. Excepting the seaports, in most cases the impacted lifelines are in riverine or inland flood zones.

Table 13. Lifeline Exposure due to the Flood Hazard

	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
St. Croix	1	193	5	0	2	31	20	252
St. John	0	0	0	0	1	1	5	7
St. Thomas	0	5	0	2	1	83	37	128

Source: HAZUS

Table 14. Consequence Classification for Lifelines Impacted by Flooding (Designated Special Flood Hazard Area)

Lifeline	Consequence Classification St. Croix	Consequence Classification St. John	Consequence Classification St. Thomas
Communications	High Impact	Low Impact	Low Impact
Energy	High Impact	Low Impact	High Impact
Food, Water, Shelter	High Impact	Low Impact	Low Impact
Hazardous Material	Low Impact	Low Impact	High Impact
Health and Medical	High Impact	High Impact	High Impact
Safety and Security	High Impact	High Impact	High Impact
Transportation	High Impact	High Impact	High Impact

Looking ahead projected sea level rise inundation, sea level rise flooding will eventually impact a subset of lifelines in the Special Flood Hazard Area or regulatory floodplain in the territory. Impact to beaches is not documented as they are not included as lifeline facilities, although economically these locations are significant assets that attract tourists who contribute significantly to local economy. Many lifelines subject to coastal flooding will be exposed to sea level rise (such as waterfront Transportation lifelines) in the future. On St. Croix, impacted lifelines include the Army National Guard compound in Bethlehem, the Good Hope School, and the US Customs facility. On St. John, the deCastro Clinic and marine facilities will be inundated. On St. Thomas, Addelita Cancryn Junior High, the Moravian School, and the US Coast Guard facility will be inundated (in addition to various waterfront Transportation lifelines).

Table 15. Four-Foot Sea Level Rise Exposure by Lifeline

Census County Subdivision	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
St. Croix	0	0	2	0	0	2	3	7
St. John	0	0	0	0	1	0	5	6
St. Thomas	1	0	0	0	0	6	18	25

Table 16. Consequence Classification for Lifelines Impacted by Four Feet of Sea Level Rise

Lifeline	Consequence Classification St. Croix	Consequence Classification St. John	Consequence Classification St. Thomas
Communications	Low Impact	Low Impact	High Impact
Energy	Low Impact	Low Impact	Low Impact
Food, Water, Shelter	High Impact	Low Impact	Low Impact
Hazardous Material	Low Impact	Low Impact	Low Impact
Health and Medical	Low Impact	High Impact	Low Impact
Safety and Security	High Impact	Low Impact	High Impact
Transportation	High Impact	High Impact	High Impact

An exposure analysis shows that storm surge impacts from a SLOSH scenario would likely impact waterfront Transportation lifelines, especially as sea levels rise, given prior flood data and its current elevation. In addition to impacting critical facilities impacted by future sea level rise, on St. Croix five terminals at the Limetree Bay Refinery on St. Croix, the WAPA power facility, and the St. Patrick Catholic School would be impacted. On St. Thomas, two additional schools, the Police Headquarters, and liquefied petroleum gas facilities are expected to be inundated under this scenario.

Table 17. SLOSH Category 5 Flood Exposure by Lifeline

Census County Subdivision	Communications	Energy	Food, Water, Shelter	Hazardous Material	Health and Medical	Safety and Security	Transportation	Total
St. Croix	0	6	0	0	0	12	6	24
St. John	0	0	0	0	1	0	4	5
St. Thomas	0	0	0	2	0	15	26	43

Source: HAZUS

Table 18. Consequence Classification for Lifelines Impacted by Storm Surge from a Category 5 Storm

Lifeline	Consequence Classification St. Croix	Consequence Classification St. John	Consequence Classification St. Thomas
Communications	Low Impact	Low Impact	Low Impact
Energy	High Impact	Low Impact	Low Impact
Food, Water, Shelter	Low Impact	Low Impact	Low Impact
Hazardous Material	Low Impact	Low Impact	High Impact
Health and Medical	Low Impact	High Impact	Low Impact
Safety and Security	High Impact	Low Impact	High Impact
Transportation	High Impact	High Impact	High Impact

Flooding Extent

Figure 30. **St. Croix Flood Hazard Zones** through Figure **32** demonstrate the extent of the Special Flood Hazard Area in the US Virgin Islands. Due to the Islands' topography, coastal flood zones are relatively limited in geographic extent. However, large sections of the inland area are designated Zone A, which means that these locations have only a one percent annual chance of flooding over a 100-year period (USVI Office of Disaster Recovery, 2019). However, due to limited data, flood depths and base flood elevations are not presently available.

Special Flood Hazard Areas

St. Croix exhibits large Special Flood Hazard Areas or regulatory floodplains that stretch deep inland along expected drainageways. Impacts are anticipated near Frederiksted and throughout portions of

the Island's interior. On St. Thomas, coastal flood areas have been delineated along the Island's ocean shoreline and surrounding the Cas Cay Mangrove Lagoon Marine Reserve. Inland flood zones are less pronounced than on St. Croix but include large sections of inland area along Nadir Gut. On St. John, limited inland flood zones have been delineated northwest of Coral Harbor near King Hill Road and extend north from the ocean along the Island's southern shore.

Figure 30. St. Croix Flood Hazard Zones

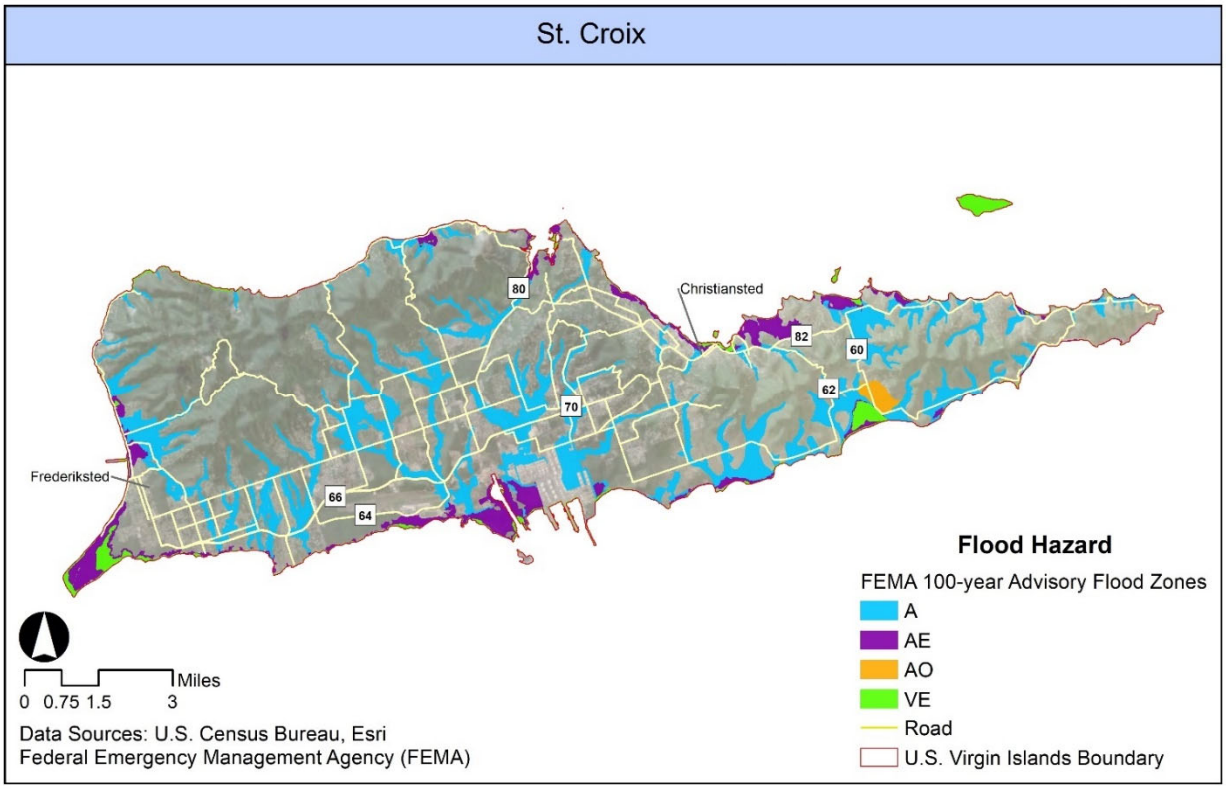


Figure 31. St. Thomas Flood Hazard Zones

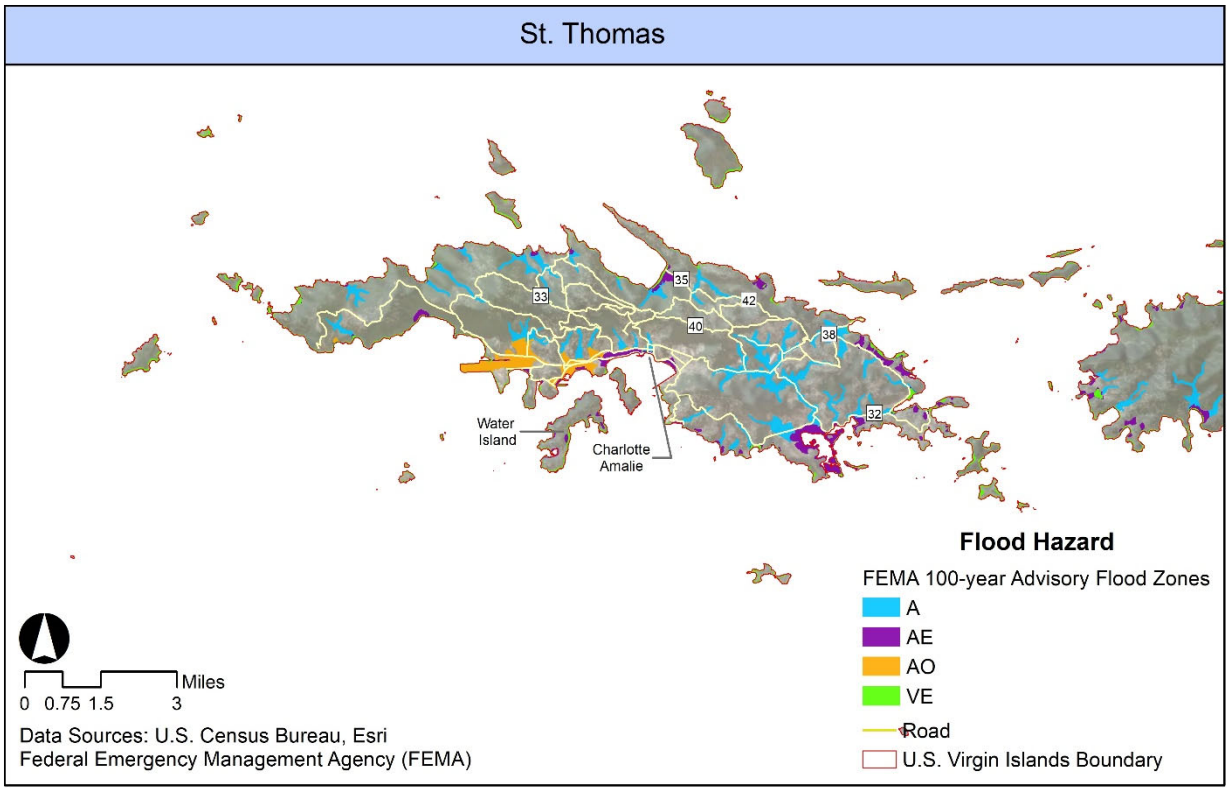
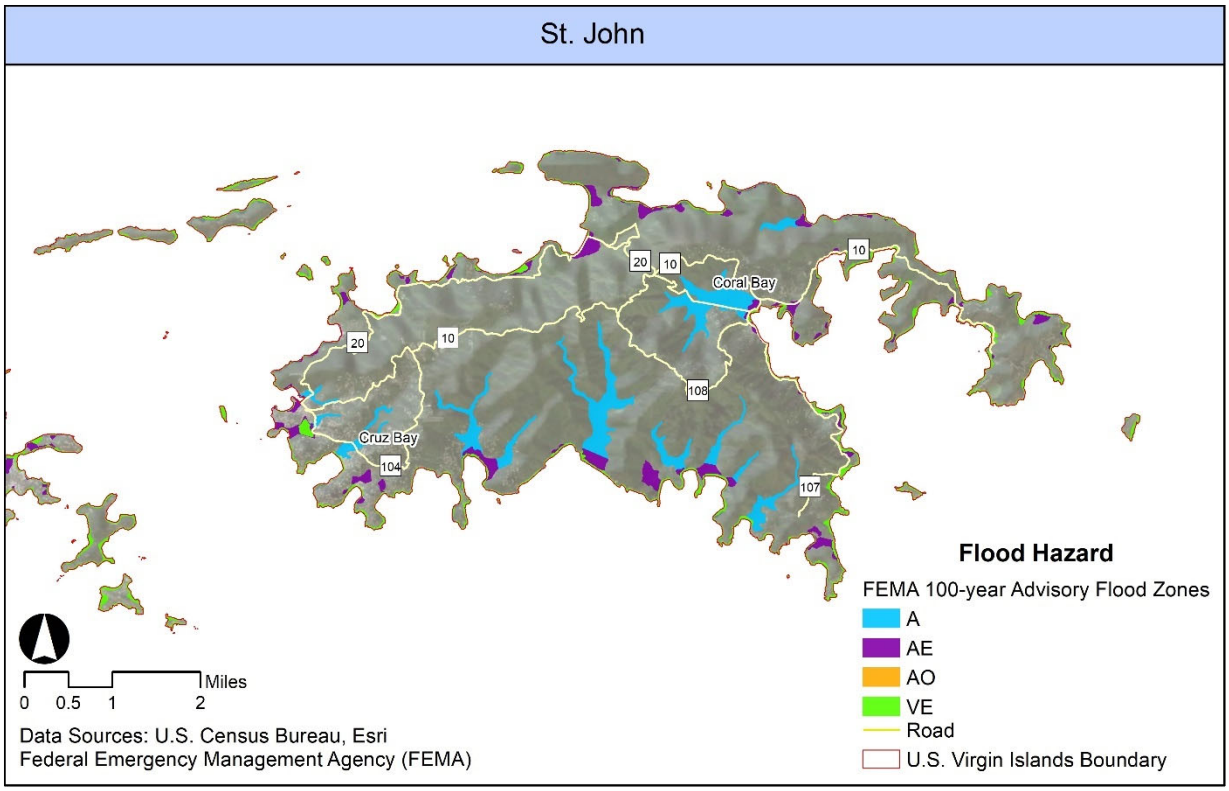


Figure 32. St. John Flood Hazard Zones



Storm Surge

The following maps show storm surge hazards impacting the three islands. On St. Croix, Sandy Point, portions of Christiansted, and portions of the St. Croix Renaissance Park are particularly vulnerable to storm surge. On St. Thomas, the inner harbor area of Charlotte Amalie is perhaps the most vulnerable owing to the density of development and potential depth of storm surge. The Veterans Drive Improvement Project is seeking to ameliorate storm surge hazards by enhancing the seawall along Veterans Drive to provide a higher level of protection. Storm surge flooding is also anticipated in Smith Bay, particularly near waterfront resorts along Water Bay. Additionally, the fuel docks at both the Randolph Harley Power Plant and the Estate Richmond Power Plant are vulnerable to storm surge. Damage to those docks will impact VIWAPA's ability to receive fuel shipments that are critical to restoring the energy lifeline. The Vitol LPG Infrastructure Acquisition seeks to reduce the impact of this threat by significantly increasing the volume of fuel stored by the power utility in each district thus giving additional time for repairs to be made to the docks should they be damaged by storm surge. St. John has relatively limited storm surge exposure due to its topography, though localized impacts can be anticipated near Cruz Bay and along the Island's northern shore.

Storm surge impacts in St. John are more limited owing to topography and settlement patterns. Exposure is more pronounced near Cruz Bay where there is a greater concentration of waterfront development.

Figure 33. St. Croix Storm Surge Hazard

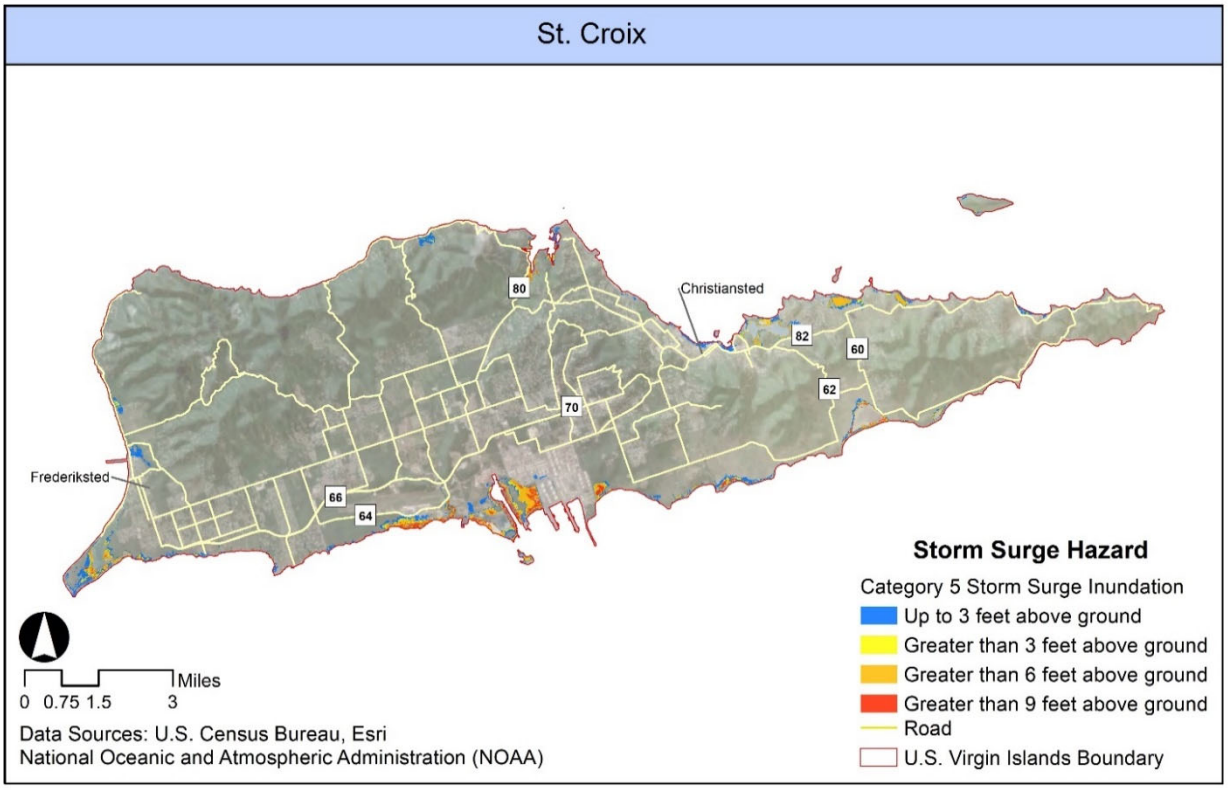
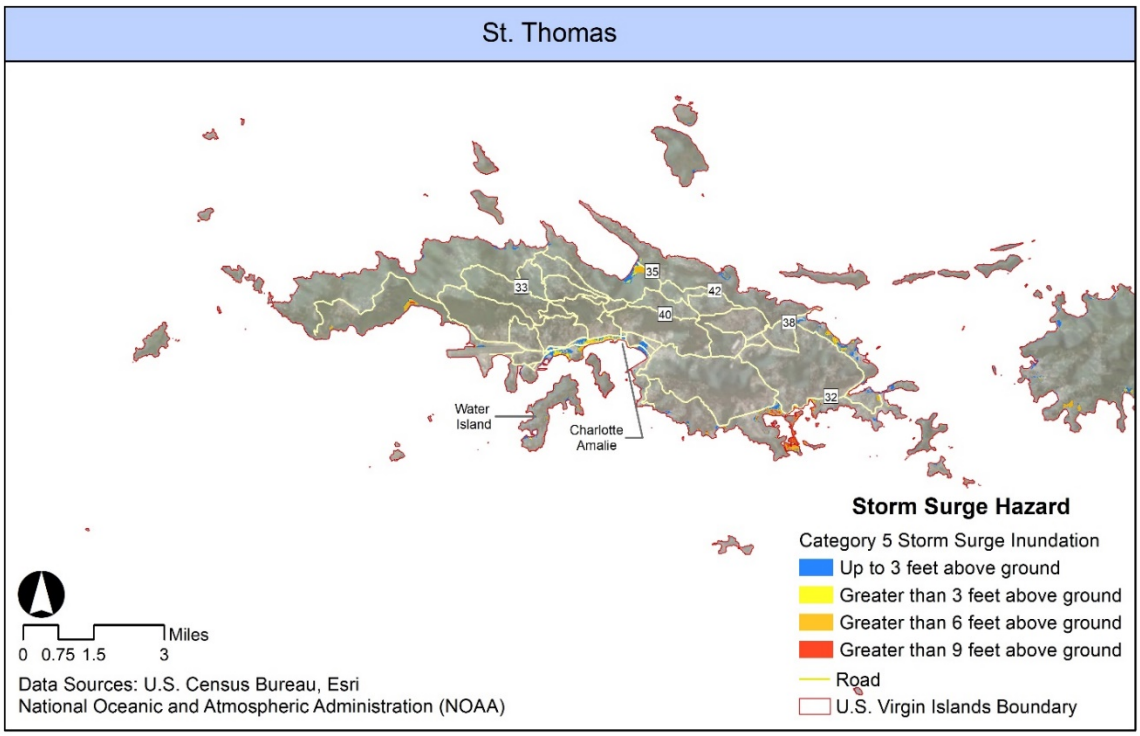
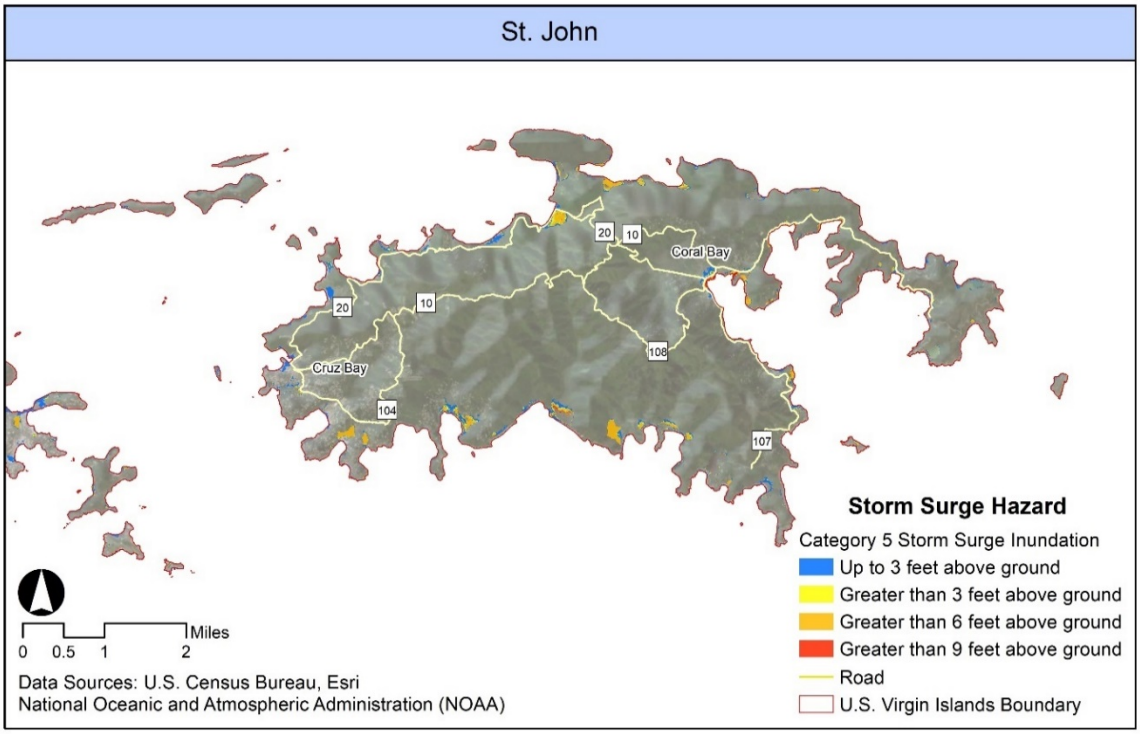


Figure 34. St Thomas Storm Surge Hazard



Storm surge impacts in St. John are more limited owing to topography and settlement patterns. Exposure is more pronounced near Cruz Bay where there is a greater concentration of waterfront development.

Figure 35. St John Storm Surge Hazard



Sea Level Rise

A four-foot sea level rise (anticipated by 2100, resulting from an intermediate emissions scenario) would have relatively limited impacts upon St. Croix, St. John, and St. Thomas due to the islands' topography. However, in combination with storm surge and coastal flooding conditions, sea level rise inundation will have a much broader and stronger exposure to areas that previously experienced coastal flooding and storm surge impacts. Under this scenario, on St. Croix, Sandy Point will likely be separated from the rest of the island and persistent shallow flooding may occur in the vicinity of the refinery and St. Croix Renaissance Park under current projections. The mangrove cays off St. Thomas will also be inundated, as will areas inland from Magen's Bay Beach, and waterfront areas of Charlotte Amalie. St. John will experience inundation along Coral Bay and along low-lying waterfront areas.

Figure 36. St Croix Sea Level Rise Hazard

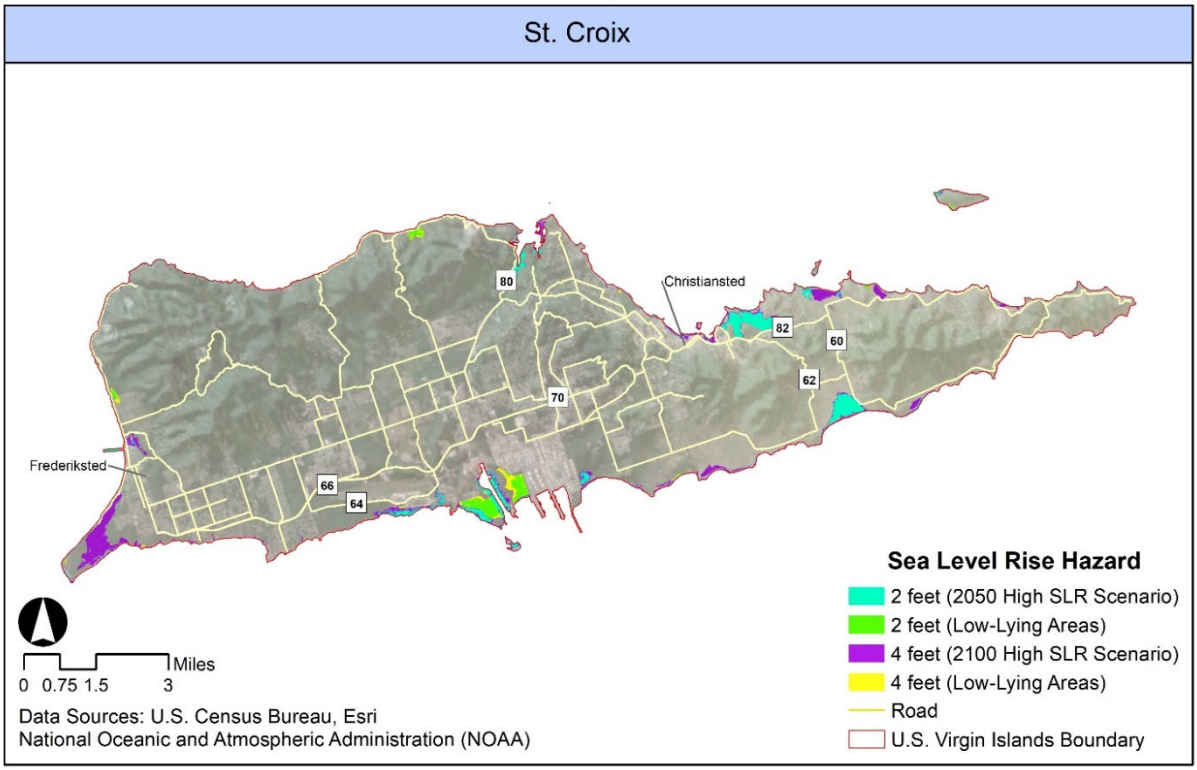


Figure 37. St Thomas Sea Level Rise Hazard

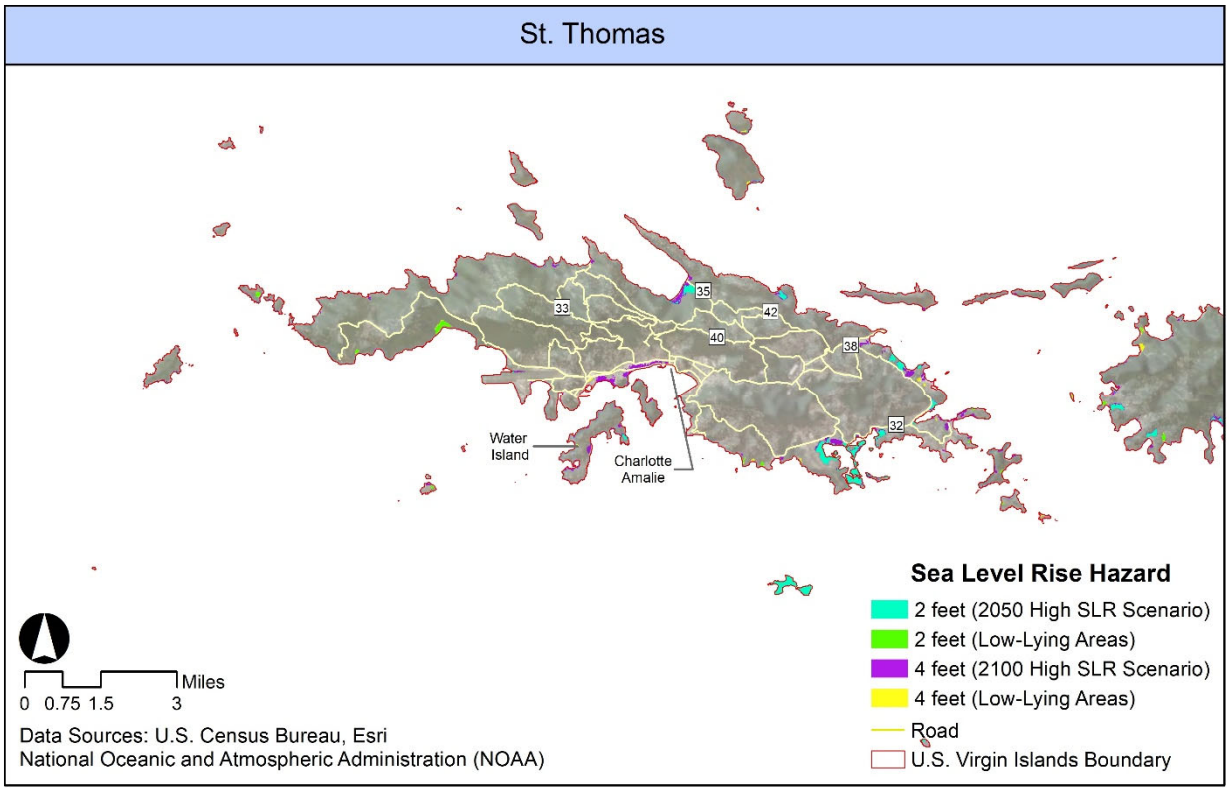
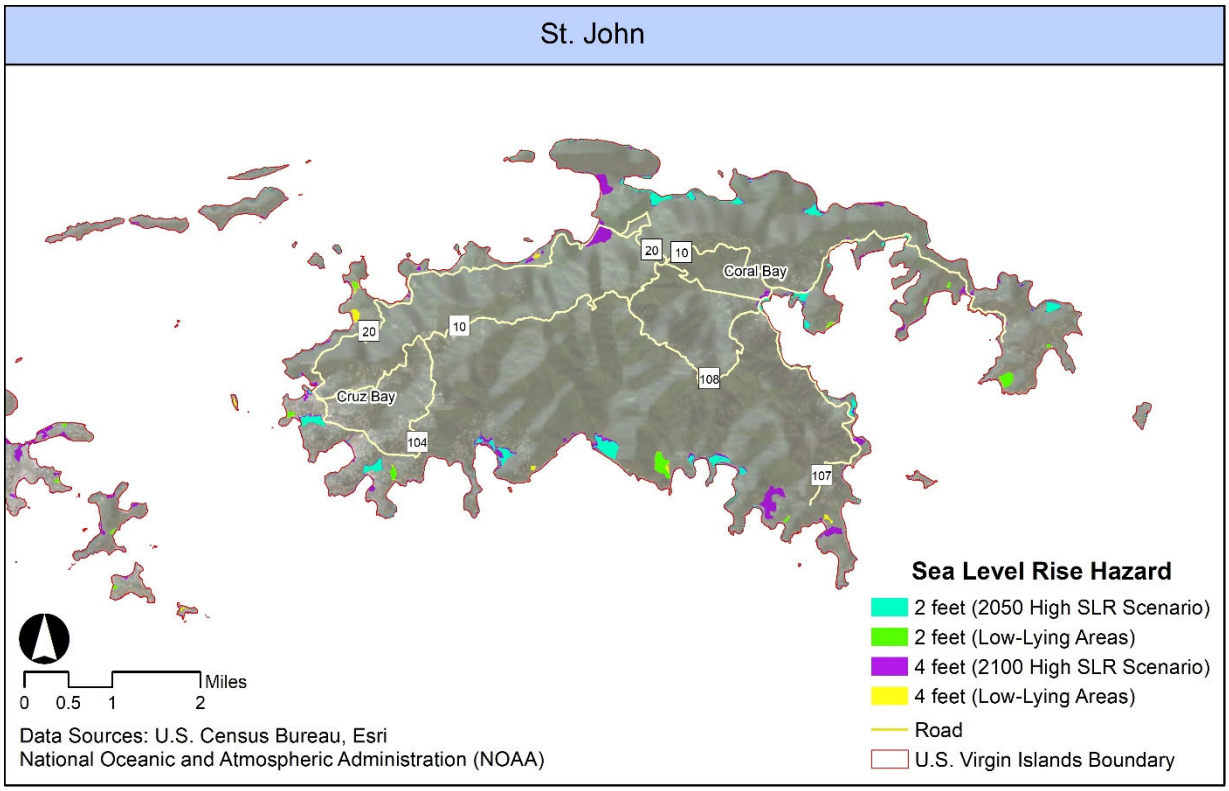


Figure 38. St John Sea Level Rise Hazard



1.9.4 Hurricane Winds

Hurricanes are categorized according to the strength and intensity of their winds using the Saffir-Simpson Hurricane Scale, as shown in Table 19. A Category 1 storm has the lowest wind speeds, while a Category 5 hurricane has the highest. Hurricane winds are a damaging aspect of the tropical systems that frequently impact the US Virgin Islands. These winds are measured on the Saffir-Simpson Hurricane Scale and are broken down into the following categories:

Table 19. Saffir-Simpson Hurricane Wind Categories

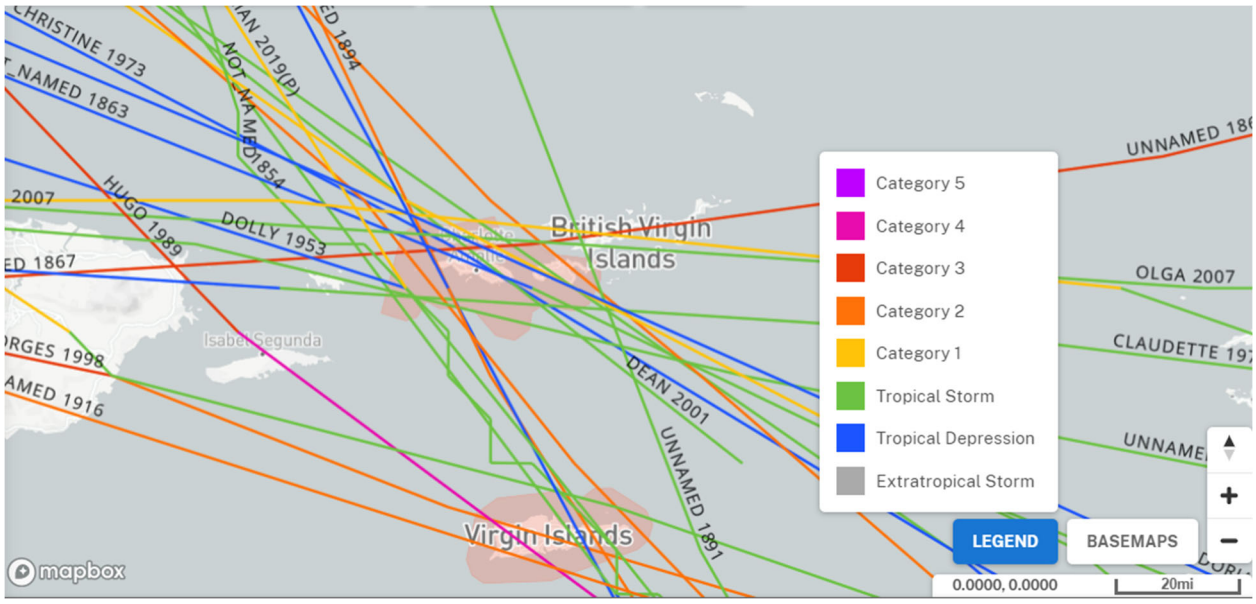
Category	Wind Speed
1	74-95 mph
2	96-110 mph
3	111-129 mph
4	130-156 mph
5	>157 mph

Source: National Hurricane Center

Hurricane winds have historically been a major source of damage in the US Virgin Islands, spawning two disaster declarations in 2017 and accounting for nine of the 22 deadliest, most expensive, and most intense hurricanes to strike outlying US territories and Hawaii in the past century (2019 Hazard Mitigation Plan). Since October 1984, Hurricanes Klaus, Hugo, Marilyn, Lenny, Omar, Earl, Irma, and Maria have had significant impacts to the islands Given its location and hurricane history, the US Virgin Islands are categorized in Wind Zone 4, where requirements for strength design wind speed are the highest at 145 mph (FEMA 2009, FEMA 2015, USVI 2019).

Since the 1850s, the US Virgin Islands have been impacted by 24 hurricanes or tropical storms that passed through the territory, the most recent of which was Hurricane Dorian in 2019. The following image shows the path and strength of storms impacting the US Virgin Islands.

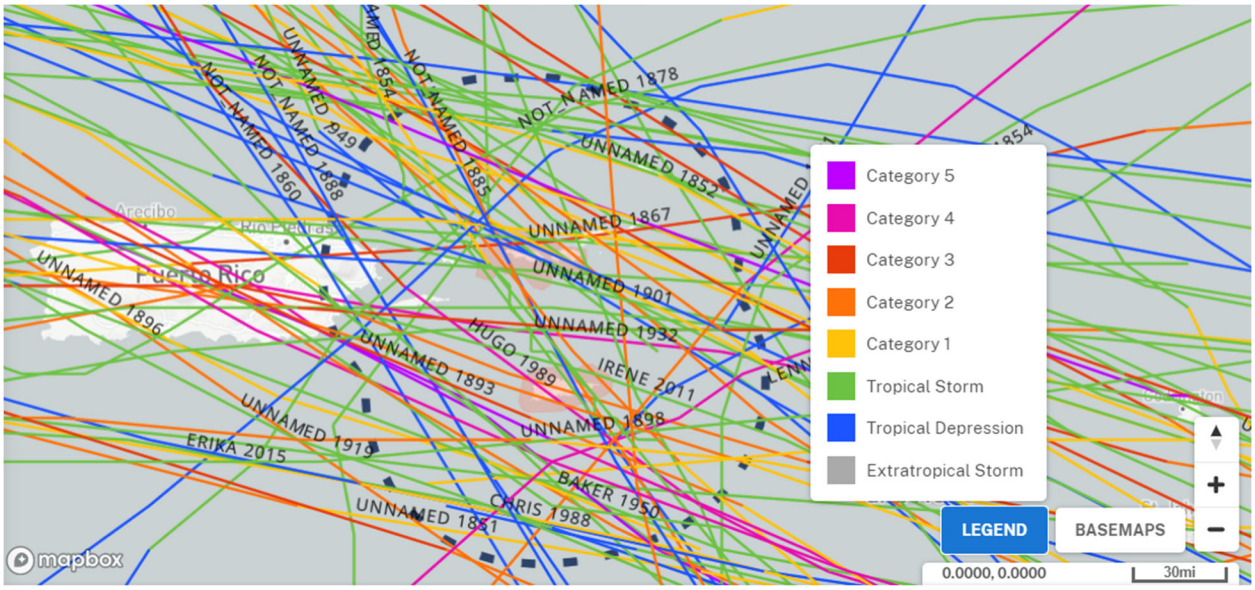
Figure 39. Hurricane Paths Impacting the US Virgin Islands (1850-2019)



Source: National Hurricane Center

In the same time period, 87 storms passed within 50 miles of the US Virgin Islands. The most significant and damaging of these were Hurricanes Maria and Irma, which occurred in 2017. The paths and strengths of these storms are shown in the following image. A 50-mile radius from the US Virgin Islands is outlined in a dashed black line.

Figure 40. Hurricane Paths Passing within 50 Miles of the US Virgin Islands (1850-2019)



Source: National Hurricane Center

For the purposes of this MNA, the 2019 THMP is utilized to provide an analysis of vulnerability related to hurricane wind events. This provides an indication of the magnitude of potential damage developed from the risk analysis in the THMP as aligned with the available data and provided in the tables below. The next THMP will benefit from the even more current available information regarding wind speeds to represent potential risk associated with this hazard in even greater detail.

The 2019 Hazard Mitigation Plan (THMP) cites data from the Atlantic Oceanographic and Meteorological Laboratory that calculates a 42% annual chance of a hurricane or tropical storm striking the US Virgin Islands. The impacts of climate change are expected to marginally increase the frequency and intensity of North Atlantic region (USVI Office of Disaster Recovery, 2019).

The vulnerability assessment of the 2019 THMP indicates that many residential and commercial properties in the Territory are vulnerable to hurricane winds, in part because of how close most buildings are to the coast and the nature of the winds the storms generate (USVI Hurricane Recovery and Resilience Task Force, 2018). On St. John, only one-third of both residential and commercial structures are considered vulnerable, almost all of which are classified as moderate or low consequence. On St. Thomas, the percentage of exposed buildings represents a majority, though also at moderate or low consequence. On St. Croix, just over half of commercial buildings and less than half of residential buildings are exposed, all of which are considered at moderate or low exposure.

Table 20. Building Exposure to Hurricane Winds

Island	Type	Percent of Total Buildings in Category Exposed	Exposed Buildings Impact		
			High	Moderate	Low
St. Croix	Commercial	58%	0%	31%	69%
	Residential	42%	5%	12%	83%
St. John	Commercial	35%	0%	27%	73%
	Residential	35%	5%	9%	86%
St. Thomas	Commercial	70%	0%	99%	1%
	Residential	54%	5%	94%	1%

Source: 2019 Territorial Hazard Mitigation Plan

Lifeline vulnerabilities to hurricane winds are variable across the islands, with lifelines on St. John at considerably less risk than that of St. Croix and St. Thomas. On those islands, lifeline facilities with pre-code structural components represent the most significant vulnerability. These facilities comprise Safety and Security lifelines.

Table 21. Lifeline Exposure to Hurricane Winds

Island/Lifeline	High	Moderate	Low
St. Croix	**28**	**20**	**33**
Energy	0	0	1
Food, Water, Shelter	17	9	21
Health and Medical	1	2	1
Safety and Security	10	8	5
Transportation	0	1	5
St. John	**7**	**2**	**12**
Energy	0	0	1
Food, Water, Shelter	3	2	4
Health and Medical	1	0	2
Safety and Security	3	0	4
Transportation	0	0	1
St. Thomas	**18**	**10**	**13**
Energy	0	0	1
Food, Water, Shelter	4	1	4
Health and Medical	2	2	2
Safety and Security	11	6	3
Transportation	1	1	3

Source: 2019 Territorial Hazard Mitigation Plan

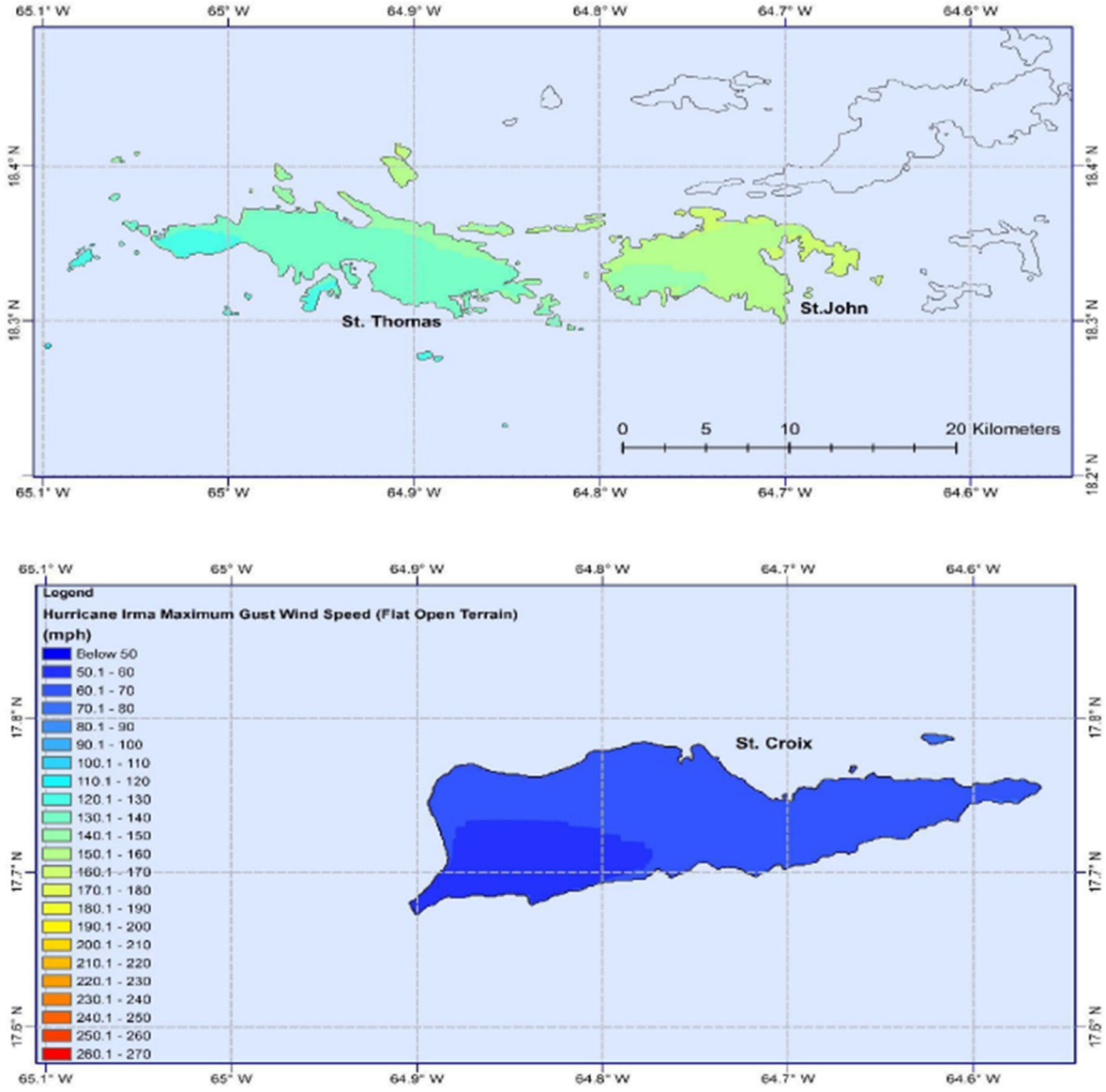
Table 22. Consequence Classification for Lifelines Impacted by Hurricane Winds

Lifeline	Consequence Classification St. Croix	Consequence Classification St. John	Consequence Classification St. Thomas
Communications	Low Impact	Low Impact	Low Impact
Energy	Low Impact	Low Impact	Low Impact
Food, Water, Shelter	High Impact	High Impact	High Impact
Hazardous Material	Low Impact	Low Impact	Low Impact
Health and Medical	High Impact	High Impact	High Impact
Safety and Security	High Impact	High Impact	High Impact
Transportation	Low Impact	Low Impact	High Impact

The THMP also highlighted specific facilities and infrastructure that are vulnerable to hurricane exposure. Both VIWAPA's fuel and water tanks were considered with the tanks on St. Croix recorded as having the greatest level of vulnerability. Out of twelve tanks, seven received a vulnerability ranking of moderate to high. None of the tanks have measures to protect them against wind damage or airborne debris. Acquiring additional fuel storage that is less susceptible to the impact of hurricane-force winds and airborne debris will go a long way in bolstering the resiliency of the energy lifeline. This will be accomplished by providing the utility with fuel storage that is less likely to be impacted by hurricane winds while simultaneously increasing the fuel storage capacity. This will drastically improve the recovery time for future disasters.

Figure 41 displays observed wind gusts from Hurricane Irma. The Hazard Mitigation Plan did not utilize HAZUS wind speed modeling, but instead utilized observed wind speeds from the 2017 hurricanes upon terrain models. The results are shown in the following map and tables.

Figure 41. Extent of Hurricane Irma Observed Wind Gusts



Source: 2019 Territorial Hazard Mitigation Plan

1.9.5 Rain-Induced Landslides

Rain-induced landslides are a hazard of concern in the US Virgin Islands. The combination of heavy rainfall, development, and natural factors combine to create a significant vulnerability for threats to life, property, and critical facilities. The 2019 Hazard Mitigation Plan identifies the following conditions for landslides to occur:

- Location on or in proximity to steep hills
- Steep road-cuts or excavations
- Existing or historically occurring landslides
- Steep areas where surface runoff is channeled
- Unmaintained or adversely altered slopes

The Islands' susceptibility to landslides is acknowledged but not well understood. St. Croix has a more dispersed risk due to precipitation variation. St. John recently experienced landslide events in November 2010 in the vicinity of Centerline Road between Cruz Bay and Coral Bay. On St. Thomas, the northern facing slopes of the island's mountains are particularly prone to landslides. The largest landslide documented on St. Thomas occurred in 1979. St. John and St. Thomas experienced several landslides in 2010, and landslides were reported in 1983 in the vicinity of Dorothea Bay on St. Thomas.

The 2019 THMP noted difficulties (including a lack of available information) to determine the frequency and magnitude of landslides in the US Virgin Islands. The 2019 THMP produced landslide susceptibility maps that are reproduced below. The significant topographical relief evident in St. Thomas and St. John indicates a high hazard level, whereas the relatively lower topographic relief in St. Croix sees less overall risk. According to the 2019 Plan, IPCC projections for an increase in precipitation event will likely increase the likelihood of landslides occurring. These conditions may be exacerbated by continued hillside development.

According to the 2019 THMP, exposure to landslides varies throughout the islands. On St. Thomas, 50% of residential building stock and 38% of commercial building stock is considered vulnerable. This figure is 18% and 17% respectively for St. Croix and 39% and 37% respectively for St. John. The majority of residential buildings on St. Thomas that are vulnerable have a moderate or high consequence classification, whereas most vulnerable commercial buildings on both St. John and St. Thomas have a low consequence classification. St. Croix, with generally flatter topography, is significantly less vulnerable to rain-induced landslides.

Table 23. Building Exposure for Landslide Hazards

Island	Type	Percent of Total Buildings in Category Exposed	Exposed Buildings Impact		
			High	Moderate	Low
St. Croix	Commercial	18%	0%	0%	100%
	Residential	18%	18%	17%	66%
St. John	Commercial	37%	0%	0%	100%
	Residential	39%	39%	24%	37%
St. Thomas	Commercial	38%	0%	0%	100%
	Residential	50%	40%	22%	38%

Source: 2019 Territorial Hazard Mitigation Plan

All identified critical facilities expected to be impacted by rain-induced landslides in St. Croix and St. John have low consequence to exposure. St. Thomas has two critical facilities – both shelters – that have high or moderate consequence to exposure.

Table 24. Lifeline Exposure to Rain-Induced Landslides

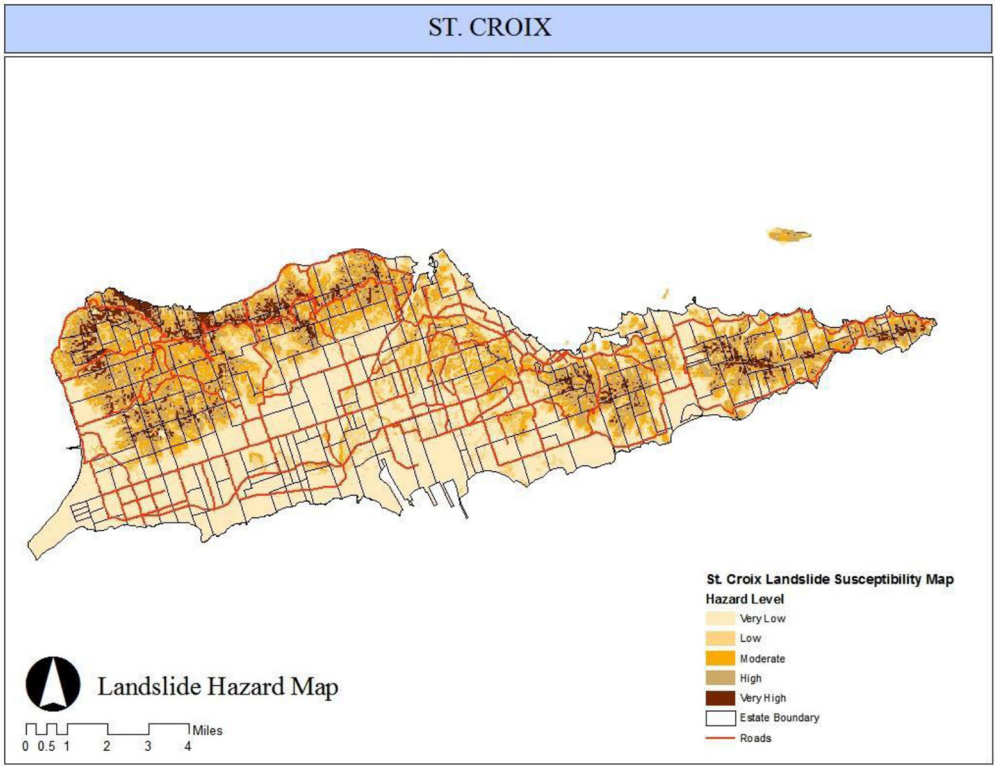
Island/Lifeline	High	Moderate	Low
St. Croix	**0**	**0**	**68**
Energy	0	0	1
Food, Water, Shelter	0	0	35
Health and Medical	0	0	3
Safety and Security	0	0	23
Transportation	0	0	6
St. John	**0**	**0**	**21**
Energy	0	0	1
Food, Water, Shelter	0	0	9
Health and Medical	0	0	3
Safety and Security	0	0	7
Transportation	0	0	1
St. Thomas	**1**	**1**	**40**
Energy	0	0	1
Food, Water, Shelter	1	1	7
Health and Medical	0	0	6
Safety and Security	0	0	21
Transportation	0	0	5

Source: 2019 Territorial Hazard Mitigation Plan

Table 25. Consequence Classification for Lifelines Impacted by Rain-Induced Landslides

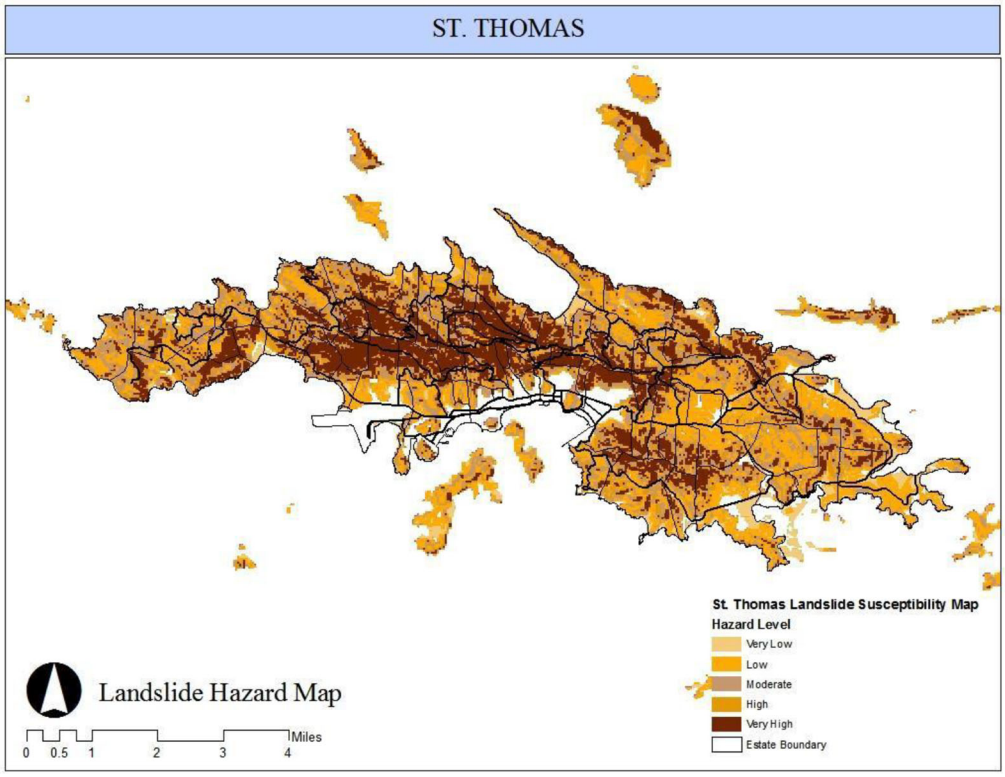
Lifeline	Consequence Classification St. Croix	Consequence Classification St. John	Consequence Classification St. Thomas
Communications	Low Impact	Low Impact	Low Impact
Energy	Low Impact	Low Impact	Low Impact
Food, Water, Shelter	Low Impact	Low Impact	High Impact
Hazardous Material	Low Impact	Low Impact	Low Impact
Health and Medical	Low Impact	Low Impact	Low Impact
Safety and Security	Low Impact	Low Impact	Low Impact
Transportation	Low Impact	Low Impact	Low Impact

Figure 42. Extent of Rain-Induced Landslide in St. Croix



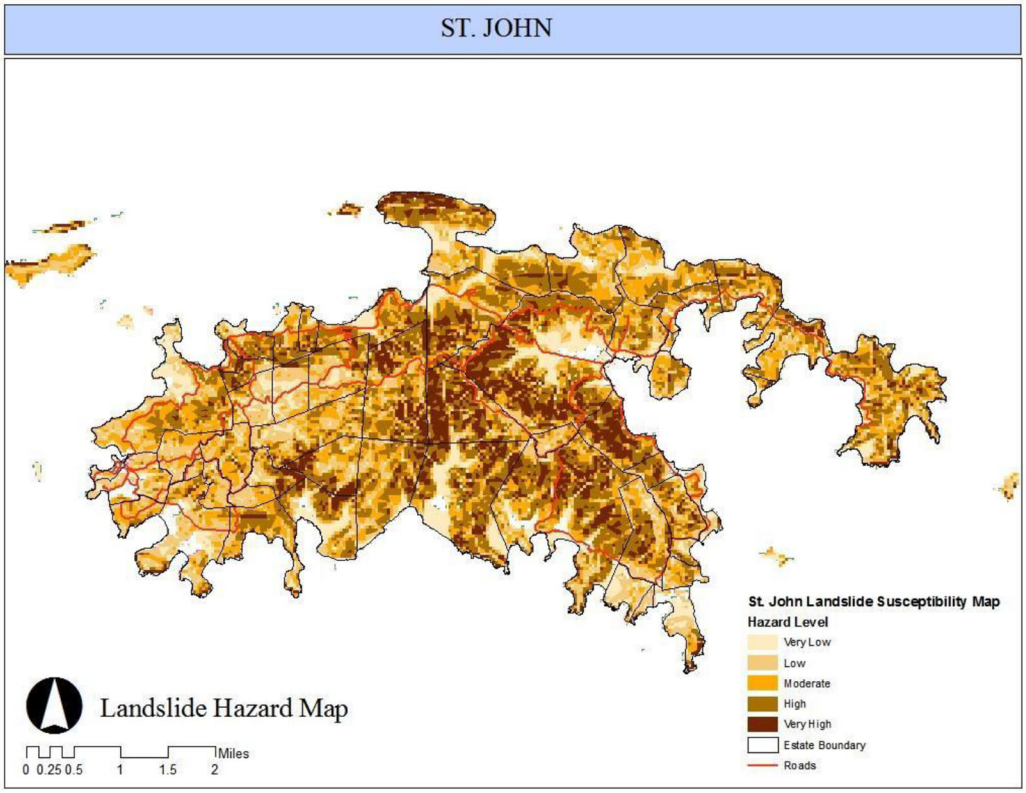
Source: 2019 Territorial Hazard Mitigation Plan

Figure 43. Extent of Rain-Induced Landslide in St. Thomas



Source: 2019 Territorial Hazard Mitigation Plan

Figure 44. Extent of Rain-Induced Landslide in St. John



Source: 2019 Territorial Hazard Mitigation Plan

1.9.6 Tsunami

The US Virgin Islands are susceptible to tsunamis owing to its history of earthquakes and its location in a seismically active region. Tsunamis can originate throughout the region and can quickly travel to adjacent coastlines at speeds between 450 to 600 miles per hour.

Vulnerability to tsunamis has increased throughout the region as populations and development have increased. A tsunami warning system for Puerto Rico and the Virgin Islands has been in place since 2000 and has an estimated response time of 20 minutes. However, the Islands' proximity to the Puerto Rican Trench and the Anegada Fault could result in a tsunami experienced on land before warnings can be issued.

The most recent and damaging tsunami impacting the Islands occurred following a magnitude 7.5 earthquake in 1867. The earthquake's epicenter was located in the Anegada Fault between St. Thomas and St. Croix. The resulting tsunami caused wave heights of up to 12.2 m near Water Island off St. Thomas, 7.8 meters at Frederiksted, and 6.1 meters at Charlotte Amalie. Since 1530, 116 tsunamis with run-ups exceeding 0.5 meters (1.6 feet) have been separately observed. Of these, 14 tsunamis were reported from Puerto Rico or the Virgin Islands.

Low-lying coastal areas are most vulnerable to tsunamis. Tsunamis pose a unique vulnerability to cruise ships and appurtenant waterfront/harbor developments, where exceptionally strong waves can cripple crucial transportation vectors. The following table shows the percentage of residential and commercial buildings impacted by the tsunami hazard. Due to the location of many buildings on higher

land away from the water, total percent of buildings impacted by a tsunami is relatively low. However, buildings that are within an anticipated tsunami zone have a very high vulnerability to the hazard. On St. Thomas, an estimated 18% of residential buildings and 33% of commercial buildings are exposed to tsunamis. On St. Croix, this figure is 11% and 5% respectively and on St. John this figure is 13% for both residential and commercial buildings.

For the purposes of this MNA, the 2019 THMP is utilized to provide an analysis of vulnerability related to tsunami events. This provides an indication of the magnitude of potential damages developed from the risk analysis in the THMP as aligned with the previously available data and provided in the tables below. Current information from NOAA 2018 will be beneficial to the latest update of the THMP to represent potential risk associated with this hazard in even greater detail.

Table 26. Building Exposure to Tsunamis

Island	Type	Percent of Total Buildings in Category Exposed	Exposed Buildings Impact		
			High	Moderate	Low
St. Croix	Commercial	5%	100%	0%	0%
	Residential	11%	100%	0%	0%
St. John	Commercial	13%	100%	0%	0%
	Residential	13%	100%	0%	0%
St. Thomas	Commercial	33%	100%	0%	0%
	Residential	18%	100%	0%	0%

Source: 2019 Territorial Hazard Mitigation Plan

Tsunamis pose significant threats to lifeline facilities, with many identified lifeline facilities in the islands experiencing very high vulnerability to tsunami hazards. Across the Islands, ports are the most vulnerable transportation lifeline, nearly all of which have a high consequence classification for exposure. On St. Thomas, nearly half of Safety and Security lifelines have high consequence classifications for tsunamis.

Table 27. Lifeline Exposure to Tsunamis

Island/Lifeline	High	Moderate	Low
St. Croix	**8**	**0**	**60**
Energy	0	0	1
Food, Water, Shelter	1	0	33
Health and Medical	1	0	3
Safety and Security	1	0	22
Transportation	5	0	1
St. John	**7**	**0**	**11**
Energy	1	0	0
Food, Water, Shelter	3	0	3
Health and Medical	0	0	3
Safety and Security	2	0	5
Transportation	1	0	0
St. Thomas	**15**	**0**	**27**
Energy	1	0	0
Food, Water, Shelter	0	0	9
Health and Medical	1	0	5
Safety and Security	10	0	11
Transportation	3	0	2

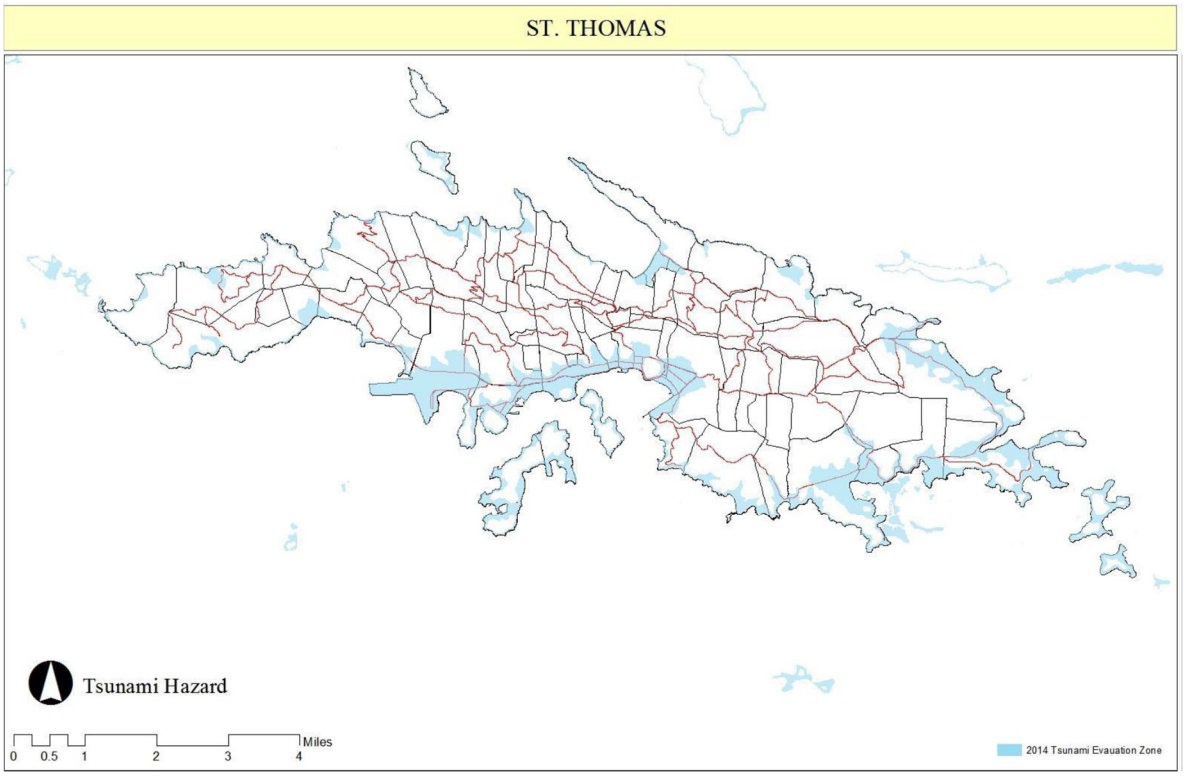
Source: 2019 Territorial Hazard Mitigation Plan

Table 28. Consequence Classification for Lifelines Impacted by Tsunami

Lifeline	Consequence Classification St. Croix	Consequence Classification St. John	Consequence Classification St. Thomas
Communications	Low Impact	Low Impact	Low Impact
Energy	Low Impact	Low Impact	Low Impact
Food, Water, Shelter	Moderate Impact	High Impact	High Impact
Hazardous Material	Low Impact	Low Impact	Low Impact
Health and Medical	High Impact	High Impact	High Impact
Safety and Security	High Impact	High Impact	High Impact
Transportation	High Impact	High Impact	High Impact

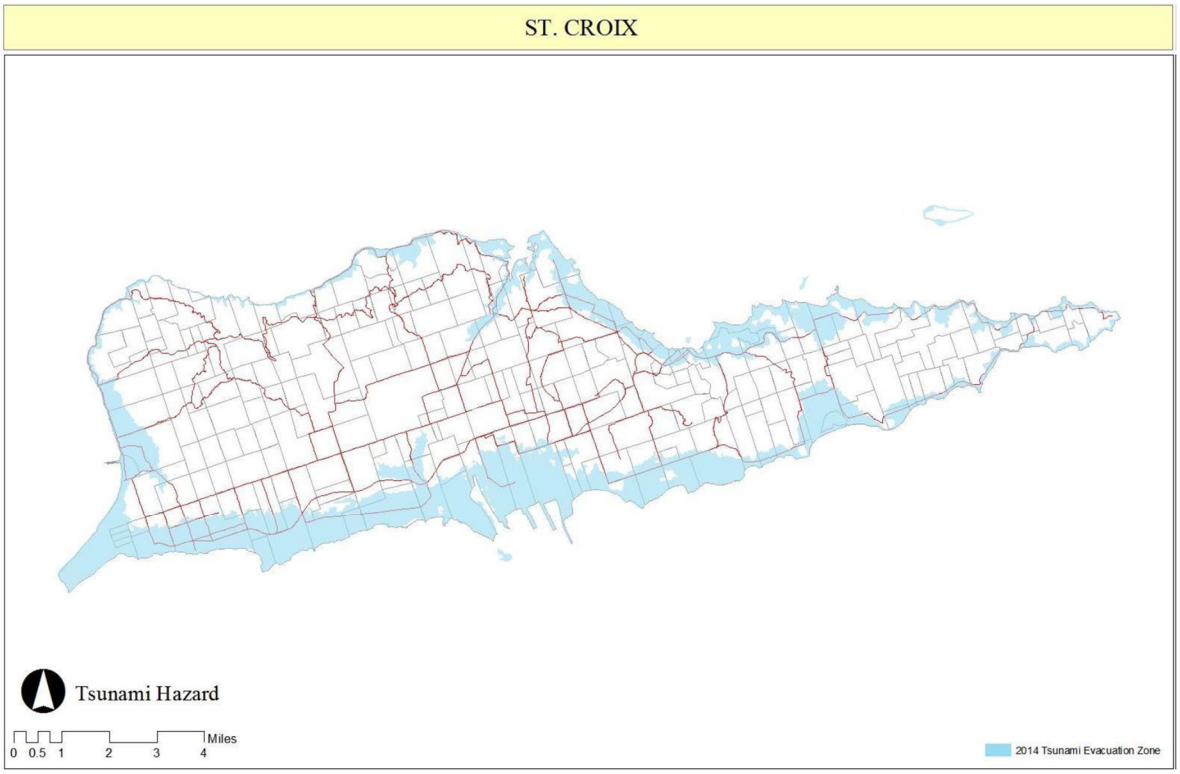
The following maps show tsunami-vulnerable areas on the three islands. The tsunami-impacted zone extends farther inland than the Coastal Flooding does, impacting a higher percentage of both buildings and lifeline facilities.

Figure 45. Extent of Tsunami Hazard for St. Thomas



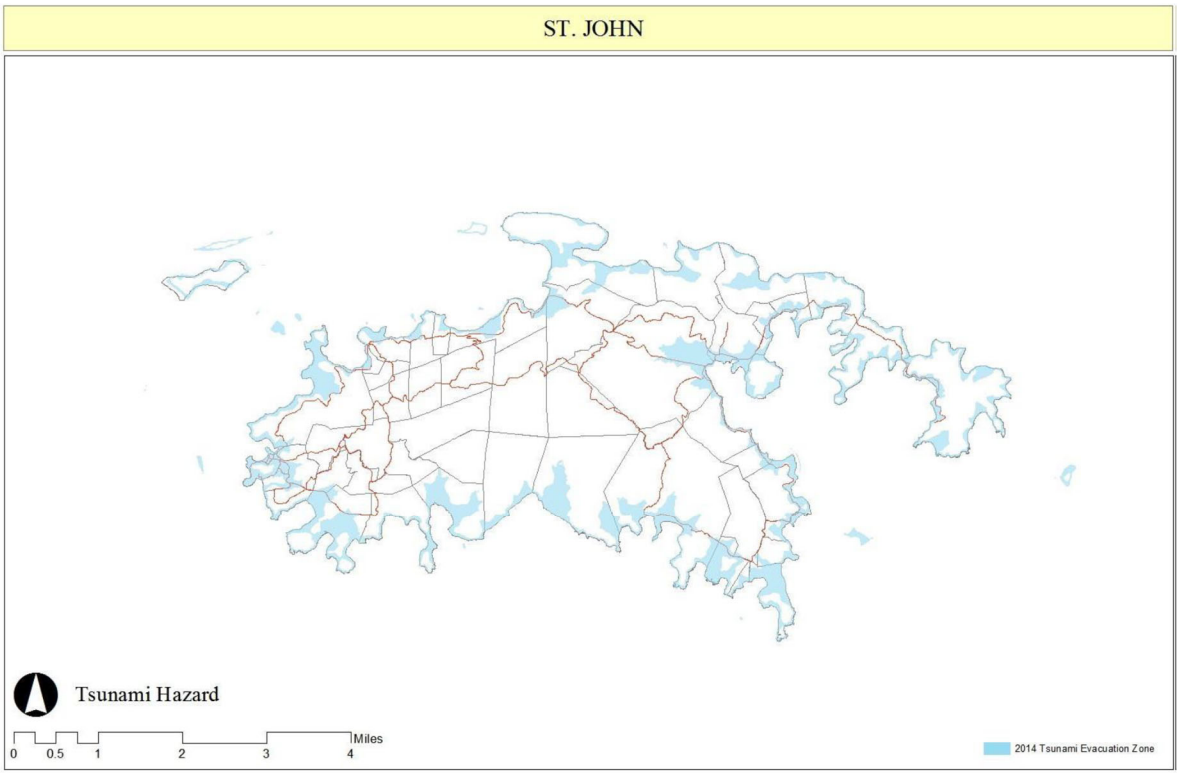
Source: 2019 Territorial Hazard Mitigation Plan

Figure 46. Extent of Tsunami Hazard for St. Croix



Source: 2019 Territorial Hazard Mitigation Plan

Figure 47. Extent of Tsunami Hazard for St. John



Source: 2019 Territorial Hazard Mitigation Plan

1.9.7 Wildfire

The dense vegetation and sprawling nature of development in the US Virgin Islands contributes to a significant wildfire risk in the communities. According to the 2019 THMP, the Islands have a mixed wildland/urban interface. Fire risk is compounded by this interface along with steep and narrow roadways on St. John and St. Thomas that make access difficult. On St. Croix, development alongside grasslands and scrublands along with trash and land-clearance fires create considerable risk. Between 2000 and 2010, all recorded wildfires on the Islands have occurred on St. Croix. The 2019 THMP estimates that the Islands can expect at least one wildfire per year. Data cited by the THMP points to warmer average temperatures (particularly in the dry months of the year) due to climate change. These changes are expected to exacerbate wildfire risk.

Wildfire risk impacts a significant percentage of residential and commercial properties across the Islands. On St. Thomas, vulnerabilities are present for 42% of residential properties and 35% of commercial properties. St. Croix's vulnerabilities are 47% and 27%, respectively. Vulnerabilities on St. John include 38% of residential properties and 44% of commercial properties.

Table 29. Building Exposure to Wildfire

Island	Type	Percent of Total Buildings in Category Exposed	Exposed Buildings Impact		
			High	Moderate	Low
St. Croix	Commercial	27%	0%	0%	100%
	Residential	47%	46%	26%	27%
St. John	Commercial	44%	0%	0%	100%
	Residential	38%	38%	18%	44%
St. Thomas	Commercial	35%	0%	0%	100%
	Residential	42%	43%	22%	35%

Source: 2019 Territorial Hazard Mitigation Plan

Table 30. Consequence Classification for Lifelines Impacted by Wildfire

Lifeline	Consequence Classification St. Croix	Consequence Classification St. John	Consequence Classification St. Thomas
Communications	Low Impact	Low Impact	Low Impact
Energy	Low Impact	Low Impact	Moderate Impact
Food, Water, Shelter	Moderate Impact	Moderate Impact	Moderate Impact
Hazardous Material	Low Impact	Low Impact	Low Impact
Health and Medical	Moderate Impact	Low Impact	Low Impact
Safety and Security	Moderate Impact	Moderate Impact	Moderate Impact
Transportation	Low Impact	Low Impact	Low Impact

The following table describes wildfire exposure to lifelines in the US Virgin Islands. On St. Croix, Transportation and Energy lifelines have low exposure, whereas more than half of Food, Water, Shelter and Safety and Security lifelines have moderate or high exposure. On St. John, most Safety and Security and Food, Water, Shelter lifelines have high exposure. On St. Thomas, most lifelines have low or moderate exposure whereas the vast majority of Safety and Security lifelines are exposed.

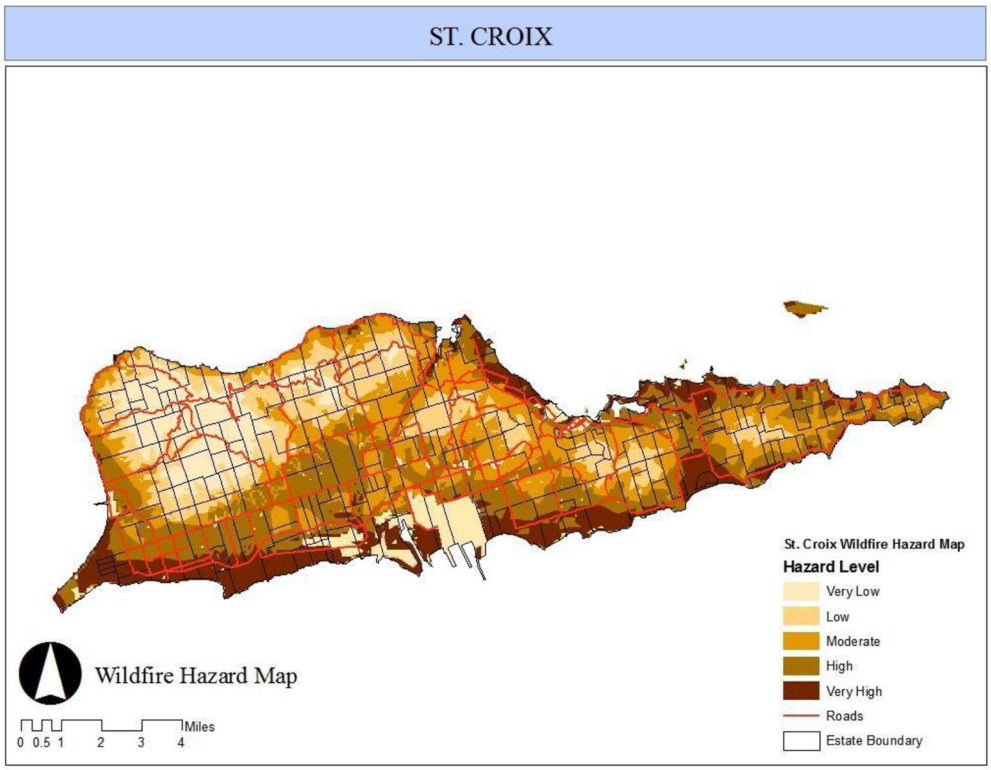
Table 31. Lifeline Exposure to Wildfire

Island/Lifeline	High	Moderate	Low
St. Croix	**30**	**12**	**45**
Energy	0	0	1
Food, Water, Shelter	19	9	25
Health and Medical	1	1	2
Safety and Security	10	2	11
Transportation	0	0	6
St. John	**13**	**0**	**7**
Energy	1	0	0
Food, Water, Shelter	6	0	3
Health and Medical	0	0	2
Safety and Security	6	0	1
Transportation	0	0	1
St. Thomas	**25**	**6**	**18**
Energy	0	0	1
Food, Water, Shelter	1	3	8
Health and Medical	1	0	6
Safety and Security	18	3	3
Transportation	5	0	0

Source: 2019 Territorial Hazard Mitigation Plan

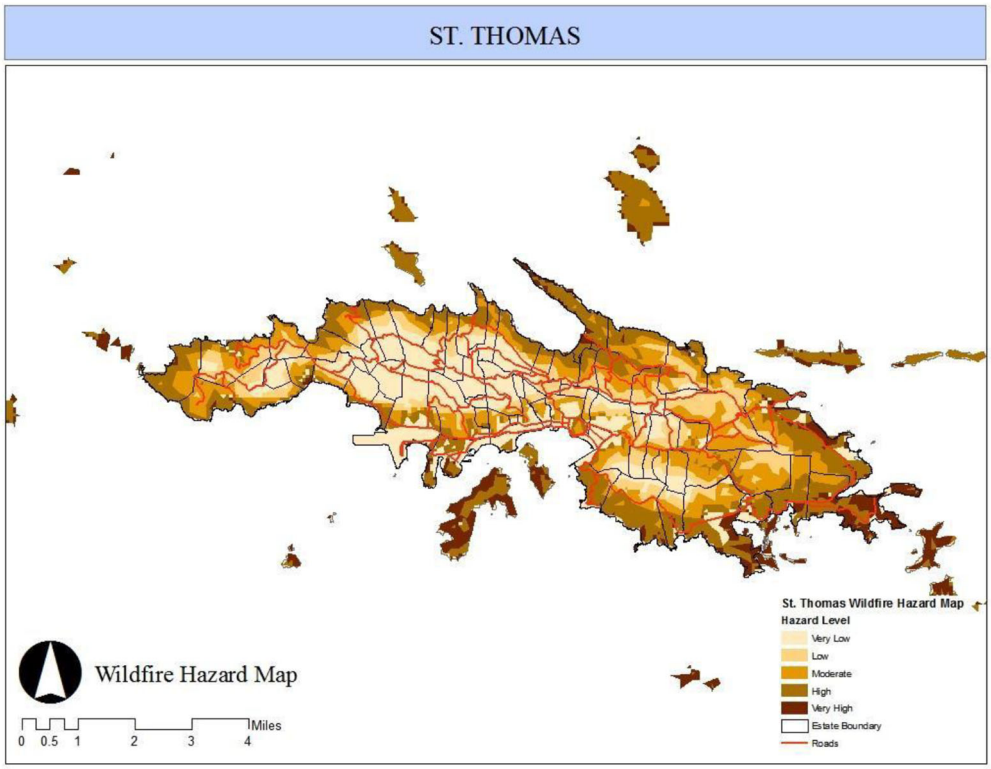
The following map shows wildfire-vulnerable areas on the three islands. Wildfire risk is relatively low in most of St. John and St. Thomas. Areas with higher vulnerability are found closer to the coastline. Acute areas of higher vulnerability are found in the southern section of St. Croix and the East End of St. John.

Figure 48. Extent of Wildfire Hazards in St. Croix



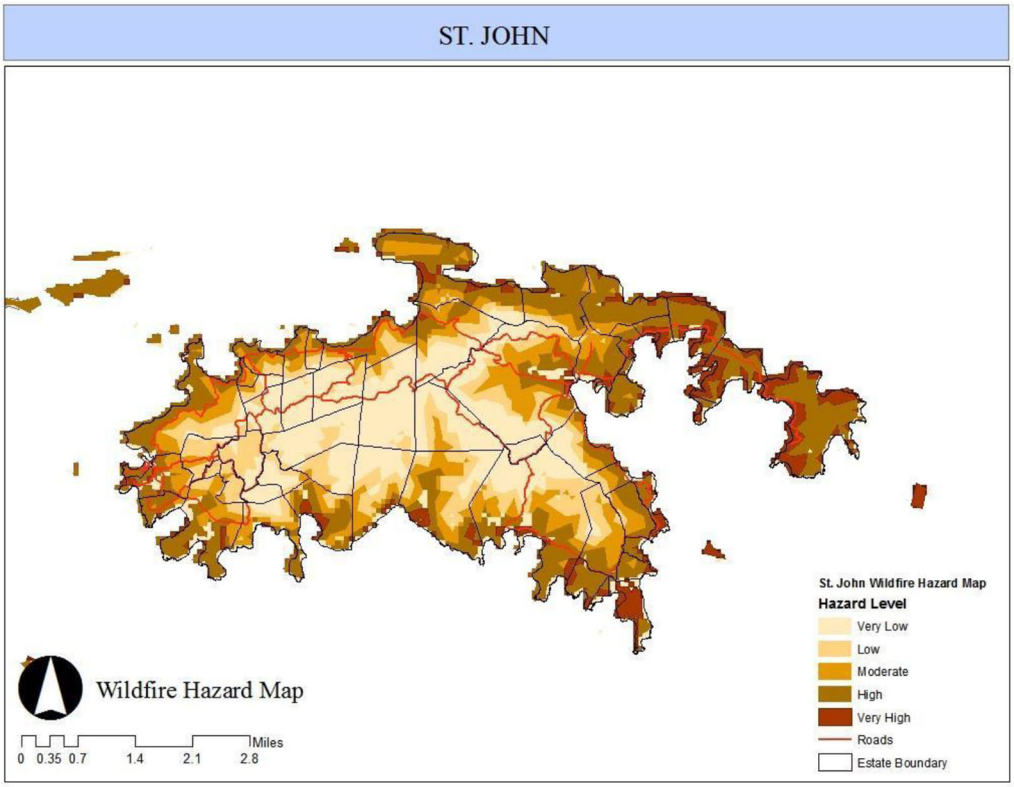
Source: 2019 Territorial Hazard Mitigation Plan

Figure 49. Extent of Wildfire Hazards in St. Thomas



Source: 2019 Territorial Hazard Mitigation Plan

Figure 50. Extent of Wildfire Hazards in St. Thomas



Source: 2019 Territorial Hazard Mitigation Plan

1.9.8 Disease Outbreak/Pandemic

An outbreak or an epidemic occurs when new cases of a certain disease substantially exceed what is expected. An epidemic may be restricted to one locale. When occurring globally, it is referred to as a pandemic. Pandemic is defined as a disease occurring over a wide geographic area and affecting a high proportion of the population. A pandemic can cause sudden, pervasive illness in all age groups on a local or global scale. A pandemic is a novel virus to which humans have no natural immunity that spreads from person-to-person. A pandemic will cause both widespread and sustained effects and is likely to stress the resources of the territorial and federal government (New Jersey Office of Emergency Management, 2019).

As an island territory with substantial tourist visitation and limited medical resources, disease outbreaks present a significant hazard for the US Virgin Islands. The hazard was not included in the 2019 Territorial HMP (THMP). However, the Islands' vulnerability was exposed during the 2020 COVID-19 pandemic.

Prior to COVID-19, isolated incidents of disease outbreak have occurred recently in the Territory. In June 2005, an outbreak of dengue virus was detected which resulted in 331 suspected cases, of which 54% resulted in hospitalizations (Mohammed, Ramos, Armstrong, & Muñoz-Jordán, 2010). In April 2012, an outbreak of acute gastroenteritis occurred sickened 51 guests and 38 employees of a hotel in St. Thomas (Leshem, et al., 2016). More recent disease outbreak control efforts in the Territory have focused on prevention of dengue and mosquito-borne illnesses (The St. John Source, 2020). Prior to 2020, the Virgin Islands had not experienced a dengue outbreak since 2012. Currently, the Centers for disease Control recognizes three non-vaccine-preventable diseases in the Territory that can be encountered, including African tick-bite fever, dengue, and zika (Centers for Disease Control and Prevention, 2021).

The table below shows the number of cases reported in the Islands in the USVI Department of Health – Epidemiology Division's 2014-2018 Report. In 2014, the USVI began to implement a National Electronics Disease Surveillance System. Of the diseases for which data were collected, Staphylococcal aureus (commonly known as a Staph infection), represented many of the reported cases, followed by influenza.

Table 32: Infectious Diseases in the US Virgin Islands, 2014-2018

Foodborne Diseases	**68**	**General Communicable Diseases**	**485**
Cryptosporidiosis	1	Staphylococcal aureus	477
Giardiasis	15	Enterococcus	6
Salmonellosis	45	Legionellosis	2
Shigellosis	4		
Staphylococcal enterotoxin	3	**Influenza**	**182**
		Influenza outbreak	6
Hepatitis	**80**	Influenza	175
Hep A- Acute	3	Novel Type A	1
Hep B- Prenatal	2		
Hep B- Acute	4	**Vectorborne and Environmental Diseases**	**22**
Hep C- Acute	2	Dengue	8
Hep B- Chronic	26	Leptospirosis	3
Hep C- Chronic	43	Lyme Disease	1
		Malaria	5
		Melioidosis	3
		West Nile	1
		Zika	1

The US Virgins Islands has been profoundly affected by novel coronavirus (COVID-19). COVID-19 is an infectious disease first identified in 2019. The virus rapidly spread into a global pandemic by spring of 2020. Older people, and those with underlying medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness (World Health Organization, 2021). With the virus being relatively new, information regarding transmission and symptoms of the virus is still new. The COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes. Reported symptoms include trouble breathing, persistent pain or pressure in the chest, new confusion or inability to arouse, and bluish lips or face. Symptoms may appear 2-14 days after exposure to the virus (based on the incubation period of MERS-CoV viruses) (Centers for Disease Control and Prevention, 2021).

In an effort to slow the spread of the virus, the federal government and states have urged the public to avoid touching the face, properly wash hands often, and use various social distancing measures. On March 23rd, the Governor of the USVI issued a "stay-at-home" order for all non-essential businesses (Government of the United States Virgin Islands, 2021). In mid-March 2020, the Territory's first COVID-19 case was reported, with the number of cases growing gradually through June 2020. By July 1st, 2020, 90 cases of COVID-19 were reported in the Territory following the reopening of Territory's tourism industry (Giles & Rodriguez, 2020). However, by the end of July more than 400 cases would be reported. As of September 2020, the number of cases has continued to increase, though at a slower rate than what was seen in July and August 2020 (Johns Hopkins University & Medicine, 2021). At the time of this plan update, there are no specific vaccines or treatments for COVID-19. However, there are many ongoing clinical trials evaluating potential treatments (World Health Organization, 2021).

As of September 21, 2020, the US Virgin Islands are on travel notice Level 3 – the CDC's highest – which recommends travelers avoid all nonessential travel to the US Virgin Islands (Centers for Disease Control and Prevention, 2021). The impact of COVID-19 upon the Territory is exacerbated by pre-existing health disparities experienced on the Island, as well as pressing health needs that were worsened by the 2017 hurricanes (Artiga, Hall, Rudowitz, & Lyons, 2018).

Table 33: COVID-19 Confirmed Cases and Deaths as of 9/9/21

Status	Count
Positive/Confirmed Infections (Cumulative)	3652
Active Cases	120
Recovered	3504

Source: USVI Department of Health - Health Data (vi.gov)

Lifelines will face considerable impacts due to disease outbreaks and pandemics, though the extent will vary based on the severity of the disease outbreak and the types of measures taken to prevent disease spread and respond to the disease. Communications, energy, and hazardous materials lifelines are anticipated to have low consequence impacts from the hazard owing to the types of operations present at those lifelines. Food, water, shelter lifelines are expected to be impacted due to disruptions to food supply chains as well as impacts to congregate/sheltering facilities and higher-density housing. Health and medical lifelines (present on each of the three largest islands) are expected to have high impacts owing to the need to treat patients and the potential for the lifelines to be overwhelmed during a large-scale event. Safety and Security and Transportation lifelines are expected to experience moderate impacts due to disruption of government services, and additional constraints or stressors placed on Transportation lifelines from transporting or evacuating disease casualties, importing supplies, and serving as a vector of disease. Energy lifelines may also be impacted if a disease outbreak occurs on a vessel transporting fuel to the territory thus causing a fuel shipment to be temporarily diverted and ultimately delayed.

Table 34: Consequence Classification for Lifelines Impacted by Pandemic

Lifeline	Consequence Classification St. Croix	Consequence Classification St. John	Consequence Classification St. Thomas
Communications	Low Impact	Low Impact	Low Impact
Energy	Low Impact	Low Impact	Low Impact
Food, Water, Shelter	Moderate Impact	Moderate Impact	Moderate Impact
Hazardous Material	Low Impact	Low Impact	Low Impact
Health and Medical	High Impact	High Impact	High Impact
Safety and Security	Moderate Impact	Moderate Impact	Moderate Impact
Transportation	Moderate Impact	Moderate Impact	Moderate Impact

Based on the data examined in this Mitigation Needs Assessment, the disease outbreak hazard has been identified as a hazard of concern for the US Virgin Islands. This assessment is due to the exceptional impacts that COVID-19 has had upon the Territory, the residents, and the economy. While the ongoing impact of COVID-19 continues to develop, its impact on the Territory cannot be overstated and must be a factor for consideration within the MNA.

1.10 Unmet Mitigation Needs

To address the unmet mitigation needs specified in this MIT-AP, CDBG-MIT funds will be allocated as described in Table 1: CDBG-MIT Allocations. Use of the one-time CDBG-MIT grant money will be

used to fundamentally change resilience preparedness in the Territory, focusing on mitigation activities that will result in reduced need for recovery and mitigation resources in the future. The Territory recognizes that the perpetual cycle of disaster and recovery is not model that is socially, economically, environmentally, or fiscally sustainable, so activities and projects will be selected based on fact-based analysis and careful review toward increasing resilience in the Territory.

In April 2021,1he U.S. Virgin Islands Hazard Mitigation Plan 2019-Update was updated to incorporate the introduction to FEMA-Lifelines and USVI Hazard mitigation planning elements that addresses a wide range of natural and human-caused hazards. The VIHFA is considering covered projects related to the community lifelines:

The proposed Energy Lifeline Project is to address the long-term operation and maintenance of the utility's fuel supply. The regulated electrical utility is the primary resource and responsible entity for providing reliable and resilient power to the territory. While VIWAPA has control over the diesel inventory, it does not currently have direct control over the LPG inventory. This places the utility in a vulnerable position as without access to LPG, power generation for the territory. The more inventory that the Authority has under its control, the more resources it has to respond to and reduce the likelihood of a service interruption.

1.11 Risk Assessment Summary

The 2019 THMP assessed potential losses to residential and commercial buildings as well as lifelines. The THMP additionally identified social impacts to vulnerable populations. In the 2019 THMP, vulnerable populations included residents under the age of 18 and over the age of 65 at the time of the 2010 Census. The following tables display the vulnerabilities for each hazard. The Islands younger residents are proportionately more exposed to droughts, earthquakes, wildfires, and hurricane winds. On St. John there is a significant exposure to rain-induced landslides for younger residents.

Table 35. Social Impact for St. Thomas Hazards

Hazard	Residents <18 years	%	Residents >65	%
Coastal Flooding	1,128	2%	23	0.04%
Drought	8,271	15%	2,037	4%
Earthquake	8,461	15%	1,692	3%
Riverine Flooding	4,512	8%	1,128	2%
Hurricane Winds	14,101	25%	2,820	5%
Rain-Induced Landslide	3,462	6%	853	2%
Tsunami	2,440	5%	919	2%
Wildfire	7,111	13%	1,752	3.11%

Table 36. Social Impact for St. John Hazards

Hazard	Residents <18 years	%	Residents >65	%
Coastal Flooding	89	2%	2	0.04%
Drought	925	21%	228	5%
Earthquake	623	14%	178	4%
Riverine Flooding	267	6%	44	1%
Hurricane Winds	1,067	24%	267	6%
Rain-Induced Landslide	1,516	34%	146	3%
Tsunami	141	3%	71	2%
Wildfire	421	9%	104	2.33%

Table 37. Social Impact for St. Croix Hazards

Hazard	Residents <18 years	%	Residents >65	%
Coastal Flooding	1,128	2%	23	0.04%
Drought	8,271	15%	2,037	4%
Earthquake	8,461	15%	1,692	3%
Riverine Flooding	4,512	8%	1,128	2%
Hurricane Winds	14,101	25%	2,820	5%
Rain-Induced Landslide	3,462	6%	853	2%
Tsunami	2,758	5%	919	2%
Wildfire	7,111	13%	1,752	3.11%

The table below displays overall losses for critical facilities/lifelines, residential properties, and commercial properties for the hazard of concern and return period. St. Thomas and St. John experience a higher volume of losses owing to the density of development. In terms of total losses, earthquakes and hurricane winds have the potential to generate the highest losses in the Territory. However, the return period for an earthquake is considerably longer than that of other hazards. Tsunami events have a similar capability to generate significant losses for all facility types, though like earthquakes the return period is longer than it is for other hazards. Owing to the Islands' development patterns, there is considerably higher absolute exposure to residential properties than there is to commercial properties.

Table 38. Island Loss Calculations

Hazard	Return Period (Years)	Critical Facility Losses	Residential Losses	Commercial Losses	Total Loss	Loss/Year
St. Thomas						
Drought	100	N/A	N/A	N/A	$1,058,990	$10,590
Earthquake	1000	$442,013,206	$4,641,269,145	$1,384,710,463	$6,467,992,814	$6,467,993
Riverine Flooding	100	$223,420,272	$752,430,862	$292,639,745	$1,268,490,879	$12,684,909
Coastal Flooding	120	$56,868,971	$115,105,946	$56,606,106	$228,581,024	$1,904,842
Hurricane	50	$314,644,509	$3,097,521,815	$571,109,732	$3,983,276,056	$79,665,521
Rain-Induced Landslide	50	$23,153,076	$76,647,667	$ -	$99,800,743	$1,996,015
Tsunami	500	$295,629,176	$808,769,974	$402,633,004	$1,507,032,154	$3,014,064
Wildfire	10	N/A	N/A	N/A	$571,815	$57,181
St. Croix						
Drought	100	N/A	N/A	N/A	$1,058,990	$10,590
Earthquake	1000	$528,799,950	$3,645,930,917	$746,489,600	$4,921,220,467	$4,921,220
Riverine Flooding	100	$61,399,508	$618,081,641	$150,076,139	$829,557,287	$8,295,573
Coastal Flooding	120	$17,245,151	$52,319,194	$26,256,719	$95,821,063	$798,509
Hurricane	50	$409,677,613	$1,508,195,711	$307,082,553	$2,224,955,877	$44,499,118
Rain-Induced Landslide	50	$ -	$ 20,892,953	$ -	$20,892,953	$417,859
Tsunami	500	$198,006,714	$524,598,730	$261,998,197	$984,603,641	$1,969,207
Wildfire	10	N/A	N/A	N/A	$571,815	$57,181
St. John						
Drought	100	N/A	N/A	N/A	$1,058,990	$10,590
Earthquake	1000	$120,120,930	$444,103,045	$88,306,986	$652,530,961	$652,531
Riverine Flooding	100	$58,192,860	$18,067,019	$1,804,774	$78,064,652	$780,647
Coastal Flooding	120	$54,333,776	$25,861,531	$4,738,932	$84,934,239	$707,785
Hurricane	50	$78,957,369	$188,034,154	$30,409,148	$297,400,671	$5,948,013
Rain-Induced Landslide	50	$ -	$21,247,859	$ -	$21,247,859	$424,957
Tsunami	500	$54,368,571	$96,449,264	$18,284,842	$169,102,677	$338,205

Wildfire	10	N/A	N/A	N/A	$571,815	$57,181

The following table shows combined hazard exposure for the three islands. The combined total losses are largest for earthquakes, riverine flooding, hurricanes, and tsunamis overall, but the likelihood of occurrences of earthquakes and tsunamis based on historical data are comparatively low. The data shows that hurricanes and flooding are much more likely to occur with more regularity in the Territory. Consideration of this aspect of the combined loss calculations is reflected in the return periods listed next to each hazard, which are shown in the loss per year. This potential loss per year must be factored into prioritizing the risks to be mitigated within the MIT-AP.

Table 39. Combined Loss Calculations

	Return Period	Critical Facility Losses	Residential Losses	Commercial Losses	Total Loss	Loss/Year
Drought	100	$ -	$ -	$ -	$3,176,969	$31,770
Earthquake	1000	$1,090,934,086	$8,731,303,107	$2,219,507,049	$ 12,041,744,242	$12,041,744
Riverine Flooding	100	$343,012,640	$1,388,579,522	$ 444,520,658	$ 2,176,112,818	$21,761,129
Coastal Flooding	120	$128,447,898	$193,286,671	$87,601,757	$ 409,336,326	$3,411,136
Hurricane	50	$803,279,491	$4,793,751,680	$ 908,601,433	$ 6,505,632,604	$130,112,652
Rain-Induced Landslide	50	$23,153,076	$118,788,479	$ -	$141,941,555	$2,838,831
Tsunami	500	$548,004,461	$1,429,817,968	$682,916,043	$2,660,738,472	$5,321,476
Wildfire	10	N/A	N/A	N/A	$1,715,445	$171,543
Total		**$2,936,831,652**	**$16,655,527,427**	**$4,343,146,940**	**$23,940,398,431**	**$175,690,281**

1.12 CDBG-DR Considerations

The primary focus of CDBG-MIT funding is to enable localities that are vulnerable to natural disasters to take a forward-looking, risk-based approach to implementing projects that are designed to reduce future losses from such disasters. Conversely, CDBG-DR is a responsive funding source intended to repair, restore, and rehabilitate communities after major disasters. For this reason, the required CDBG-MIT risks analysis will utilize similar data but focus more on long-term priorities to mitigate risks instead of immediate recovery projects, even while making sure that identified CDBG-MIT project plans align with identified FEMA THMP and CDBG-DR plans for the Territory in an effort to ensure that undertaken CDBG-MIT activities effectively compliment projects already contemplated in the Territory.

During program design for CDBG-MIT, it became apparent that lessons learned, and data gathered implementing CDBG-DR programs would be a major consideration for CDBG-MIT programming. In this instance, the unmet housing and public facilities and infrastructure needs for Hurricanes Irma and Maria are major priorities for CDBG-MIT funding.

1.12.1 Analysis of the Mitigation Housing and Public Facilities Needs

Within the MNA outlined above, potential threats and risks have been analyzed with regard to mitigation measures that may reduce potential risk to residents of the Territory. Investment priorities, project selections and proposed programs in this Action Plan align the MNA with selected activities outlined herein. While the CDBG-MIT framework is not ideal to serve every action item, there is

significant overlap between territorial priorities, the assessment of the data for community needs, and the CDBG eligible activities.

The programs outlined in this Action Plan were developed to meet CDBG-MIT, federal and Territorial requirements, and to fund activities that will protect against loss of life and property and reduce suffering and hardship attributable to natural disasters. Identified risks in the MNA have been considered along with planning, housing, economic, infrastructure and public facilities needs across the Territory to yield potential projects that will help to make the Territory more resilient in the event of future disasters or other threats to community lifelines.

Housing is a key component to be considered for residents of the Territory, as this is the primary means of shelter for residents when hurricanes and floods occur, with housing a key component for HUD in establishing the Community Development Block Grant program. In the Territory, limited housing options continue to be a source of concern for many residents, especially those considered LMI. The 2015 Housing Demand Study commissioned by VIHFA determined that there was already a 5,000-unit shortage of affordable housing in the Territory before the dual hurricane disasters in 2017, both for purchase and rent. As shown within that study, the Territory's housing market severely limits options for LMI individuals, as approximately 6% of the homes sold could be designated as affordable for them.

Table 40. Home Sales Data by Type – USVI – April 2015

	St. Croix	St. John	St. Thomas	USVI
Average Sale Price				
Overall	$572,168	$1,984,599	$797,993	$966,826
Single Family	$763,485	$2,190,574	$1,218,199	$1,306,163
Condominiums	$186,236	$560,687	$272,736	$259,766
Median Sale price				
Overall	$259,500	$1,362,500	$798,436	$398,700
Single Family	$394,500	$928,000	$545,000	$647,700
Condominiums	$149,700	$510,000	$236,250	$210,000
Average Days on Market				
Overall	222	219	203	246
Single Family	254	318	207	265
Condominium	159	375	197	202
# of Homes for Sale				
Overall	350	182	279	811
Single Family	234	159	155	548
Condominium	116	23	124	263

Source: Community Research Services, LLC, 2015

Limited homeownership options can be linked to home prices increasing dramatically starting in 2000, a trend that has continued to the present, which means for many residents it is becoming considerably more difficult to obtain housing. As housing assumes an important role in mitigating hurricane and flood risks, looking at housing availability for residents is an important consideration, especially for LMI households that have less income and have fewer housing options. The high cost of development across the Territory has been a primary issue in regard to providing affordable housing. Per unit costs are often as much as three times as compared to continental development. The numbers show that from a supply standpoint, an extremely limited number of homeowner choices are available for low- and moderate-income households on all three islands. While St Croix offers more options, far fewer

exist on St. Thomas, and even fewer still on St. John, where affordable homeownership options are essentially nonexistent (Community Research Services, LLC, 2015).

Rental housing options for low- and moderate-income households also have been affected, with limited options available. As noted in the 2015 study, rental rates seem to be continuing to appreciate at a rate well above wage/income growth, resulting in an increase in the level of rent-overburden for low-income renter households, a trend that the 2017 hurricanes only exacerbated as landlords worked to rebuild damaged properties. That same 2015 Housing Demand Study conducted by the Community Research Services, LLC in 2015 showed strong findings of the significant need in the Territory for a myriad of housing, to include the following:

- Affordable rental housing – for households with one income and families across the Territory.
- Affordable homeownership opportunities – to provide direct and indirect assistance for those families seeking homeownership.
- Supportive Housing – targeted for those that are homeless and/or exhibit various special needs characteristics.
- Senior rental housing – primarily targeted for persons aged 65 and older on St. Thomas and St. Croix, with potential options for multi-generational housing, mixed-use development, and mixed- -income housing.

The Housing Needs Study made the following recommendations in 2015 that still represents present reflect the present-day market needs, with development options ranked by priority:

St. Croix:

#1) Homeless/Special Needs

#2) Affordable Senior Rental

#3) Workforce/Affordable Rental

#4) Homeownership

St. Thomas:

#1) Homeless/Special Needs

#2) Workforce/Affordable Rental

#3) Affordable Senior Rental

#4) Homeownership

St. John:

#1) Workforce/Affordable Rental

The condition of the existing housing stock is also a major factor in terms of overall housing need creating an increasing preference for newer and more modern housing options and a greater need for demolition of substandard units. There is a significant percentage of the Territory rental units that are considered substandard, much greater than the national average. The total substandard percentages range from 16 percent to 18 percent. The impact of major storms has only exacerbated the housing need and tighten the rental market. According the 2019 USVI Comprehensive Housing Market

Analysis of the overall rental vacancy rate in the Territory was estimated to have fallen by more than one-half since the hurricanes, with rents estimated to have more than doubled for some unit types.

The USVI has historically had one of the highest cost-burden rental population with residents spending more than 30% of their income on rent far exceeded the rest of the nation, an issue that has been compounded by rapidly rising rents since the hurricanes. The lack of affordable multi-family developments has resulted in many low-income residents being forced to seek market rate units. As of August 2019, Studio units, which rented for $600 a month prior to the hurricanes, are currently estimated to rent for up to $1,000 a month, while rents for one-bedroom units, which previously rented for $1,100 a month, are currently as high as $2,500 a month. Two- and three-bedroom units, which rented for approximately $1,800 and $2,500, currently rent for as much as $3,000 and $6,000 a month, respectively.1.13 Assessing Priorities

In Section 5 of the THMP, the Territory outlines goals aimed at reducing risk. Each major island is assessed by description of the goal to be achieved, the priority of the goal according to risk presented, collaborative partners, and identification of funding sources, among other things. The selection of projects and proposed programs in this Action Plan aligns the MNA with selected projects. While the CDBG-MIT framework is not ideal to serve every action item, there is significant overlap between territory priorities, the assessment of the data for community needs, and the CDBG eligible activities.

Identified mitigation actions to be considered based upon the MNA include:

- Planning activities including studies and other products that can help local communities better understand their risks.
- Engagement with all territorial entities to identify available funding that could be used for mitigation and discuss opportunities to collaborate.
- Housing development to increase the resilience of housing for their residents after disasters
- Infrastructure and public facilities improvements that use mitigation measures
- Economic resilience activities

The VIHFA recognizes that Territorial priorities exist in the THMP which are focused on risks that are unique to the Territory. These specific priorities are most strongly associated with CDBG-MIT funded interventions and in many instances are complimentary. USVI will continue to look at planned CDBG-MIT projects, to identify connections to those arising from the THMP to ensure alignment of these assessments and initiatives.

2.0 Long-term Planning and Risk Mitigation Assessments

2.0 LONG-TERM PLANNING AND RISK MITIGATION ASSESSMENTS

The Territory commends the various planning organizations for their accomplishments and disaster management efforts prior to the creation of this CDBG-MIT Action Plan (MIT-AP). Organizations and efforts, such as those undertaken by the Virgin Islands Office of Disaster Recovery, the Virgin Islands Territorial Emergency Management Agency, and Department of Planning and Natural Resources represent a few examples of existing efforts that have inspired the content of the present Mitigation Action Plan. The considerable funds made available in the CDBG-MIT allocation provided to the US Virgin Islands provides ample opportunities that require careful consideration as to their best and highest use for long-term planning and risk mitigation considerations.

Given the many fundamental needs within the Territory, the goal for this MIT-AP has been to select clear, actionable mitigation activities that are supported by a data-driven analysis of the corresponding mitigation need. An allocation of funds is available to fund planning events, as well as to fund the CDBG-MIT Action Plan development itself and good community outreach to inform future projects and programs. However, the Territory will revisit planning needs as projects and programs develop to ensure that activities undertaken with CDBG-MIT funds engage local and Federal partners to produce a data-driven, comprehensive analysis of the mitigation approaches funded in this Action Plan. This following Action Plan section reviews the state of broad planning initiatives across the Territory, examining actionable elements that include building codes, land use, and flood risk protection.

Due to the relatively small size and limited resources of the Territory, funding for planning activities has not been widely available in the past. Historically, local and regional planning efforts have been limited. However, approximately $29 mm is being set aside in the MIT-AP for planning efforts to be undertaken by the parties and stakeholders best positioned to do so in the USVI. This represents an unprecedented opportunity for local and regional planning to be undertaken on a scale not previously possible. UVI, VITEMA ODR and other departments of government, academic institutions and non-profits will be enabled to undertake much needed planning efforts to increase resiliency in the Territory.

2.1 Building Code Standards

The US Virgin Islands has adopted and enacted the International Code Council construction standards as its own within the Territory. These include:

- International Building Code (IBC) - Pertains to the construction of commercial and multi dwelling buildings.
- International Residential Code (IRC) – Regulates the construction of single and two-family dwellings.
- International Mechanical Code (IMC) – Establishes standards for electrical, plumbing and air quality systems.
- International Energy Conservation Code (IECC) – Pertains to the standards for energy efficient structure construction

Buildings in the Territory are required to comply with the USVI Building Code, which automatically updates every three years when the International Code Council (ICC) releases its updates, to then be enforced six months later. These codes established by the International Code Council contain specific references to hazard mitigation. Consistently enforcing these construction codes would result in a significant reduction of property loss, especially from identified mitigation hazards like windstorm and earthquake, as well as fire and flooding.

The USVI Building code is also informed by the "Construction Information for a Stronger Home" guide available through the Department of Planning and Natural Resources (DPNR), which undergoes periodic updates, as needed. Newly constructed buildings and homes or those requiring renovations of over 50 percent of the structure must comply with code updates, and no requirements currently exist for retrofitting structures to meet updated building codes. The requirements are outlined in "Construction Information for a Stronger Home," a document promulgated by the Department of Planning and Natural Resources (DPNR). A complete copy of the most recent version of this guide will be attached to the final action plan as Appendix E.

The Division of Building Permits (DBP) within DPNR oversees both permit issuance and building code development for new and modified buildings. DBP does not perform regular or systematic compliance checks, relying instead on outside engineers to submit their recommendations for design approval and code issues prior to construction. Under the present system, current building codes do not explicitly address floodplain construction requirements, per se. A combination of local floodplain management regulations and building codes determine the requirements that govern construction, which are applied at the building permit stage, as outlined further herein.

2.1.1 Vertical Flood Elevation Protection

The VIHFA requires that new or substantially improved residential structures are elevated two feet or more above the BFE or high-water mark (if outside the floodplain), unless the home is already connected to an existing cistern, as is common with many older homes. For new construction using CDBG-MIT funds, VIHFA will remain consistent with this requirement and depending on the facts of the construction may require additional freeboard or other mitigation techniques to ensure that new construction is sufficiently protected.

2.2 Land Use and Zoning Policies

Land use and zoning practices, including adopting zoning regulation and amending zoning text or maps is a legislative policy choice entrusted to local elected officials. Plans provide a context to consider the long-term impact of individual land use decisions. Planning provides for public participation, coordination of programs and decisions, and the opportunity to set forth the basic policy choices that underlie a rational program of land use regulation.

While contemplated previously, no Territory-wide comprehensive land use and zoning plan is currently in place. A long-range Comprehensive Land and Water Use Plan (CLWUP) had previously been developed to provide guidance on how, when, and where the Virgin Islands were to be developed until the year 2005. That plan projected how the Virgin Islands would look by 2005 and addressed known issues, including infrastructure deficiencies, lack of affordable housing, and environmental degradation. The Legislature did not adopt the draft plan, and in February 2020 plans emerged for revisiting the CLWUP approach to develop a land-use plan tailored to fit each island district as part of the larger whole, to account for variations in geography and land use in St. Thomas, St. John, and St. Croix, which would factor in existing plans for Coastal Zone Management and Land Development Regulations.

2.2.1 Coastal Zone Management

The Federal Coastal Zone Management Act of 1972 included requirements for the States and Territories of the United States to develop a coastal zone management program. The US Virgin Islands

Coastal Zone Management Act of 1978 became effective in 1979. The resulting US Virgin Islands Coastal Zone Management Program was prepared by the US Virgin Islands Planning Office (which has since been reorganized as DPNR) and submitted by the Governor to the US Department of Commerce. The Virgin Islands Coastal Zone Management Program, as articulated in Title 12 VIRR, Chapter 21, §901-14, is based on a fundamental desire to preserve a significant environmental resource that benefits the economy and quality of life for the Territory's residents.

DPNR is the central territorial agency administering the Coastal Zone Management program in the US Virgin Islands. Other principal entities include the Office of the Governor, Legislature, the Department of Public Works, and the Board of Land Use Appeals. The Coastal Zone Management Act created a Coastal Zone Management Commission within DPNR. A Division of Coastal Zone Management was also created within DPNR to assist the Commission and the Commissioner in administration and enforcement.

2.2.2 Land Development Regulations

Land development regulations play an essential role in an integrated coordinated mitigation program. By controlling where and how development occurs, major problems can be lessened or avoided. Also, as properties are redeveloped or rebuilt, strong regulations can ensure that the replacement or repaired structures are better able to resist damage from future events.

In the US Virgin Islands, the key elements to land development regulation include the following:

- Zoning;
- Subdivision Regulations;
- Building Codes; and
- Building Permits

US Virgin Islands zoning law is based on VIC Title 29, Chapter 3, Subchapter 1. The code divides all the islands into various land and water-based districts. Applying these key elements functionally prohibits or regulates the development and redevelopment in hazard prone areas. In this way zoning can be an effective means to eliminate or reduce the risk of loss of life and property damage, especially for hazards that have defined geographic extents such as flooding, as identified within the MIT-AP Hazard Mitigation section. Comparing hazard profiling and risk assessment with the existing Zoning District Map helps to identify areas where potential development may be in harm's way. A careful study into updating or revising the current map to provide a better match between the suitability of the land for development and the type and intensity of use proposed would be an excellent use of mitigation planning funds.

Considering a revised Zoning District Map for the Territory that includes substantial reductions in development capacities in hazard prone areas would have immediate results in limiting future losses. Zoning can also be used to reduce density in existing developed areas. By down-zoning (i.e., reducing allowable development densities and intensities), non-conforming uses will be established. Under the current system, these uses will persist until such time as the property owners request permits for substantial changes to the property or until the property is substantially improved or damaged (i.e., at a level greater than 50 percent of its value). In these cases, provisions can then take effect to reduce hazard vulnerability and / or the property would not be redeveloped.

The US Virgin Island Code sets out Zoning and Subdivision Law, describing permitted uses and restrictions assigned to classified Agricultural, Residential, Business, Commercial, Industry,

Waterfront, Public, and Special properties within the Virgin Islands Development Code. These zoning laws define acceptable lot uses, sizes, maximum density, height, parking requirements, and setbacks, for example. DPNR is charged with revising the US Virgin Islands zoning regulations and enforcing their use.

DPNR and the Division of Environmental Protection have implemented a regulation requiring all applicants submitting documents and plans for construction or earth change permits, for developments one acre or greater, to submit a storm water prevention plan. Any storm water prevention plan must consider pre-existing hydrology as well as postulate on post construction run-off. The storm water prevention plan must also clearly indicate how mitigation measures will be introduced in the site design. This action has potential to be an effective strategy to ensure that surface run-off does not exceed pre-existing conditions and may assure that future development does not exacerbate flooding in downstream areas.

2.3 Flood Mitigation Efforts

As the CDBG-MIT allocation is directly tied to the impacts of flooding from the 2017 hurricanes, flood mitigation must be a key part of the MIT-AP. The Territory remains committed to ensuring responsible floodplain and wetland management based on the history of flood mitigation efforts and the frequency and intensity of precipitation events.

Coordinating infrastructure and other projects can facilitate design decisions to mitigate potential drainage and water management issues. All programs will incorporate, where applicable, appropriate mitigation measures and floodplain management.

The Territory previously adopted NFIP-compliant floodplain management provisions under Rules and Regulations on Flood Damage Prevention, Title 3. Executive Chapter 22, Department of Planning and Natural Resources, Subchapter 401(b)(15), VIRR in 1993. The Rules and Regulations apply only to the areas defined in the most recent FIRMs as the Special Flood Hazard Areas (SFHA). In these areas, a permit is required for any type of development procedure or change to the floodplain including excavation, dredging, filling, drilling, modification to existing structures and construction of new structures. The Rules and Regulations reference the appropriate provisions of Section 44 of the Code of Federal Regulations (44 CFR) as General Standards, but also add several general and specific standards. The Commissioner of DPNR is appointed to administer and implement the provisions of these regulations and may request the assistance of other departments and agencies to provide technical assistance.

FEMA's HMGP funding anticipates obligating important mapping and hydrologic studies, which will provide up-to-date data and land use recommendations that are critical for roads and power-related projects and can be used as part of efforts to develop a comprehensive land use and zoning plan that is current and based on present observations within the Territory.

2.3.1 Elevation

While the Territory will implement resilient home construction standards, the Territory does not anticipate elevating homes given the cost and structural limitations of cisterns, which are structurally connected to the slab. However, new housing construction within the floodplain will be built in accordance with the existing local building codes. The existing code is consistent with HUD guidance to ensure all structures, as defined at 44 CFR 59.1, designed principally for residential use and located

in the 1 percent annual (or 100-year) floodplain that receive federal assistance for new construction, repair of substantial damage, or substantial improvement, as defined at 24 CFR 55.2(b)(10), must be elevated with the lowest floor, including the basement, at least two to three feet above the 1 percent annual base floodplain elevation as determined by best available data.

Residential structures with no dwelling units and no residents below two feet above the 1 percent annual floodplain, must be elevated or flood-proofed, in accordance with FEMA flood proofing standards at 44 CFR 60.3(c)(3)(ii) or up to at least two feet above the 1 percent annual floodplain. Thus, the Territory has put mechanisms in place to ensure all structures requiring elevation go through an in-depth structural analysis to determine how and whether the rehabilitation or reconstruction is the most cost-effective approach to helping the homeowner. Home elevation is not common in the Territory, as it is not often required due to the mountainous and hilly terrain. Further, a home's cistern is often connected to its foundation and provides some elevation to the home. However, elevation will be done where required by the Territory's building code, which in accordance with 44 CFR 59.1, requires the first floor of structures located in the 1 percent annual (or 100-year) floodplain that receive federal assistance to be at least two to three feet above the 1 percent annual base floodplain elevation as determined by best available data.

Property owners assisted through the recovery program will be required to acquire and maintain flood insurance if their properties are in a FEMA-designated floodplain. This requirement is mandated to protect the safety of residents and their property and the investment of federal dollars. The elevation height of a house can significantly reduce the cost of flood insurance. The Territory will implement procedures and mechanisms to ensure that assisted property owners comply with all flood insurance requirements, including the purchase and notification requirements as a condition of receiving assistance.

2.3.2 Stormwater Management

The Virgin Islands Department of Public Works (DPW) has been actively surveying and assessing the Territory's stormwater management post-hurricanes. For example, they conducted a survey of 160 culverts on St. Croix, as well as some on St. Thomas and St. John. The storm water management system includes ghuts, culverts, concrete swales, low water crossings and curbs. Some ghuts are naturally formed green infrastructure (dry stream beds) and others are concrete lined channels added to facilitate water runoff, often along the side of streets.

In conjunction with these efforts, the Territory continues to work on addressing water/flooding damages to local roadways in FEMA Public Assistance Project Worksheets (PWs) via hazard mitigation. Mitigation measures may include paving a gravel street, building new concrete swales, re-building sections of road as rigid pavement (concrete) instead of the original asphalt design that is easily damaged by water. Conversations moving forward need to include resizing culverts and replacing older ones and adding best use and maintenance of green infrastructure. Some older culverts simply need to be replaced as they have degraded over time to not work well, and large sections of the system need to have previously installed 8" pipes upgraded to larger ones to improve how the system currently functions.

2.3.3 Unified Watershed Assessment and Restoration Priorities

The Department of Planning & Natural Resources (DPNR) for the Territory has developed the Unified Watershed Assessment Report pursuant to the Territory's Clean Water Action Plan, in cooperation with the US Department of Agriculture and its Natural Resources Conservation Service. Undertaking a cooperative process for restoring and protecting water quality on a watershed basis is a key priority

for the Territory. DPNR has identified problem watersheds that have not met or are in danger of not meeting clean water or other natural resource goals. The DPNR assessments utilize existing information and represent a collaborative effort between local government, federal land management agencies, conservation districts and land conservation departments, non-governmental and private organizations, and other stakeholders as well.

The watershed approach and the collaborative model for public and private partnerships would be conducive to much of the work that needs to be done to implement a comprehensive hazard mitigation strategy. However, the implementation of these programs has been stymied by lack of adequate staffing and resources. Enforcement of erosion and sediment control should become priorities for DPNR, particularly as it relates to reducing surface run-off and flood hazard reduction along with water quality protection.

2.3.4 High Wind

In addition to this vertical height requirement, the VIHFA will take into consideration high wind considerations for new or rehabilitated buildings. There are many informational resources available to safeguard against high wind conditions, including *FEMA 543: Risk Management Series Design Guide for Improving Critical Facility Safety from Flooding and High Winds*. FEMA 543 recommends incorporating hazard mitigation measures into all stages and at all levels of critical facility planning and design, for both new construction and the reconstruction and rehabilitation of existing facilities (Federal Emergency Management Agency, 2007). While the guidelines in FEMA 543 are applicable to critical facilities, they may also be applied to new construction of other buildings and infrastructure. In all instances, the VIHFA will defer to engineering and design experts to ensure that high wind hazards are addressed.

2.3.5 Sea Level Rise

In addressing flood mitigation, it is essential to the long-term planning process to also consider the effects of sea level rise on the coastal communities of the State. According to National Oceanic and Atmospheric Administration (NOAA) data, the sea level off the coast of USVI has risen 11 inches higher than its 1950 level (National Oceanic and Atmospheric Administration).

While the Territory's topography somewhat lessens the future impact, rising sea levels potentially place both private and public waterfront properties at risk of coastal erosion in the future, as well as greater risk of flooding, compounding complications with storm surges when hurricanes threaten the Territory. As a result, FEMA's 100-year floodplain will expand further, putting more homes at risk of flooding during storms and requiring more homeowners to purchase flood insurance (National Oceanic and Atmospheric Administration).

2.4 Local and Regional Planning Coordination

The CDBG-MIT Action Plan (MIT-AP) has been prepared by the Government of the U.S. Virgin Islands in consultation with local territorial government agencies and authorities (and/or their consultants), including the Virgin Islands Housing Authority (VIHA), and community stakeholders. As it is a territory, the U.S. Virgin Islands lacks the state government layer seen elsewhere in the United States. This means that government is conducted without restrictions that arise from state laws and regulations, as well as those that are connected with municipal and county regulations and laws too. As a result,

the USVI Territorial Government uses various autonomous and semi-autonomous agencies/authorities in conducting governmental operations in the Territory.

The U.S. Virgin Islands plans to spend no more than 15% of its total allocation on eligible Planning activities. This includes all Action Plan development activities, which are considered Planning activities. The U.S. Virgin Islands also intends to fund planning-only grants for studies, technical reports, or the like. This may include costs incurred for data gathering, studies, analysis, and preparation of plans. For the purposes of this grant award, the cost of engineering or architectural plans in support of construction activities will be treated as direct project delivery costs. Only VIHFA and its subrecipients can incur planning costs.

Following the multiple methods CDBG-MIT funding for the Territory will be disbursed, the VIHFA will continue to coordinate with existing planning efforts, including the Governor's Hurricane Recovery and Resilience Taskforce and the planned update of the Hazard Mitigation Plan. FEMA's Hazard Mitigation Grant Program (HMGP) is funding a comprehensive update to the Territorial Hazard Mitigation Plan with 100 percent HMGP funding for an amount around $3 million, with the University of the Virgin Islands (UVI) taking the lead for the technical work on this key endeavor. The current plan was completed in 2014 and expires in 2019. The VIHFA is working closely with VITEMA to stay up to date on related efforts being funded through HMGP, which are also coordinated through the Territory of the Virgin Islands Administrative Plan for the Hazard Mitigation Grant Program.

As part of its coordination efforts, the VIHFA has partnered with VIHA, in consultation with the Government of the Virgin Islands and others, to convene an Urban Land Institute Advisory Panel to provide input on potential redevelopment areas. The panel focuses on ways to support the transformation of St. Croix through the long-term recovery process including economic growth through equitable and entrepreneurially means. The VIEDA Vision 2040 Plan, partially funded with CDBG-DR, functions as a long-term strategic economic recovery and development plan with economic growth, job creation and wealth generation as measurable deliverables, with a focus on improved quality of life for the Territory's residents.

Furthermore, the VIHFA will further develop a protocol for coordination amongst implementing entities and other stakeholders key to fulfilling programmatic goals defined with the Action Plan for the Territory. Working with the Government of the U.S. Virgin Islands and implementing entities to determine what additional planning needs exist and how to best coordinate them for the Territory will result in continuing updates to the unmet needs analysis and program identification interventions to support both short and long-term recovery efforts.

2.5 Flood Insurance Coverage

With respect to flood insurance, CDBG-MIT funded homeowners of a property located in a Special Flood Hazard Area (SFHA) must obtain and maintain flood insurance in the amount and for the duration prescribed in FEMA's National Flood Insurance Program. Section 102(a) of the Flood Disaster Protection Act of 1973 (42 U.S.C. 4012a) mandates the purchase of flood insurance protection for CDBG-MIT (a HUD-assisted property) within a SFHA, when CDBG-MIT is used to finance acquisition or construction, including rehabilitation. The VIHFA will encourage the purchase of flood insurance outside of SFHA's but carrying flood insurance outside of SFHA's is not a requirement.

Section 582 of the National Flood Insurance Reform Act of 1994, as amended, (42 U.S.C. 5154a) prohibits flood disaster assistance in certain circumstances. In general, it provides that no Federal disaster relief assistance made available in a flood disaster area may be used to make a payment

(including any loan assistance payment) to a person for "repair, replacement, or restoration" for damage to any personal, residential, or commercial property if that person at any time has received Federal flood disaster assistance that was conditioned on the person first having obtained flood insurance under applicable Federal law and the person has subsequently failed to obtain and maintain flood insurance as required under applicable Federal law on such property. This means that CDBG-MIT assistance may not be provided for the repair, replacement, or restoration of a property to a person who has failed to meet this requirement.

Section 582 also imposes a responsibility on the VIHFA and its subrecipients to inform property owners receiving assistance that triggers the flood insurance purchase requirement that they have a statutory responsibility to notify any transferee of the requirement to obtain and maintain flood insurance in writing and to maintain such written notification in the documents evidencing the transfer of the property, and that the transferring owner may be liable if he or she fails to do so.

Private rentals, tax credit rentals, and communities are insured with casualty and property policies to protect buildings in the event of a disaster. Insurance for privately owned real estate is only required if properties are mortgaged or their owners have construction loans. In the former case, forced-placed insurance is applied when homeowners do not insure a mortgaged property, and all financed properties must also be assessed for flood insurance requirements (see below). In the latter case, homeowners must purchase builders' risk insurance during construction. Unfortunately, owners who are not required to purchase insurance often do not do so: homeowners insurance premiums in the Territory are high, forcing many USVI homeowners with no mortgage USVI Hurricane Recovery and Resilience Task Force 139 "Housing and Buildings" to underinsure or forgo homeowners insurance entirely.

To ensure homeowners are educated on the risks of remaining uninsured or underinsured, the USVI government issued an emergency order in February 2018 to insurance companies, mandating explanation of the consequences of underinsurance to their policyholders.

2.5.1 National Flood Insurance Program, Floodplain Management, and Building Codes

In the future, as hurricanes become more intense— though not necessarily more frequent—homes and housing properties may face greater damage. For public housing, the aging 40+ year-old buildings in the territorial public housing communities will continue to deteriorate and sustain more damage if the buildings are not improved and mitigated. For private owners, worse storm damage, combined with an increase in storms and flooding, will also lead to stricter requirements and higher property and homeowner's insurance rates, potentially increasing the number of homeowners unable either to get or pay for insurance coverage.

Improved floodplain management, including land use planning, zoning, and enforcement in the Territory can reduce flood related damage for both existing buildings and new development. Taking full advantage of the National Flood Insurance Program (NFIP) is critical to the reduction of future, repetitive flood damage costs to taxpayers.

All developments, regardless of the location, require a permit to include buildings, fill, and any other type of development. The Territory has the authority to implement and enforce adopted ordinances related to floodplain management, building code and zoning compliance. The NFIP requires that when the cost of reconstruction, rehabilitation, addition, or other improvements to a building equal or

exceeds 50% of the fair market value, then the building must meet the same construction requirements as a new building. Substantially damaged buildings must be brought up to new construction standards. A residence or building damaged so that the cost of repairs equals or exceeds 50% of the structure's fair market value must also be elevated above the Base Flood Elevation (BFE) in flood zones where BFEs are established. This provision applies to the entire jurisdiction of the Territory.

FEMA's National Flood Insurance Program (NFIP) offers flood insurance to businesses, homeowners, and renters, but the coverage is optional. Homeowners can purchase up to $250,000 in coverage, while businesses can purchase up to $500,000; renters can purchase separate contents protection for coverage. Typically, policies can be purchased through homeowner's insurance agents, as rates do not differ from one company or agent to the next. The amount a policy holder pays is based on various factors, including the year the building was constructed, building occupancy, number of floors, location of its contents, flood risk (flood zone), location of the lowest floor relative to the Base Flood Elevation on the flood map, the deductible amount, and amount of building and contents coverage. Buildings with federally backed mortgages (e.g., through Fannie Mae) are required to get insurance through NFIP if they are in FEMA-determined flood zones.

3.0 Connection of Mitigation Programs to Identified Risks

3.0 CONNECTION OF MITIGATION PROGRAMS TO IDENTIFIED RISKS

The Territory remains committed to advancing mitigation programs and projects that advance long term resilience to current and future hazards. HUD published 84 FR 45838 on August 30, 2019 (CDBG-MIT Main Notice) that outlined the primary rules for grantees administering CDBG-MIT funded projects and programs. The CDBG-MIT Main Notice established the following definition for mitigation:

For the purposes of this notice, mitigation activities are defined as those activities that increase resilience to disasters and reduce or eliminate the long-term risk of loss of life, injury, damage to and loss of property, and suffering and hardship, by lessening the impact of future disasters.

Each mitigation program or project funded through this Action Plan must meet this definition of mitigation to be eligible for funding through the CDBG-MIT program.

Additionally, each proposed mitigation program or project must comply with the following three-pronged test established in the CDBG-MIT Main Notice:

1. It must advance long-term resilience.
2. Align with other planned capital improvements; and
3. Promote community-level and regional planning for current and future disaster recovery efforts and additional mitigation investment.

The VIHFA will incorporate this three-pronged test as a requirement to be met for any projects proposed in procurements issued for CDBG-MIT funding or projects proposed by subrecipients. Additionally, this Action Plan provides approximately $29,000,000 for community and regional level planning which the VIHFA is making available to promote the kind of community and regional planning required above. In the past, the Territorial government has not had the financial resources necessary to engage in many of such planning activities. This relatively massive investment in planning will make such planning efforts possible.

The Mitigation Needs Assessment (MNA) cited the Hazard Ranking from the 2019 Territorial Hazard Mitigation Plan (THMP) (see Table 4 above). Hurricanes and Riverine Flooding were identified as the two top ranked hazards. While earthquakes and tsunamis were ranked third and fourth respectively, the return periods for such hazards are much longer than those for hurricanes and riverine flooding (see Table 27 above).

The projected return periods for Hurricanes are 50 years and riverine flooding is 100 years. In contrast, the return periods for earthquakes are 1,000 years and tsunamis are 500 years. The Combined Loss Calculations in Table 27 take into consideration the relationship between relative frequency and potential losses of likely hazards. This analysis yields a loss/year calculation of $130,112,652.00 for hurricanes, $21,761,129.00 for riverine flooding, $12,041,744.00 for earthquakes and $5,321,476.00 for tsunamis.

To demonstrate the connection between mitigation and identified risks, all proposed projects or programs must fall squarely within the above mitigation definition and meet the three-pronged test outlined above. Furthermore, each program or project selected must be coordinated with and guided by the identification and prioritization of hazards described in the MNA. Examining the combined loss

calculation analysis shows that Hurricane, Riverine Flooding, Earthquake, and Tsunami pose the most significant risks financially overall when factoring in losses to critical facilities, commercial interests, and residential losses.

3.1 Infrastructure & Public Facilities

The U.S. Virgin Islands' reliance on the proper functioning of its infrastructure systems—including energy, transportation, and telecommunications infrastructure—was evident when these systems failed in the aftermath of Hurricanes Irma and Maria. High winds, torrential rainfall, and flooding from both disasters had compounding effects on the infrastructure sectors on each of the U.S. Virgin Islands, leading to widespread and prolonged failures which has delayed economic recovery. High winds toppled above-ground utility lines; storm water runoff flooded roads and induced mudslides; and flooding, wind, and heavy rain severely damaged water and wastewater treatment plants, hospitals, and other buildings that provide critical services. Electrical substations were crippled, causing power failures to 95% of electrical customers. Water pump failures and sewage overflows from storm water surges led to potable water safety precautions such as "boil water" advisories and EPA drinking water assessments. Lacking both a steady power supply and functioning transportation and water infrastructure, many businesses were forced to shut down, some for extended periods. Closure of the ports and airports for more than two weeks, had significant effects on the Territory's connectivity, limiting the pace of voluntary evacuation efforts, delaying the delivery of essential supplies for emergency relief, and causing further disruption to the economy.

The U.S. Virgin Islands has identified multiple infrastructure priorities that must be addressed, and which directly support housing needs. Residents not only suffered from direct damage to their homes from the hurricanes, but also endured the loss of critical services such as power and water due to damaged public infrastructure. Without water or power, residents were forced to evacuate their homes and seek shelter and emergency assistance. If the Territory's infrastructure is made more resilient, critical services could be stabilized and maintained for residents in the event of a future disaster, creating a safer and more secure environment. Like housing programs, all infrastructure programs will meet a HUD national objective. The most applicable national objective for infrastructure will likely be LMI benefit. A subcategory of LMI benefit is the low- and moderate-income area benefit (LMA). LMA allows activities that benefit all persons in a particular service area to count towards the LMI objective when at least 51% of residents in the service area are classified as LMI. For each activity, the Territory will determine the appropriate service area based on factors including: the nature of the activity; the location of the activity; accessibility issues; the availability of comparable activities; and boundaries for facilities and public services. The Territory will ensure that projects will be appropriately prioritized to provide services to LMI persons and support unmet housing needs.

Program activities will be reviewed to determine URA/104(d) compliance and required actions. The policies and procedures will be further developed in modifications to the existing Residential Anti-displacement and Relocation Assistance Plan (RARAP) and a soon to be developed Optional Relocation Policy. Primary needs for the proper preparedness for, and recovery from, future natural disasters include: (i) comprehensive planning to identify resilience opportunities; (ii) adoption and enforcement of codes to bring critical infrastructure up to industry standards; (iii) holistic mitigation designs to meet future challenges and hazards; and (iv) implementation of innovative technology and other best practices to create a more reliable, sustainable, and cost-effective electric grid.

Infrastructure improvements to the public water system will increase resilience by providing a more plentiful, safe, and stable water system. The current system relies heavily on individual residents

capturing rainwater in cisterns. Approximately 25% of the residents are connected to the public water system and therefore rely on cistern capture for the water needed to sustain life. Frequent “dry spells” and droughts often result in residents having to refill their cisterns with costly water obtained from private tanker trucks which serve as backup when rainwater is not available. Therefore, extending the public water system to more homes will help more USVI families to decrease the risks to health and safety posed by rainfall water shortages.

Infrastructure improvements to the pedestrian and vehicular mobility systems will enable residents to evacuate more effectively as necessary to remove themselves from harm’s way when natural disasters strike. Currently, the street systems for vehicular traffic are generally very narrow with little or no shoulder for emergency stops to enhance driver safety in the event of an accident or mechanical problem. Additionally, the street system experiences significant congestion and traffic delays in the more concentrated areas. The pedestrian mobility system is almost non-existent, except for a few commercial areas predominantly frequented by tourists. The lack of sidewalks, crosswalks, medians and hike and bike trails makes it extremely difficult and dangerous for pedestrians to move safely between residential and commercial centers even when no natural disasters are present. During disasters this danger is exacerbated when floods, storm debris (e.g., vegetative, building, etc.), and other hazards impede vehicular mobility and render pedestrian mobility even less practical and even more dangerous. For low-income residents who do not own cars and for the chronically homeless, the lack of safe alternatives to vehicular mobility is a significant barrier to resilience. Furthermore, the inadequate street system heightens danger to residents in times of crisis.

Improvements to the USVI storm drainage system will significantly decrease danger to residents during hurricanes, and other high rain events that result in riverine and other flooding.

USVI recovery efforts have been supported through the provision of multiple funding sources. Primarily of interest to long-term mitigation are funds received for FEMA Public Assistance (PA), FEMA Individual Assistance (IA), FEMA Hazard Mitigation Grant Program (HMGP), Small Business Administration (SBA) Disaster Loans, Department of Transportation (DOT) funds, and U.S. Army Corps of Engineers (USACE) funds. Currently, a list of ongoing USACE projects does not indicate that there is significant priority overlap with CDBG-MIT activities (United States Army Corps of Engineers). If new USACE projects are introduced, the VIHFA will establish whether they would be a vehicle to leverage CDBG-MIT funds. Given the limited CDBG-MIT funds available, it is difficult to meaningfully interface with the major infrastructure projects that the USACE typically undertakes.

3.2 Housing

Within the Housing programs, the VIHFA will utilize a slate of solutions to address the need for resilient and viable permanent housing solutions. Solutions include mitigation rehabilitation or reconstruction of owner-occupied and rental units; options for first time homebuyers; voluntary acquisition or buyouts of high-risk properties; increased affordability of rental stock; and restoring and making more resilient the inventory of units for particularly vulnerable populations, especially those living in public and supportive housing. Priority will be given to the most vulnerable Virgin Islanders.

3.2.1 New Construction for Homeownership Opportunity and First Time Home Buyer Assistance

To build resiliency, reduce the pressure on the housing stock, and improve the quality of life for residents of the U.S. Virgin Islands funds will be used to provide LMI households the opportunity to purchase a home through direct financial incentives, effectively creating first time home buyers. The

program will provide an affordable alternative to renting by creating new homeowner stock; thus, it will alleviate some of the pressure on the rental market post-storms. Hurricanes Irma and Maria caused significant damage to both owner-occupied and rental stock, depleting the already-limited housing stock, and drove up prices beyond affordable levels. Almost half of all renters in the Territory were cost-burdened paying more than 30% of their income on rent prior to the storms. Due to the limited affordable rental stock, renters are most often paying more than the costs of a mortgage for homes of a similar size.

3.2.2 Public and Affordable Housing Development

The VIHFA will use funding to redevelop and create new affordable rental housing stock including subsidized and mixed income rental units. Eligible development activities include development of low-income and mixed-income units, infill construction of new units, and substantial rehabilitation of vacant commercial or uninhabitable dwellings to bring more mixed-use rental stock online. Funding will be used to incentivize the development of new low-income and mixed-income small and multi-family stock, including project-based subsidized housing. While low-income stock remains an urgent priority, mixed-income stock is also needed on the islands given the unmet need for rental units across the full spectrum of citizens, from low-income individuals typically supported by Low-Income Housing Tax Credit housing, low-income households with incomes that make them ineligible for LIHTC tax credit units (e.g. households with incomes between 60% of AMI and market rate) and tenants that can afford market rate units. This program intends to enable the development of rental housing which prevents concentrations of poverty. The VIHFA uses the HUD-defined fair market rents as a basis to determine affordable rent caps.

For mitigation projects, the VIHFA will foster the creation of Public Private Partnerships (PPP) to leverage available CDBG-MIT funds and focus additional resources on the identified risks. For example, in developing more resilient affordable housing, the VIHFA and the Virgin Islands Housing Authority (VIHA) plan to work cooperatively to form PPPs with Low Income Housing Tax Credit equity investors, commercial lending institutions and private sector nonprofit and for-profit developers. These PPPs will allow the VIHA to comprehensively rehabilitate or reconstruct its portfolio of approximately 3,000 aging and functionally obsolete public housing units.

Many of these units are more than 50 years old and sustained significant damage from Hurricane's Irma and Maria. VIHA's goal is to transform these homes by hardening or replacing them with state-of-the-art hurricane, flood and drought resiliency design features and components. Repairing and hardening existing structures would conserve natural resources and reduce construction and demolition waste by maintaining the available housing stock.

In addition to the pressing need to render VIHA's housing stock safer and more resilient, as explained within the 2015 Housing Demand study prepared for the VIHFA, the Virgin Islands Housing Authority (VIHA) has confirmed that a 5,000-unit shortage of affordable housing in the Territory existed even before the 2017 hurricanes devastated VIHA's existing housing (see VIHA 10-year Action Plan, page 1).

The acute shortage of affordable housing in the Territory has put enormous economic pressure on LMI residents resulting in many Virgin Islanders being housed in substandard or overcrowded conditions or becoming homeless. Therefore, improving and increasing resilient affordable housing will directly address the needs of those most vulnerable to Hurricanes and flooding by providing

affordable housing that can safely sustain such disasters and by providing safe shelter to those who are chronically homeless.

3.2.3 Homeless and Supportive Housing

The Territory will continue to prioritize the creation of a Supportive Housing for Vulnerable Populations program which covers eligible costs to rehabilitate or replace damaged residential units for the Territory's most vulnerable populations. CDBG-MIT funds will be allocated for the creation of new temporary and supportive housing, and for the expansion or development of supportive U.S. Virgin Islands' This housing will be available to assist those USVI residents who were homeless before the storms, those who became homeless as a result of the storms and those applicants who are in danger of becoming homeless as a result of job loss in connection with the storm, the requirement to make higher than normal rental housing payments. It will also be developed to assist victims of domestic violence, drug abuse or developmental disabilities and mental illness. The VIHFA will continue to use its emergency housing plan as a guide to prioritize potential projects for populations, including domestic violence, natural disaster victims, catastrophic incident victims, and financial hardship victims.

Pictured: Groundbreaking ceremony for the VIHFA's Wild Pineapple housing development.

4.0 Low- and Moderate-Income Priority

4.0 LOW- AND MODERATE-INCOME PRIORITY

The VIHFA is committed to serving the LMI population of the impacted areas of the Territory. By waiver in the Notice, the requirement to expend 70 percent of CDBG funds on activities that benefit low- and moderate-income persons is replaced by a requirement to expend 50 percent of funds on LMI activities. This waiver does not change the need to prioritize the protection of LMI individuals. The VIHFA has a goal of reaching the traditional 70 percent level of LMI benefit.

Therefore, the affordable housing components of the CDBG-MIT allocation will be at least 70 percent allocated to the benefit of LMI individuals and households. To the extent that it is feasible, buyout and acquisition activities will also prioritize LMI individuals and households – although following HUD guidance on executing buyouts strategically, exceptions may be made as a means of acquiring contiguous parcels. To the maximum extent practicable, the VIHFA will attempt to avoid circumstances in which parcels that could not be acquired through a buyout remain alongside parcels that have been acquired through the grantee's buyout program. This may require executing buyouts that do not serve an LMI individual or household.

4.1 Vulnerable Populations

Of significant concern is housing which typically serves vulnerable populations, including transitional housing, permanent supportive housing, permanent housing serving individuals and families (including subpopulations) that are homeless and at-risk of homelessness, and public housing developments. The VIHFA intends to repair or rehabilitate existing housing and will also create new housing opportunities outside of the floodplain. An analysis of the housing need in these areas will be conducted prior to project approval to ensure that these vulnerable populations are not ignored.

The VIHFA is considering individuals with access and functional needs that will require assistance with accessing and/or receiving CDBG-MIT disaster resources. These individuals may be children, senior citizens, persons with disabilities, from diverse cultures, transportation disadvantaged, homeless, having chronic medical disorders, and/or with limited English speaking, reading, having comprehension capacity, or altogether be non-English speaking.

The VIHFA is considering the provision of specialized resources that may include, but are not limited to, public or private social services, transportation accommodations, information, interpreters, translators, I-speak cards, and other services for those persons who may be visually or speech impaired during the Action Plan process free of charge. The VIHFA is taking care to ensure that individuals can access disaster recovery resources.

As previously stated in its Hurricanes Irma and Maria CDBG-DR Action Plan, the approach to recovering both homes and neighborhoods after Hurricanes Irma and Maria was to strategically examine where the damage occurred, and then focus its recovery efforts in those areas, paying special attention to the housing types, household types, and special needs of these unique communities. The strategy for mitigation and resiliency is similar in that the VIHFA will approach disaster resilience and climate change adaptation through a cross-sector lens that anticipates how a changing climate, extreme events, ecological degradation, and their cascading effects will impact the needs of the Territory's vulnerable populations.

4.2 Specific Impact on Vulnerable Populations and Protected Classes

4.2.1 Seniors

According to the 2010 Census, 10% of households in the Virgin Islands are single households comprised of an individual 65 or older. FEMA IA data bolsters this estimate of the elderly population in Territory: as of March 30, 2018, 12% of registered households were individuals 65 or older living alone, and 30% of registered households had at least one individual 65 or older in their household. Based on past experiences from other disasters, the U.S. Virgin Islands recognizes that certain senior households may face special challenges after natural disasters. For example, senior owner-occupied households in the Territory are likely to have larger unmet needs following a disaster as a large proportion has fully paid off their mortgages and thus are not frequent purchasers of home insurance. Hurricanes Irma and Maria have highlighted the need to increase the resilience of seniors' homes and utilities so that vulnerable senior residents can remain housed safely during future severe weather events. Furthermore, there is a need to ensure a safe potable water supply and prevent the loss of power to maintain medicines at correct temperatures. The senior population is expected to grow significantly, intensifying the need for special considerations and accommodations for the aging population.

4.2.2 Special Needs

According to the 2010 U.S. Census, approximately 15% of the population of the U.S. Virgin Islands have disabilities. Hurricanes Irma and Maria had a particularly negative affect on these individuals, who are more likely to have a difficult time navigating assistance program and finding accommodating housing. Moreover, the storms also inflicted damages on support facilities and impacted service delivery for the special needs' population. For example, VIHFA's Emergency Housing Program provides close to 40 units of temporary housing for victims of domestic violence, natural disaster, catastrophic incidents, and financial hardships across four complexes – three in St. Croix and one in St. Thomas. All four complexes sustained damages because of the hurricanes. According to the service providers managing the complexes, residents had to be relocated to other housing. Other residents chose to leave the Territory for the mainland. Estimates of the total amount of damage incurred to the Program's facilities are still being developed. Another example is Lutheran Social Services (LSS), which is the largest provider of housing for adults and children with developmental disabilities and vulnerable seniors with 166 individuals housed in 8 properties. LSS experienced at least some amount of storm-damage to all 8 properties, requiring them to temporarily move some of their vulnerable residents to less damaged units in partially repaired facilities or to place them with local families.

4.2.3 Homelessness

According to a January 2019 study conducted by the Virgin Islands Continuum of Care consortium (CoC), the organization of service providers, advocacy groups and other stakeholder agencies charged with preventing and ending homelessness, there are 314 individuals across the Territory who were homeless. Of that total, 0 were family households, 13 were Veterans, 6 were unaccompanied young adults (aged 18-240), and 105 were individuals experiencing chronic homelessness. The hurricanes had a devastating impact on this population, many of whom were unable to find shelter during the storms. The storms caused severe damage to homeless facilities and providers serving vulnerable populations. According to the Homeless Management Information System (HMIS)

maintained by the CoC, there were 14 homeless facilities operating in the Territory as of January 2017, providing a total of 136 beds. As of March 2018, only 11 of these facilities were in operation and offered only 99 beds. The lack of insurance or sufficient insurance has left several providers without the resources to repair facilities. Furthermore, several shelters are in floodplains, thereby inhibiting their ability to consistently provide assistance.

Facilities need immediate and longer-term assistance to return to the level of repair they were before the storm. Few have been able to repair the structures with their own funds and all need improvements to make them more resilient for future disasters.

Based on emerging contractor estimates of repair costs for existing facilities, the unmet need for the Territory's homeless population is approximately $2 million, including efforts aimed at bringing existing facilities back to pre-storm condition and increasing the resilience of those facilities.

The CDBG-MIT housing programs will coordinate with the CDBG-DR housing programs to prioritize the most vulnerable Virgin Islanders, especially those who remain placed or living in severely damaged homes more than a year after the 2017 hurricanes. The Territory will further prioritize reconstruction for owner-occupied low- and moderate- income households whose homes were either destroyed or with major or severe damage with no other resources to complete rehabilitation or reconstruction. The roof repair solution under STEP has drastically reduced the number of unmet needs. Households not eligible for STEP are being evaluated for CDBG-DR funded home rehabilitation or reconstruction.

The proposed housing program will also support the repair and development of affordable rental and public housing as well as sheltering initiatives. The program will support landlords who continue to make repairs or build new rental housing to repair and expand the availability of affordable rental more quickly. Additionally, the Territory will build new affordable housing for eligible owners and renters. The program will manage disaster-impacted, low- to moderate-income households that may be ready to move up to home ownership or are interested in subsidized and affordable rental housing.

New public housing and affordable rental units, the need for which predates but was exacerbated by the storms, will be built to provide long-term housing for LMI families throughout the U.S. Virgin Islands. Residential units for particularly vulnerable populations—the homeless, disabled, mentally ill, and elderly—will also be prioritized. New housing units funded through this Action Plan will meet the U.S. Virgin Islands' enhanced building codes and HUD's resilience standards, which will reduce the future need for emergency sheltering.

Based on available data, as well as input from relevant Territorial departments, organizations and agencies, the needs of vulnerable populations include:

- Assisting providers of housing for the vulnerable to repair or replace their damaged units;
- Supporting the expansion or new development of units for the vulnerable, especially for the aged and the mentally ill; and
- Enabling providers to support the most vulnerable through provision of services including those for mental health and crisis counseling, legal counseling, and case management, enabling individuals to access the programs they need.

In October 2017, the Governor created an expert advisory committee to help guide short- and long-term recovery efforts for the Territory. This Task Force included representatives from territorial departments and agencies that serve low-income residents, the elderly, children, and persons with physical and developmental disabilities. While these individuals face the most barriers, they may be

the least able to advocate on their own behalf. The involvement of groups and agencies that represent them ensures that these vulnerable individuals and households are not forgotten in the recovery.

The vulnerable population is estimated by the Governor's Recovery and Resilience Task Force to be approximately 63,000 people; 56,500 supported through financial programs, 6,300 elderly, 1,100 children and 400 persons with disabilities (USVI Hurricane Recovery and Resilience Task Force, 2018). This number represents roughly 60% of the Virgin Island's total population (U.S. Census Bureau, n.d.). Through the consultation process and Task Force involvement, the organizations helped to make sure the needs of these populations were recognized and addressed in both the CDBG-DR Action Plan and the CDBG-DR MIT Action Plan.

Funds under the CDBG MIT Plan are allocated among 4 broad categories—infrastructure; economic resilience; housing; and public services. The Virgin Island Housing Finance Authority Analysis of Impediments dated 2006; updated in 2015, and as may be further amended, contains discussion on vulnerable populations, areas of poverty concentration; and steps that VIHFA are already undertaking to insure priority and inclusivity of the protected classes under the Fair Housing Act. We hereby incorporate the AI by reference herein and will continue to roll in other recommendations as the projects are more specifically defined. Thus, the impact that the above-mentioned activities will have on both vulnerable and protected classes, etc. includes, but are not limited to the following:

(1) Creating more resilient units of affordable housing through:
    a. An increase in the number of units of affordable single-family housing
    b. An increase in the number of units of affordable multi-family housing

(2) There will be better access to information for protected and vulnerable populations

(3) Will provide the appropriate number of disabled units in multifamily projects; and more than the minimum, if necessary

(4) Single-family housing for disabled persons will be equipped and made appropriately accessible for their comfortable living and maneuvering

(5) For vulnerable populations, there will be an increased number of resilient transitional housing units and shelters

(6) VIFHA will increase the capacity of system providers and coordination between providers

(7) Work with Public Transportation and the public to ensure that to the greatest extent feasible; public transportation is accessible to persons with disabilities

(8) All public facilities will be accommodated to ensure use by the disabled community

(9) Will seek other ways to work with public and private transportation companies in how to assist this vulnerable community.

The VIHFA is dedicated to ensuring that it reaches its vulnerable populations; providing accessibility and making changes and adjustments to enhance quality of life.

Historically, over 52% of fair housing complaints are filed by persons with special needs or persons with a disability. VIHFA will ensure that this population has easy access to voicing all complaints to HUD. VIHFA will also use its own Virgin Island Fair Housing Commission to ensure complaints are being heard; and resolutions are following.

The Fair Housing Act prohibits discrimination because of race, color, national origin, religion, sex, familial status, and disability. We recognize that additional protection under fair housing includes, but is not limited to Title VI of the Civil Rights Act of 1964, Section 109 of the HCD Act of 1974, Section 504 of the Rehabilitation Act of 1973, Section 508 of the Rehabilitation Act of 1973, American With Disabilities Act of 1990, The Architectural Barriers Act, HUD's Equal Access Rule that specifically includes sexual orientation, etc. The VIHFA is committed to driving an equitable recovery and serving all residents, particularly the most vulnerable in the Territory where the entire territory has been designated as a Most Impacted and Distressed or "MID" area, which means that the great majority of the funding will be spent in LMI. We understand that while income is not a factor in the fair housing statute; the low-income requirement overlays protected classes (see maps below delineating dispersal of LMI populations across the USVI).

The following are minimum actions that the VIHFA will take to ensure that the public is aware of their rights; and that they have convenient and immediate access to filing complaints of discrimination in all areas impacted by the Act.

(1) VIHFA will launch an aggressive Fair Housing Campaign, that educates the public with respect to their rights under the Fair Housing Act, in coordination with the Virgin Islands Housing Authority (VIHA).
(2) VIHFA will make educational materials and information available in prominent public places; to include some of the following: apartment associations, public platforms, radio spots, PSA's, etc.
(3) VIHFA will work with utility companies to place an education pamphlet in the electric bills.
(4) VIHFA will place a Fair Housing PowerPoint presentation on the VIHFA Website.
(5) VIHFA will require training for all employees and recipients of federal funds.
(6) In conjunction with VIHA, establish a Fair Housing Hotline to capture data regarding prevalent issues and the number of protected classes that may be impacted.
(7) Analyze data at the end of each year to determine what steps VIHFA will take to ameliorate such barriers.
(8) VIHFA will offer continuing training that will help to overcome lack of affordable housing barriers (credit repair, financial literacy, computer services, etc.) VIHFA already provides such training to the community, adding additional training on Fair Housing.
(9) VIHFA will hold a regular Housing Expo event that brings together governmental agencies, non-profits, for-profits, etc. that covers all things Fair Housing.

Finally, due to the unique demographics and small land areas of the islands, coupled with the fact that approximately 80% of the population in the Territory is African or Hispanic, racially and ethnically concentrated areas as well as concentrated areas of poverty are not segregated as is often the case in the continental United States.

Additionally, there is a lack of data describing and delineating protected classes as opposed to such data which is normally readily available in the continental US. Nevertheless, VIHFA reported in the earlier version of its Analysis of Impediments that Public Housing presents an issue of concentration. The issue is whether it is minority concentration, since the island is majority minority. VI will look at case scenarios around the country that have been previously approved by FHEO, along with the rules, and will work directly with FHEO to resolve any concentration issues.

Figure 51. LMI Household Damage Analysis (St. Croix)

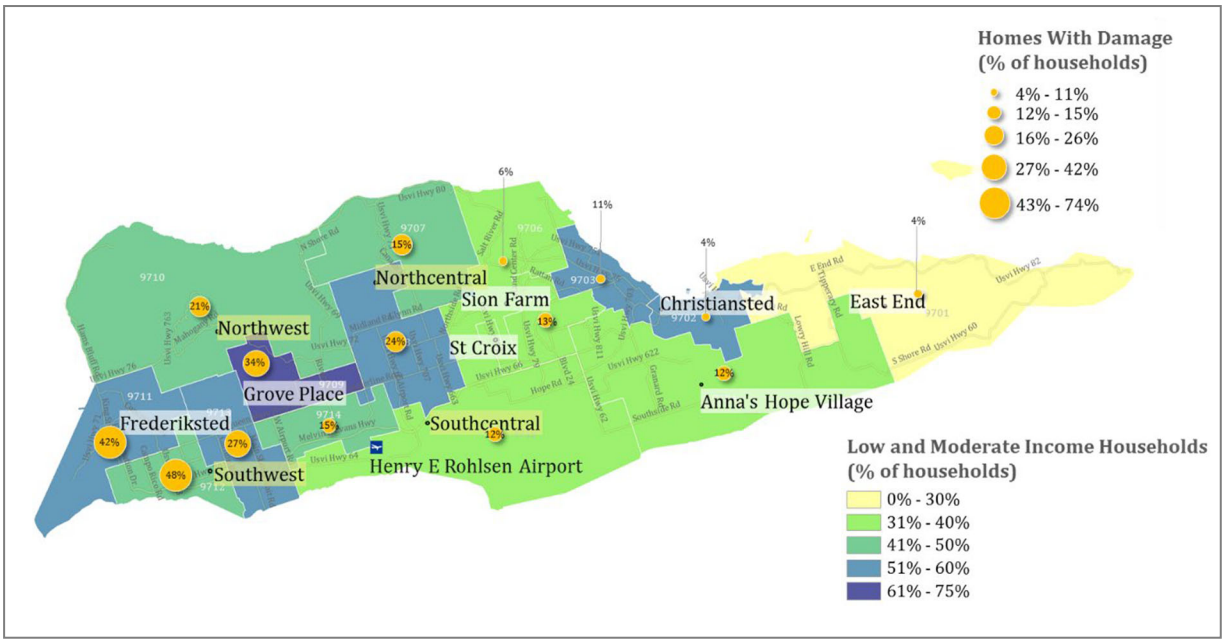
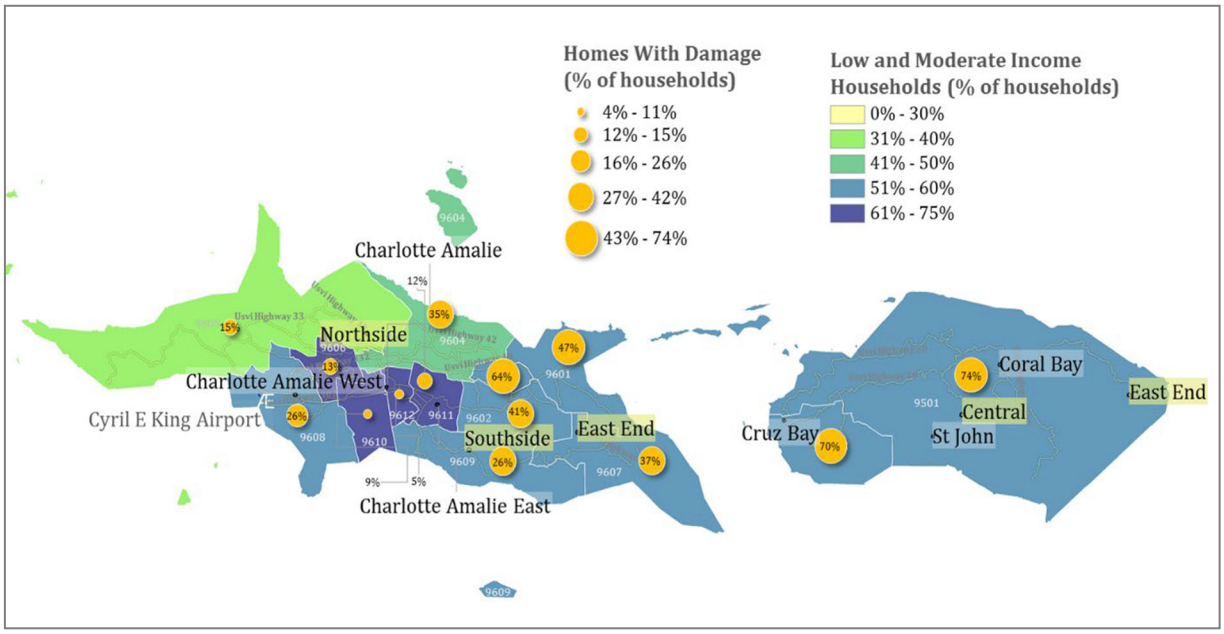


Figure 52. LMI Household Damage Analysis (St. Thomas and St. John)



Advocates of vulnerable populations who may need additional resources to engage with the CDBG-DR-MIT planning process are encouraged to contact the CDBG-DR Program Communication Manager at (340) 772-4432. A list of the vulnerable populations that will continue to be outreached to directly and information about equitable accessibility is available in the VIHFA Citizen Participation Plan which is available in Spanish on the VIHFA Mitigation website (https://cdbgdr.vihfa.gov/programs/cdbg-mitigation/). Citizens are advised on the website to please call (340) 772-4432 or write to cdbgdr@vihfa.gov, for any questions on any accessibility needs.

Physical copies of the proposed Action Plan with a Spanish translation are available at VIHFA and partner government offices and public libraries. A large print version is available online and in print upon request. The website continues to be compatible with Google Translate and screen reader software.

All meeting locations will be ADA-accessible and language (Spanish (required based upon population) and French Creole (by request only) and accessibility services for hearing or sight-impaired available upon request (with 48-hours' notice).

4.2.4 Natural Infrastructure

Beyond the specific methods needed to assess and compare grey (human engineered) infrastructure against natural infrastructure options relative to their utility to mitigate risk, a framework is required that would provide guidance to USVI on how to consider natural infrastructure solutions in its envisioned CDBG-MIT projects. The VIHFA is focused on how municipalities are advancing adaptation to climate change through the management of natural infrastructure assets that provide municipal and ecosystem services. Such focus provides effective solutions for minimizing coastal flooding, erosion, and runoff, as do man-made systems that mimic natural processes – known as natural infrastructure. Across the Territory, aging water infrastructure is creating challenges for water management. Combined sewer systems are pumping toxins into estuaries, bays, lakes, and other water bodies and overflowing during extreme precipitation events into urban and residential areas. At the same time, coastal communities are being heavily damaged from extreme storm events and sea level rise.

Experts agree that natural infrastructure such as healthy wetlands can provide many of the same benefits of traditional man-made infrastructure at a much lower investment and maintenance cost. Natural infrastructure approaches include forest, floodplain and wetland protection, watershed restoration, wetland restoration, permeable pavement, and driveways; green roofs; and natural areas incorporated into city designs, and conservation easements. A natural infrastructure approach represents a successful and cost-efficient way to protect riverine and coastal communities. While there is much to be done in the way of design and restoration in coastal communities, this plan, due the preponderance of MID counties and communities and their locations, will focus on upstream rather than coastal natural infrastructure.

Ordinances and codes are the regulatory mechanisms available to local governments for land use and natural resource management. Though local governments in USVI have no preexisting grants of power, the General Assembly has made both general grants of power to cities and counties and specific grants of power to regulate other activities under certain special circumstances. Cities and counties are generally allowed to "by ordinance define, regulate, prohibit, or abate acts, omissions, or conditions detrimental to the health, safety, or welfare of its citizens and the peace and dignity of the county; and may define and abate nuisances." Other grants of authority are made to address specific issues, including the environmental impacts of development, and are found in other statutes.

Many of the resources discussed here are written as separate ordinances but could also be modified to work in a unified ordinance framework. Some of the ordinances are written as overlay ordinances, which are used to establish additional development requirements in specific areas of a community, such as environmentally sensitive areas. The additional requirements are superimposed over, or "overlay", the base regulations already in place.

4.3 How Programs or Projects Increase Resiliency for Housing Serving Vulnerable Populations

The territory has allocated 25% of its CDBG-MIT which is approximately $192,700,000 towards housing activities that will include but not be limited to new single family and multi-family construction or reconstruction that will serve its vulnerable population. The new and reconstructed housing units will meet additional resiliency and mitigation standards. The USVI will serve as a regional example for more resilient residential construction practices and provide the opportunity to disseminate these practices through the residential construction industry on a scale larger than previously attempted.

Given the increased construction costs of the U.S. Virgin Islands the VIHFA will invest additional CDBG-MIT program funds into the rehabilitation to increase the resiliency of its existing housing inventory, including but not limited to affordable rental housing, transitional housing, public housing, permanent supportive housing, and permanent housing serving individuals and families that are homeless or at risk of becoming homeless and new housing developments. All housing construction or rehabilitation will comply with the accessibility requirements under Section 504, the ADA, and the Fair Housing Act, and local building codes.

The USVI programs and projects will serve a two-fold function: (1) provide high quality, durable, sustainable, and mold resistant housing; and (2) demonstrate cost effectiveness of enhanced resiliency features in residential construction on a large scale to protect against the inevitable next storm or flooding event. By building homes to a higher standard than conventional construction practices on the scale proposed through this Action Plan, new housing activities will bring those more resilient building practices into the mainstream where they can scale-up and become cost-competitive with conventional building practices.

To ensure that CDBG MIT activities focus on providing services to the territory's low/moderate vulnerable population, all proposed projects will undergo AFFH review by the VIFHA before approval. Such review will include assessments of (1) a proposed project's area demography, (2) socioeconomic characteristics, (3) housing configuration and needs, (4) educational, transportation, and healthcare opportunities, (5) environmental hazards or concerns, and (6) all other factors material to the AFFH determination. The VIHFA will ensure that projects lessen area racial, ethnic, and low-income concentrations, and/or promote affordable housing in low-poverty, nonminority areas in response to natural hazard-related impacts. This effort will also assist the territory to allocate funding to increase resiliency for housing that serves vulnerable populations, including transitional housing, permanent supportive housing, permanent housing serving individuals and families that are homeless and at-risk of homelessness and public housing developments.

The VIHFA will also expand its range of populations under the definition to include socially vulnerable populations to reflect protected classes that are vulnerable to the effects of disasters. The VIHFA will collect data to identify the following in areas vulnerable to damage from disasters: (1) racial and ethnic make-up of population; (2) Limited English proficiency (LEP) populations; (3) number or percentage of persons belonging to other protected classes (race, color, national origin, religion, sex, disability, and familial status); and (4) racially and ethnically concentrated areas and concentrated areas of poverty.

The VIHFA will utilize its planning and administration allocation for the comprehensive review of land use policies, codes, and procedures, including affordable housing siting maps and decisions to protect against segregation and to comply with HUD's site and neighborhood standards.

The VIHFA will also encourage the use of its CDBG-MIT Planning allocation for modifications to USVI planning, zoning and other land use policies, codes, and procedures. The VIFHA will also review projects to ensure against the segregation of persons with disabilities.

The VIHFA will ensure that a key target population for all CDBG-MIT projects and activities are Section 3 residents (public housing residents and low- and very low-income residents who live in areas where Section 3 covered assistance is expended) and businesses. The VIHFA will require all CDBG-MIT funding recipients to have a Section 3 plan to ensure that construction activities (commercial and residential) provide employment, training, contracting, and other economic opportunities to Section 3 residents to the greatest extent feasible.

4.4 Minimizing Displacement

Prior to pursuing each activity, the VIHFA will consider the potential that the activity will trigger relocation or displacement and will explore options to minimize relocation or displacement of persons and entities. In instances in which relocation or displacement is necessary, the VIHFA will take the following steps to mitigate disruption due to relocation and to minimize displacement.

1. Facilitate, to the greatest extent possible, new construction on government-owned, vacant land.
2. Stage rehabilitation of apartment units in a manner such as to allow tenants to remain in the building or complex during and after the rehabilitation – i.e., by working with vacant units first and transferring existing tenants as units are completed.
3. Arrange for facilities to house persons who must be relocated temporarily during rehabilitation.
4. Adopt policies which provide reasonable protections for tenants faced with conversion of their housing to a condominium, cooperative, or single-family ownership, such as working closely with the local PHA to identify alternate housing including provision of Housing Choice Vouchers for those tenants who choose to vacate rather than participate in the conversion initiative.

Permanent relocation is not anticipated under the programs covered in this Action Plan; however, if invoked, temporary relocation and permanent replacement housing payments will be provided in accordance with the Uniform Relocation Act. As temporary relocation will likely be necessary, the VIFHA will develop an Optional Relocation Policy. The policy will include certain provisions for relocation advisory services to persons with disabilities such as facilitating supportive services and provide for grievance procedures.

5.0 Coordination of Mitigation Projects Leverage

5.0 COORDINATION OF MITIGATION PROJECTS LEVERAGE

The Territory has benefitted from the extensive and fruitful participation in mitigation planning by stakeholders, including VITEMA, Public Works, ODR, DPNR, Waste Management, WAPA as well as with representatives of the major non-profit entities in this community. This communication has enabled the VIHFA to identify key risks and structure activities and programs that will yield projects that will provide optimum resilience against those risks. Additionally, such cooperation has facilitated identification of opportunities to leverage CDBG-MIT funds with other funding from USVI, federal, private nonprofit and for-profit enterprises together with philanthropic sources.

Favorable leverage opportunities will receive greater prioritization for CDBG-MIT funding.

For mitigation projects, the VIHFA will foster the creation of Public Private Partnerships (PPP) to leverage available CDBG-MIT funds and focus additional resources on the identified risks. For example, in developing more resilient affordable housing, VIHFA and the Virgin Islands Housing Authority (VIHA) plan to work cooperatively to form PPPs with Low Income Housing Tax Credit equity investors, commercial lending institutions and private sector nonprofit and for-profit developers. These PPPs will allow the VIHA to comprehensively rehabilitate or reconstruct its portfolio of approximately 3,000 aging and functionally obsolete public housing units.

The development of new construction for Homeownership Opportunity and First Time Home Buyer Assistance will also be priority of the CDBG-MIT Funding. CDBG MIT funding will be used to provide to expand existing VIHFA program for LMI households the opportunity to purchase a home through direct financial incentives, effectively creating first time home buyers.

Due to the ongoing need, CDBG-MIT funding will also be leveraged to expand the EnVIsion Tomorrow's Homeowner Rehabilitation and Reconstruction Program. The program will continue eligible costs for the rehabilitation or replacement of damage to real property, replacement of disaster-impacted residential appliances, and environmental health hazard mitigation costs related to the repair of disaster-impacted property. For residences considered substantially damaged, support will be granted for reconstruction or provision of a modular (or manufactured) home in place of their original unit. The Program recognizes the advantages of modular construction, from a cost standpoint, speed of construction and the potential for workforce development as well.

Homeless Initiatives to provide Permanent Supportive Housing for those experiencing chronic homelessness will provide leveraging opportunities through the potential utilization of Low-income Housing Tax Credits, FEMA funding, private debt or equity and other sources.

Pictured: VITEMA Emergency Operation Center on St. John.

6.0 Minimizing Displacement and Ensuring Accessibility

6.0 MINIMIZING DISPLACEMENT AND ENSURING ACCESSIBILITY

The Territory will minimize displacement of persons or entities as a result of the implementation of CDBG-MIT projects by ensuring that all programs are administered in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act (URA) of 1970, as amended (49 CFR Part 24) and Section 104(d) of the Housing and Community Development Act of 1974 and the implementing regulations at 24 CFR Part 570.496(a), subject to any waivers or alternative requirements provided by HUD. While nonstructural mitigation (e.g., elevations, buyout and/or acquisition) programs may prove to be necessary to achieve flood risk mitigation goals and may cause displacement in certain rare instances, many of the programs detailed in this MIT-AP will be implemented with the goal of minimizing displacement of families from their homes, whether rental or owned. Moreover, in the event displacement does occur, VIHFA will take into consideration the functional needs of the displaced persons in accordance with guidance outlined in Chapter 3 of HUD's Relocation Handbook.

In practice, when a tenant is displaced by a CDBG-MIT activity, relocation case managers are assigned to both owners and tenants work with applicants to coordinate activities and communicate updates in real time concerning when to expect to move out of their residences, assist the displaced individuals with securing temporary housing arrangements, and all other aspects of moving belongings. One of the case manager's primary goals is to minimize the time that the tenant/owner will be impacted by coordinating the construction calendar in real time and during construction, keeping the displaced individual updated on the construction progress and communicating an expected timeline for construction completion and eventual move in.

To ensure accessibility for applicants, VIHFA has adopted a Section 504/Americans with Disabilities Act (ADA) policy which ensures the full right to reasonable accommodations by all program participants. Under this policy, case managers shall assess the specific needs of each program beneficiary and determine if a 504/ADA modification is required based on the family composition members. All public facilities that are federally assisted shall also exceed the minimum threshold for 504/ADA compliance. Multifamily and other housing development programs will also be required to have a certain set-aside of fully compliant 504/ADA units of varying sizes to accommodate eligible applicants. Along with single family programs, the multifamily rental programs will be required to have an architect's/engineer's signature on a form stating that the designed unit meets 504/ADA compliance. Failure to deliver the appropriately constructed ADA/504 compliant unit(s) will result in the construction firm not being paid and in breach of contract until the deficiencies are corrected.

7.0 Allocation and Maximum Award Amounts, Necessary and Reasonable Assistance

7.0 ALLOCATION AND MAXIMUM AWARD AMOUNTS, NECESSARY AND REASONABLE ASSISTANCE

The Virgin Islands Housing Finance Authority (the VIHFA) has established program allocations that consider the risks identified and prioritized in the MNA, data from ongoing CDBG-DR recovery, and the public participation process. In addition, the mitigation activities to be undertaken have been considered in conjunction with potential threats to Community Lifelines. These combined factors were evaluated in determining reasonable and necessary amounts of assistance in different programs to improve the Territory's resilience to future disaster events in the most effective manner possible.

The VIHFA has identified the maximum assistance available for each program (minimum amounts will be identified in program guidelines) and has established priorities for the programs with consideration of the guidelines set forth in the CDBG-MIT Main Notice. Some CDBG-MIT activities align with unmet recovery needs and have functional overlap with CDBG-DR activities. Activities where a CDBG-MIT activity is used in combination with CDBG-DR funds previously allocated will be indicated in project applications submitted to the VIHFA.

All of the Territory's mitigation activities under this grant will meet at least one CDBG-MIT national objective for either (1) benefiting low- to moderate-income persons (LMI), or (2) urgent need mitigation (UNM). At least 50 percent of CDBG-MIT funds will be used to support activities that benefit LMI persons.

- LMI (Low- and moderate-income). Activities which benefit low- and moderate-income individuals, such as providing an area benefit to an LMI area, establishing benefits to limited clientele, housing LMI individuals and households, or job creation or retention. While the VIHFA will strive to attain approximately 70% LMI benefit overall, at least 50% of CDBG-MIT funds must be spent on projects that primarily benefit LMI individuals to comply with HUD rules.
- UNM (Urgent Need Mitigation). Set by HUD in the Notice to allow for certain mitigation activities. To meet the UNM National Objective, the VIHFA must document that the activity addresses the current and future risks as identified in the MNA of most impacted and distressed areas and will result in a measurable and verifiable reduction in the risk of loss of life and property.

Most activities undertaken by the Territory are anticipated to meet the LMI national objective, and if certain projects do not meet this objective, the UNM national objective will be used.

Projects utilizing the CDBG-MIT UNM National Objective must indicate that they meet the following two criteria:

1. Addresses the current and future risks as identified in the grantee's Mitigation Needs Assessment of most impacted and distressed areas; and
2. Will result in a measurable and verifiable reduction in the risk of loss of life and property.

Projects qualifying under the UNM national objective will be required to submit as part of the application documentation evidence of a measurable and verifiable reduction in loss of life or property which addresses risk(s) identified in the Mitigation Needs Assessment. Additional guidance regarding UNM project justification requirements will be released in the program guidelines, and the VIHFA will assess these criteria prior to undertaking projects using the UNM national objective.

7.0.1 Projected LMI Benefit

The Territory has unique geographic and demographic characteristics. Given the impact of both Hurricanes and its unique geography, all 3 islands are Most Impacted and Distressed or "MID" areas as defined by HUD and should each be seen as having sufficient LMA for the territory to qualify as having more than 51% of its residents as LMI. The relatively small geography of the islands coupled with high density in developed areas results in a situation where mitigation projects with general or community-wide impact will benefit LMI residents, as reflected within the LMI projections herein.

At least 51% of its residents must be LMI persons for an area to meet the low- and moderate-income area (LMA) benefit requirements under HUD guidelines. Many areas that qualify as low- and moderate-income within the U.S. Virgin Islands are shown via the 2010 U.S. Census data, which is still the most recently available data at the census tract level. 2010 Census data shows that a majority of St. Thomas and St. John census tracts exceed the threshold 51% LMI resident threshold. Just over half (52%) of households in the Virgin Islands are LMI households overall, though this figure varies slightly between the Islands. Given population density, both St. John (54.8% LMI) and St. Thomas (57.9% LMI) qualify for the LMA benefit at an island level, with Hassel Island and Water Island included as part of the St Thomas data. While only a third of St. Croix census tracts qualify for LMA benefit, the island does not meet the LMA based only on the 2010 census data, as only 46.3% of residents are LMI, just a few percentage points below the 51% threshold. The updated LMA and Service Benefit derived from the FEMA IA data allowed by HUD specifies that 64.21% of the island is LMI. With St. Thomas at 61.90%, St. Croix at 66.39% and St. John at 65.35% which appropriately represents the most accurate post-storm LMI data for the USVI. As a result, all eligible projects and activities that are determined to provide an "island-wide" benefit should utilize the FEMA IA LMI data.

While census data is important to the HUD CDBG-MIT Action plan, the 2010 Census data does not reflect the current picture in the Territory, which HUD acknowledged in its 9/28/2020 "Waivers and Alternative Requirements for Community Development Block Grant Disaster Recovery Grantees" Federal Register notice. Recognizing the high cost and other unique characteristics of the Territory, HUD granted the USVI a waiver of 42 U.S.C. 5302(a)(20)(A) in order to standardize the area median incomes (AMI) across the entire territory, permitting the USVI to use the St John area median income for all islands in the territory (because those LMI income limits are the highest of the three islands). As LMI eligibility is defined by the AMI standard and St. John qualifies with its higher income level than on St. Croix, the entire Territory can properly be classified as having over 51% of LMI residents within the present plan.

7.1 Program Allocations

The total CDBG-MIT allocation set forth in PL 115-123 is $774,188,000.00. The VIHFA will set aside five percent of these funds for administrative costs associated with the mitigation activities described below. As a result of the MNA, lessons learned from CDBG-DR, and from community and stakeholder input, the following table outlines the allocations for each CDBG-MIT eligible activity. All funds have been allocated to the eligible mitigation activities outlined in Sections 7.3 through 7.8 below.

Pictured: VIHFA office on St. Croix.

Table 41: CDBG-MIT Program Allocations

Activity Category	Project/Program	Project Costs	VIHFA Project Delivery Costs	Total Allocations	% of Total	% LMI Projection	Identified Community Lifeline Risks	Identified Territory Risks
Infrastructure & Public Facilities	Community Resilience & Public Facilities	$93,500,000	$6,500,000	$100,000,000			• Food Water Shelter • Transportation • Energy • Health & Medical	• Hurricane • Riverine Flooding
	Resilient Critical & Natural Infrastructure	$353,505,000	$14,495,000	$368,000,000		• Energy	• Transportation • Hazardous Material • Safety& Security	• Hurricane • Riverine Flooding • Drought
	Total Allocation	$447,005,000	$20,995,000	$468,000,000	60%	65%		
Economic Resilience & Revitalization	Commercial Hardening & Financing	$12,000,000	$988,935	$12,988,935			• Transportation • Food Water Shelter • Health & Medical	• Hurricane • Riverine Flooding • Pandemic
	Small Business Mitigation	$7,000,000	$863,935	$7,863,935			• Health & Medical • Communication • Energy	• Hurricane • Riverine Flooding
	Entrepreneurship Resilience and Innovation Program	$8,000,000	$1,008,935	$9,008,935			• All Community Lifelines	• Hurricane • Riverine Flooding • Pandemic
	Workforce Development Mitigation Program	$8,000,000	$1,008,935	$9,008,935			• All Community Lifelines	• Hurricane • Riverine Flooding • Pandemic
	Total Allocation	$35,000,000	$3,870,739	$38,870,739	5%	70%		
Housing	Multifamily Housing	**$100,000,000**	**$9,000,000**	**$109,000,000**			• Food Water Shelter • Health & Medical	• Hurricane • Riverine Flooding
	VIHFA New Home Construction (Home Ownership)	**$60,000,000**	**$3,900,000**	**$63,900,000**			• Food Water Shelter • Health & Medical	• Hurricane • Riverine Flooding
	Homeless Housing Initiative	**$23,000,000**	**$1,380,000**	**$24,380,000**			• Food Water Shelter • Health & Medical	• Hurricane • Riverine Flooding
	Innovative Resilient Housing	**$5,000,000**	**$300,000**	**$5,300,000**			• Food Water Shelter • Health & Medical	• Hurricane • Riverine Flooding
	Total Allocation	**$188,000,000**	**$14,580,000**	**$202,580,000**	**26%**	**80%**		
Public Services		**$15,000,000**	**$400,000**	**$15,400,000**	**2%**	**100%**		
Planning		$9,750,000	$877,861	$10,627,861	**1%**	**70%**		

Administration	**$38,709,400**	**$0**	**$38,709,400**	**5%**	
Totals	$733,464,400	$40,723,600	$774,188,000	100%	**≥70%**

7.2 Overall Method of Distribution and Delivery

All programs will be implemented by the VIHFA, its subrecipients, or non-profit or for-profit entities selected in accordance with applicable procurement requirements. Details regarding program allocations, maximum awards, eligible applicants, project prioritization and timeline are outlined within the programs described below. **Further details including the application process and criteria used to select applicants for funding under each program, including the relative importance of each criterion, will be developed in program policies and procedures.**

The VIHFA will oversee the entire portfolio of programs, but certain projects will be implemented by other appropriate agencies of the territorial government. The VIHFA determined funding will be delivered through three primary methods based on the needs for services and the expertise of certain entities to complete specific projects.

- The first method will deliver funds directly to beneficiaries including primarily residents and landlords depending on the eligibility criteria detailed within respective programs.
- The second method will be a direct grant to implementing entities, or subrecipients, to oversee a specific program and/or projects as outlined within the Action Plan.
- A third method will utilize subrecipients selected through a competitive process to deliver a service or project to beneficiaries under a specific program.

Many projects are being further defined in direct coordination between the VIHFA, partner agencies of the territorial government, and other entities established by the territorial government. If any project development results in a Covered Project, this Action Plan will be amended to include project details and a benefit-cost analysis as detailed in the CDBG-MIT Main Notice. A Covered Project is defined for USVI as "any infrastructure project having a total project cost of $50 million or more, with at least $25 million of CDBG funds, regardless of the source (e.g., CDBG–DR, CDBG–MIT, or CDBG)."

FR-6109-N-02 encourages grantees to maximize the impact of available funds by encouraging leverage, private-public partnerships, and coordination with Federal programs. This includes mitigation grants administered by FEMA or the US Army Corps of Engineers (USACE). Use of CDBG-MIT funding as non-federal cost share for the FEMA Public Assistance Program ("Local Match") is authorized by relevant legal requirements pertaining to FEMA and HUD. Additionally, both FEMA and HUD have encouraged the use of the "Flexible Match Concept" in the "*Implementation Guidance for Use of Community Development Block Grant Disaster Recovery Funds as Non-Federal Cost Share for the Public Assistance Program*" published jointly by FEMA and HUD in October of 2020. Therefore, applicants may request (subject to approval of the VIHFA) that any of the CDBG-MIT funds referenced in this Action Plan may be used as Local Match if doing so would be consistent with all applicable legal requirements pertaining to the FEMA PA and HUD CDBG-MIT programs.

7.3 Infrastructure and Public Facilities

The U.S. Virgin Islands' reliance on the proper functioning of its infrastructure systems—including energy, transportation, and telecommunications infrastructure—was evident when these systems failed in the aftermath of Hurricanes Irma and Maria. High winds, torrential rainfall, and flooding from both disasters had compounding effects on the infrastructure sectors on each of the U.S. Virgin Islands, leading to widespread and prolonged failures which has delayed economic recovery. High winds toppled above-

ground utility lines; storm water runoff flooded roads and induced mudslides; and flooding, wind, and heavy rain severely damaged water and wastewater treatment plants, hospitals, and other buildings that provide critical services. Electrical substations were crippled, causing power failures to 95% of electrical customers. Water pump failures and sewage overflows from storm water surges led to potable water safety precautions such as “boil water” advisories and EPA drinking water assessments. Lacking both a steady power supply and functioning transportation and water infrastructure, many businesses were forced to shut down, some for extended periods. Closure of the ports and airports for more than two weeks, had significant effects on the Territory’s connectivity, limiting the pace of voluntary evacuation efforts, delaying the delivery of essential supplies for emergency relief, and causing further disruption to the economy.

The U.S. Virgin Islands has identified multiple infrastructure priorities that must be addressed If the Territory’s infrastructure is made more resilient, critical services could be stabilized and maintained for residents in the event of a future disaster, creating a safer and more secure environment.

In addition to hardening infrastructure and following other construction best practices to mitigate the risks described in the MNA, the Territory will seek to incorporate the “no adverse impacts” approach (NAI) set forth by the Association of State Floodplain Managers, as applicable. This strategy relies on a calculated mix of mitigation approaches to ensure infrastructure development does not increase flooding risks. A key consideration in NAI is green infrastructure and the use of green spaces and natural systems to promote safer, more predictable conveyance of water through communities. All projects in the Infrastructure and Public Facilities programs will be required to provide a narrative summary of the green and natural infrastructure components applicable to the project during scope and budget development and are encouraged to use the ASFPM’s NAI How-to-Guide for Infrastructure to assist in effective project design.

Table 42. Infrastructure Program

Program	Project Allocation	Community Lifeline Impact	National Objective
Community Resilience & Public Facilities Construction	$100,000,000.00	• Food, Water, Sheltering • Communications • Safety and Security	LMI UNM
Resilient Critical and Natural Infrastructure	**$368,000,000.00**	• Food, Water, Sheltering • Transportation • Health and Medical • Hazardous Materials • Energy	LMI UNM

7.3.1 Community Resilience Centers & Public Facilities Construction

There are several risks to the Territory identified in the MNA that require adequate sheltering during and after disasters. When Hurricanes Irma and Maria hit the U.S. Virgin Islands in September of 2017 there were limited locations for individuals, families and the most vulnerable to seek shelter from the storms. Throughout the public participation process, community shelters and communications were mentioned as mitigation measures residents believe are needed to be better prepared for future disasters. The VIHFA has identified the need to have centralized and well-equipped shelters for receiving resources, critical communications, charging phones and battery-operated equipment, among other functions.

This program addresses the urgent need for adequate, permanent emergency shelters in the U.S. Virgin Islands. To this end, the program will support the development of multi-purpose facilities which will be dedicated to disaster preparedness, sheltering needs in disasters and other emergency situations. Additionally, the program may support increasing sheltering capacity by hardening and upgrading existing

community, public or private infrastructure to bring them up to sheltering standards. To address this need, this program will cover the eligible costs to rehabilitate, reconstruct or newly construct a facility to meet the needs of this population. In addition, the projects will address mitigation measures by utilizing construction methods that meet FEMA standards.

Allocation Amount and Maximum Award

Project Allocation Amount: $100,000,000.00

Maximum Award Amount: $25,000,000.00

Minimum Award Amount: $1,000,000.00

Eligible Applicants

- Non-governmental organizations (501(c)(3)) or Not for Profit Entities
- Units of Government of the USVI, and its autonomous and semi-autonomous entities
- Public or Private Institutions of Higher Learning (Universities)
- Private developers
- Private Utility Companies

Eligible Activities

- HCDA Section 105(a)(1) Acquisition of Real Property
- HCDA Section 105(a)(2) Public Facilities and Improvements
- **HCDA Section 105(a)(3) Code Enforcement**
- HCDA Section 105(a)(4) Clearance, Rehabilitation, Reconstruction, and Construction of Buildings
- HCDA Section 105(a)(5) Architectural Barrier Removal
- HCDA Section 105(a)(8) Public Services
- **HCDA Section 105(a)(11) Relocation**
- HCDA Section 105(a)(12) Planning
- HCDA Section 105(a)(14) Activities Carried Out through Nonprofit Development Organizations
- HCDA Section 105(a)(15) Eligible nonprofit organizations
- **HCDA Section 105(a)(19) Technical Assistance**
- HCDA Section 105(a)(21) Higher Education
- **HCDA Section 105(a)(25) Construction of Tornado-Safe Shelters**
- **HCDA Section 105(a)(26) Lead-based Paint Hazard Evaluation and Reduction**

Priorities

- All facilities constructed or rehabilitated as part of this program must be available to the public in future disaster events.
- Organizations and agencies must agree to provide year-round maintenance and operations expenses as CDBG-MIT funds will not fund long-term maintenance and operations.
- During non-crisis events shelters may serve as traditional community centers for public benefit. For example, the shelter may be leased or rented year-round for community organizations or for events, and income generated will be utilized to maintain the operation of the center and shall not be considered program income.
- Projects may be selected based on their projected performance against a set of factors, including but not limited to: cost effectiveness, speed with which projects and shelters can be developed, number of

individuals served, location and accessibility, and proposed use(s) outside of hurricane season or other disaster events.

- All projects must:
  - Meet the definition of mitigation activities;
  - Address identified current and future risks; mitigation related to hurricanes, tropical storms and depressions, severe flooding, earthquake, tsunami, drought, landslide, wildfire, and pandemic;
  - Meet a CDBG national objective;
  - Include a plan for the long-term funding and management of the operations and maintenance of the project.
- For any proposed projects not listed below, the VIHFA will develop a competitive application process to select eligible projects that meet the criteria described above. The competitive application process will be open to all eligible applicants and one application may be submitted per entity. Applicants are encouraged to incorporate nature-based solutions, including natural or green infrastructure, into their proposed projects.
- The VIHFA will prioritize development of the following known shelter projects, assuming they meet the criteria and application requirements developed for public facilities projects:
  - A multi-purpose complex on the St Croix campus of the University of the Virgin Islands (UVI) in an amount of approximately $25,000,000.00.
  - A community shelter and natural infrastructure recreational area at Mars Hill Park
  - Restoration and hardening of the Territory's two homes for the elderly, which also serve as special needs shelters – Herbert Grigg and Queen Louise, managed by the Department of Human Services at an amount of no more than $25,000,000 per development.
- The Territory will also prioritize a potential dredging project at Gallows Bay in an amount of approximately $6,000,000.00, which is intended to expand port capacity through dredging and additional berthing space. This will enable the Territory to enter formal berthing access agreements for larger cruise ships, thus increasing the number of cruise passenger arrivals and overall tourism expenditures in the Territory. This project may also be eligible as an Economic Resilience and Revitalization project.

Projected Start and End Date

The proposed timeline for shelter and public facilities projects is from 2021 to 2029.

7.3.2 Critical & Natural Infrastructure Resilience

Hardening public infrastructure is critical to the Territory's ability to mitigate risks to public health and safety even before an extreme weather event occurs. A high priority for the U.S. Virgin Islands will be funding activities that mitigate risks to utility, transportation, and hazardous waste disposal systems particularly for the facilities that serve the health and safety of the community. The Territory has identified several resilience and mitigation measures, which include hardening public infrastructure, elevating key roadways, burying or otherwise hardening utility lines, reducing the risk of storm water runoff erosion and flood exposure, and creating sustainable waste management for the Territory.

Activities related to these projects will be focused on hardening infrastructure against severe weather events. This will include measures to harden infrastructure facilities against high winds, heavy rainfall, flood exposure, storm water run-off, and their effects (e.g., erosion). For example, the Department of Public Works (DPW), with assistance from FEMA and FHWA, has identified potential mechanisms to reduce overall vulnerability of the transportation infrastructure. Structural projects for DPW may include repair, reconstruction, and improvement of resilience to transportation infrastructure including roads, bridges, ghuts, culverts, additional drainage systems, embankments, traffic signals, and bringing signage up to industry standards, as applicable to the Territory. Non-structural approaches may include hydrologic and

hydraulic studies, flood-risk modeling, monitoring systems such as GIS, public outreach and education, and future planning measures.

The US Virgin Islands Waste Management infrastructure was severely damaged by Hurricanes Irma and Maria. The hurricanes generated 825,000 cubic yards of debris, which is almost three times as much waste as the Territory typically generates in an entire year. The Territory's two existing landfills are mandated to close by two Consent Decrees, entered in 2012 and 2013. One of the overburdened landfills is near an environmentally sensitive zone on St. Thomas (Bovoni) and the other landfill is near the St. Croix airport (Anguilla).

Pictured: Storm impact at the VI Waste Management facility on St. John near Cruz Bay.

The debris from the two hurricanes during that period, further exacerbated the serious waste disposal issues that previously existed in the Territory. VIWMA is subject to two federal Consent Decrees, under which a district court judge in St. Thomas directly oversees compliance with the Decrees, which require installation and operation of the gas collection and control systems, plus the closure of the landfills. Not only must VIWMA close the existing landfill, but also there may be more waste excavation and re-shaping needed due to all the excess waste placed over the last several years.

Ultimately the goal is to close the landfill, open a new landfill site and manage stormwater and landfill gas so that there is no negative impact to resident health and safety due to hazardous materials being dumped outside of acceptable locations, and/or damaging groundwater, surface water, or the adjacent mangroves, which have already been significantly impacted by both hurricanes.

The limitations on landfill use makes debris removal and cleanup a major health and safety concern for residents when future disasters generate significant amounts of additional debris. Few mangroves remain on the island and it is important for the long-term sustainability of the coast to preserve the mangroves as they assist with flood control. Mangroves may reduce the impact of the storm surge and resulting debris generation.

The Virgin Islands Water and Power Authority's infrastructure sustained significant damage from Hurricanes Irma and Maria. While the transmission and distribution system sustained the most visible damage, the Authority's other infrastructure was also adversely impacted. The fuel containment ring of Tank #10 pictured below suffered a catastrophic failure. All VIWAPA's diesel fuel tanks are similarly constructed and thus are susceptible to this type of failure. The fuel containment serves as a mitigation measure should a tank start leaking. Without it, the tank cannot remain in service. Ultimately, VIWAPA needs to secure resilient fuel storage capacity to further secure the energy lifeline against this type of damage. The proposed Vitol Acquisition directly addresses this risk as the project proposes giving VIWAPA title and ownership of LPG storage vessels housed in resilient concrete bunkers that will be used to supply fuel to their newest and most efficient generators in both districts. The concrete bunkers are virtually impermeable to wind damage and by allowing VIWAPA to utilize its newest generators this project will have a positive impact on grid reliability. Reliable power is key to a speedy recovery. This acquisition project

was selected as it is the fastest and most cost-effective way to address this type of risk as the infrastructure already exists. Additionally, there are no other comparable facilities that have tanks stored in concrete bunkers or are capable of supplying LPG at the utility-scale. This acquisition will also give the Authority an alternate way to receive and dispense fuel as it consists of acquiring the VLGC mooring and the truck racks.

Figure 53 Illustration of Damage to Fuel Storage Tank No 10.

The VIHFA will develop policies and procedures for the Critical and Natural Infrastructure Resilience program that will outline all requirements for a project to be eligible for funding. Potential projects to be carried out by governmental departments of the Territory have been determined to be key mitigation priorities for the Territory as described below. All proposed projects must submit an application that describes the project's connection to mitigation needs and the priorities and eligibility requirements outlined in this Action Plan. If remaining funds allow for additional projects that are not identified below in Priorities, they may be ranked and scored in conformance with a set of scoring criteria identified in the policies and procedures.

Covered Projects

If a proposed infrastructure project results in a Covered Project, which is an infrastructure project having a total project cost of $100 million or more, with at least $50 million of CDBG funds (regardless of source (e.g., CDBG–DR, CDBG–MIT, or CDBG), this Action Plan will be amended to include the project at a future date.

HUD defines an infrastructure project at 84 FR 45838, 45851, as an activity or group of related activities that develop the physical assets that are designed to provide or support services to the general public in the following sectors: surface transportation, including roadways, bridges, railroads, and transit; aviation; and ports, including navigational channels; water resources projects; energy production and generation, including from fossil, renewable, nuclear, and hydro sources; electricity transmission; broadband; pipelines; stormwater and sewer infrastructure; drinking water infrastructure; and other sectors as may be determined by the Federal Permitting Improvement Steering Council.

Critical Lifelines Infrastructure & Public Facilities

Transporation	Health & Safety	Water Management	Solid Waste Management	Energy Lifelines	Communication	Hazardous Materials

Sector Lifeline	Agency/Entity	Estimated Project Costs	Other Funding Source	National Objective	HCDA Eligibility
Energy	Water and Power Authority	$145,000,000 VITOL Acquisition	N/A	UNM	Section 105(a)(1)(D) Section 105(a)(2)2) Section 105(a)16
Infrastructure	Department of Public Works (DPW)	$124,000,000 Veteran's Drive	$42,000,000	LMA	Section 105(a)(2) Section 105(a)(8)

See Infrastructure Projects Cost and Benefits section below for details about this process.

Allocation and Maximum Award

Allocation Amount: **$368,000,000.00**

Maximum Award Amount: To be determined based upon necessary and reasonable costs submitted with applications for infrastructure projects. If another Covered Project is proposed, this Action Plan will be amended at a future date.

Eligible Applicants

- Units of Governments of the USVI, including its autonomous and semi-autonomous instrumentalities, such as the Water and Power Authority, the Department of Public Works, the Waste Management Authority, the Bureau of Information Technology and other infrastructure related governmental and quasi-governmental entities, plus private sector entities procured to execute Public-Private Partnerships.

Eligible Activities

- HCDA Section 105(a)(1) Acquisition of Real Property
- HCDA Section 105(a)(2) Public Facilities and Improvements
- **HCDA Section 105(a)(3) Code Enforcement**
- HCDA Section 105(a)(4) Clearance, Rehabilitation, Reconstruction, and Construction of Buildings
- HCDA Section 105(a)(5) Architectural Barrier Removal
- HCDA Section 105(a)(8) Public Services
- HCDA Section 105(a)(11) Relocation

- HCDA Section 105(a)(12) Planning
- HCDA Section 105(a)(14) Activities Carried Out through Nonprofit Development Organizations
- HCDA Section 105(a)(15) Eligible nonprofit organizations
- HCDA Section 105(a)(16) Development of energy use strategies
- **HCDA Section 105(a)(19) Technical Assistance**
- HCDA Section 105(a)(21) Higher Education
- **HCDA Section 105(a)(25) Construction of Tornado-Safe Shelters**
- **HCDA Section 105(a)(26) Lead-based Paint Hazard Evaluation and Reduction**

Priorities

- Project beneficiaries are evidenced to be at least 50% low- and moderate-income persons or communities.
- Projects that meet the definition of mitigation activities.
- Projects that meet a CDBG-MIT national objective.
- Projects that demonstrate an accelerated timeline.
- Projects that use natural infrastructure methods to achieve resilience.
- Projects that include measures to prevent vulnerability in the future or provide innovative solutions to existing vulnerabilities.
- Projects that both improve existing infrastructure and address identified current and future risks; mitigation related to hurricanes, tropical storms and depressions, severe flooding, earthquake, tsunami, drought, landslide, wildfire, and pandemic;
- Projects that employ modern sustainability standards or best practices.
- An operations and maintenance plan must be provided to maintain the infrastructure in the long-term.
- The project is evidenced to resolve an impediment to or create new opportunities for economic activities.
- For any proposed projects not listed below, the VIHFA will develop a competitive application process to select eligible projects that meet the criteria described above. The competitive application process will be open to all eligible applicants and up to three applications may be submitted per entity. Depending on demand, no applicant will be awarded for their subsequent application until all successful eligible applicants have been awarded funding at least once. If a project is a phase of a larger project, the phase of the project submitted must be viable as a stand-alone project. Applicants are encouraged to incorporate nature-based solutions, including natural or green infrastructure, into their proposed projects.
- Department of Public Works projects in an aggregate amount of approximately $147,479,876.00.
- Essential Water projects by WAPA Water in an amount of approximately $36,500,000.000.
- Essential Electric projects by WAPA Electric in an amount of approximately $145,000,000.00.
- Waste Management department solutions that meet the requirements of this Action Plan and offer long term advantages for sustainability will be considered in an amount up to $100,000,000.00.

Projected Start and End Dates

Due to the complexity of this program, the timeline is 12 years from the date of the grant agreement.

Infrastructure Project Cost and Benefits Analysis

Infrastructure projects typically carry a high cost of labor and materials relative to the continental U.S. due to the isolated geography and limited workforce in the Territory. Each project will be informed by a consideration of cost and benefits considering these unique circumstances, but whenever possible will utilize local/regional talent and materials to reduce costs. The Territory's approach to assessing costs and benefits may be based on two existing frameworks. The first, HMGP's Guidance on cost effectiveness relies on a Benefit Cost Analysis, where projects for which benefits exceed costs are generally considered cost effective.

- The project cost estimate requested with each project application includes a line-item breakdown of all anticipated costs, including, as applicable: Costs for anticipated environmental resource impact treatment or historic property treatment measures;
- Costs for engineering designs/specifications, including hydrologic and hydraulic studies/analyses required as an integral part of designing the project;
- Construction/demolition/relocation costs, such as survey, permitting, site preparation, and material/debris disposal costs;
- All other costs required to implement the mitigation project, including any applicable project-type specific costs. Benefits in this methodology are often calculated using standard loss of function estimates provided by relevant federal agencies, which may also be utilized by the Territory.

  One disadvantage of this method is that benefits may only be measured as avoided damage, loss of function, and displacement and not fully consider the important socio-economic factors involved. Given the Territory's approach to mitigation and resilience as giving full consideration to systemic, inter-related processes that promote resilience, the method produced through the National Disaster Resilience Competition (NDRC) will help to supplement some of these factors. Under this method, to the greatest extent possible, a narrative description may be produced to identify evidence-based practices as the basis for the project proposal.

  This method includes the following steps:

1. A full proposed cost, including Federal, Territorial, and private funding, as well as expected operations and maintenance costs and functionally related to geographically related work;
2. A description of the current situation and the problem to be solved (including anticipated changes over the analysis period);
3. A description of the proposed project or program including functionally or geographically related elements and estimated useful life;
4. A description of the risks to the community if the proposal and any land use, zoning or building code changes are not implemented, including costs that might be avoided if a disaster similar to the qualifying disaster struck again, including costs avoided if as a result of the project remaining effective in a future disaster;
5. A list of the benefits and costs of the proposal and the rationale for including each effect using the table provided according to the following categories:
   a. Lifecycle costs;
   b. Resiliency value;
   c. Environmental Value;
   d. Social Value; and
   e. Economic Revitalization.
6. A description of risks to ongoing benefits from the proposed project or program; and
7. An assessment of challenges faced with implementing the proposal.

The exact method of benefit and cost assessments may vary and will be detailed further in the Infrastructure Policies and Procedures. Infrastructure programs will generate a wide array of employment opportunities and other positive impacts. The Territory is committed to ensuring local firms and jobseekers are fully engaged in this work. Coordination is underway with the Virgin Islands Department of Labor (DOL) to ensure employers' and jobseekers' needs are being considered for both large and small-scale infrastructure projects. DOL is a critical partner in ensuring the Territory's workforce is trained, prepared, and qualified for the work initiated by infrastructure construction. A key target population for this program will be low-income residents and businesses that qualify under Section 3. The Section 3 program requires

that recipients of certain HUD financial assistance, to the greatest extent possible, provide training, employment, contracting and other economic opportunities to low- and very low-income persons, especially recipients of government assistance for housing, and to businesses that provide economic opportunities to low- and very low-income persons. Each agency receiving funds under the Infrastructure Programs will receive technical assistance from VIHFA and direct hiring and training assistance from DOL to ensure their projects are compliant with Section 3 to the greatest extent feasible.

7.4 Economic Resilience & Revitalization

As part of a comprehensive mitigation program, economic development is a crucial component for the long-term resilience and viability of communities and households. Each economic resilience activity must demonstrate how it will contribute to meeting the CDBG-MIT criteria for eligible economic development assistance.

In addition to the economic hardship caused by Hurricanes Irma and Maria, the U.S. Virgin Islands economy has contracted since the Great Recession in 2008 and the closure of the HOVENSA oil refinery in 2012. A 2019 report notes that "Economic stressors on the predominantly single -sector economy have contributed to high unemployment and conspicuous poverty in the Territory" (Caribbean Exploratory Research Center, 2019). According to the assessment, the major areas of employment in the U.S. Virgin Islands are government, services, leisure and hospitality, and wholesale retail trade while the areas of manufacturing and information represent the industries with the lowest employment levels in the Territory.

As detailed in the CDBG-DR Action Plan, Hurricanes Irma and Maria had profound and lasting effects on the already fragile economy of the U.S. Virgin Islands. Revitalizing economic sectors like tourism and retail are critical to job creation/retention and expanding economic opportunities for small businesses throughout the Territory. Along with creating economic opportunities for residents, hardening commercial areas, and assisting small businesses with mitigation efforts will ensure that future disasters cause less economic disruption.

In addition to reinvigorating existing economies such as tourism, it is important to support the sustainable diversification of the economy. A more diversified economy will be more resilient in the face of future natural disasters and will incentivize the creation of higher-earning jobs in the long-run.

Economic diversification can pose major challenges, as there are considerable obstacles to attracting private investment and expanding existing businesses within the Territory. In addition to dramatically higher-than-average shipping and electricity costs and regulatory hurdles, the lack of a skilled labor force can preempt the relocation, growth, and creation of new, high-value businesses. Furthermore, access to financing is seriously limited, especially for small business ventures. It is critical that entrepreneurs in the Territory have a supportive business environment with easier access to capital and adequate technical support in the design and implementation of viable business plans.

Therefore, the U.S. Virgin Islands proposes an economic resilience program to complement its economic revitalization efforts through CDBG-DR.

The VIHFA will develop policies and procedures that will outline all requirements for any Economic Resilience & Revitalization project to be eligible for funding. All proposed projects must submit an application that describes the project's connection to mitigation needs and the priorities and eligibility requirements outlined in this Action Plan. Identified projects will be ranked and scored in conformance with a set of scoring criteria identified in the policies and procedures.

Table 43. Economic Resilience and Revitalization

Program	Allocation	Community Lifeline Impact	National Objective
Commercial Hardening & Financing	**$12,000,000.00**	Food, Water, Sheltering Safety and Security Hazardous Materials Communications	**LMI** **UNM**
Small Business Mitigation	**$7,000,000.00**	Food, Water, Sheltering Safety and Security Communications	**LMI** **UNM**
Entrepreneurship Resilience and Innovation	**$8,000,000.00**	**Safety and Security**	**LMC** **LMJ**
Workforce Development Mitigation	**$8,000,000.00**	**Safety and Security**	**LMC** **LMJ**

7.4.1 Commercial Hardening & Financing Program

The goal of the Commercial Hardening & Financing Program is to minimize operational down time and accelerate recovery of commercial areas after a disaster to benefit LMI residents and others. Privately owned commercial or industrial buildings or ports may be rehabilitated or hardened to become more resilient. Such projects may include but are not limited to those that result in abatement of asbestos hazards, remediation of mold, lead abatement, lead-based paint hazards evaluation and reduction, and the correction of code violations and provision of permanent emergency power (e.g., generators and solar arrays). 24 CFR 570.202(a)(3).

The intention of the program is to upgrade private buildings and return them to productive business uses and ensure the ability for such facilities to be fully operating during emergencies. Accordingly, at the time the application is submitted the private entity or person that is going to undertake the rehabilitation of the structure must own the property or have an option to purchase the property.

Commercial financing is often needed to supplement or replace CDBG-MIT funds for economic resilience and revitalization projects. Programs initiated or systems improved to enhance or replace privately available capital sources may be eligible for funding.

Historic Preservation: CDBG-MIT funds may be used for the rehabilitation/hardening, preservation or restoration of historic properties that are privately owned. Historic properties are those sites or structures that are either listed in or eligible to be listed in the National Register of Historic Places, listed in an inventory of historic places, or designated as a landmark or historic district by appropriate law or ordinance. Historic preservation, however, is not authorized for buildings for the general conduct of government.

Hardening marine industrial and commercial facilities has particular importance to the US Virgin Islands. Current facilities are limited, with only three marine industrial sites operating in the Territory at present. Therefore, damage to or degradation of such facilities can and has had profound impact on island commercial enterprises that depend on having clear and functioning port facilities.

For example, when a hurricane approaches, many ships--be they residential or commercial--must be moved out of ports and on to safe land-based facilities to avoid destruction from hurricane winds and waves. Previous disasters have resulted in the sinking of numerous ships in areas such as Krum Bay where deteriorating sunken ships have resulted in environmental degradation of the Bay and pose an environmental risk to the island's salinization-based water supply system, which has its intake nearby.

Pictured: Deteriorating ships and barges in Krum Bay.

The USVI has received a small grant from the United States Environmental Protection Agency (EPA) to assist in removing the sunken vessels from Krum Bay. However, the EPA grant would only cover a small part of the cost of eliminating the environmental hazards and clearing the defunct wreckage out of the bay.

There is an essential need for alternate port sites to dramatically improve the efficiency and speed of critical life-saving operations and the inflow of supplies needed to assist residents of the island, especially during emergencies.

Mitigation measures undertaken as part of commercial hardening may include but are not limited to:

- Drainage and stormwater/surge management for commercial areas
- Boat ramps and improved shoreline and roads for evacuation/receiving supplies
- Port and harbor improvements
- Generators for commercial facilities' infrastructure
- Generators for continuous power at critical private retailers
- Removal of hazardous materials
- Hardening of Building exteriors and improved facility for community outreach/education efforts

Allocation and Maximum Award

Allocation Amount: **$12,000,000.00**

Eligible Applicants

- For profit businesses
- Non-profit organizations
- Units of Government of the USVI, including its autonomous and semi-autonomous instrumentalities

Eligible Activities

- HCDA Section 105(a)(1) Acquisition of Real Property
- HCDA Section 105(a)(2) Public Facilities and Improvements
- **HCDA Section 105(a)(3) Code Enforcement**
- HCDA Section 105(a)(4) Clearance, Rehabilitation, Reconstruction, and Construction of Buildings
- HCDA Section 105(a)(5) Architectural Barrier Removal

- HCDA Section 105(a)(8) Public Services
- HCDA Section 105(a)(11) Relocation
- HCDA Section 105(a)(12) Planning
- HCDA Section 105(a)(14) Activities Carried Out through Nonprofit Development Organizations
- HCDA Section 105(a)(15) Eligible nonprofit organizations
- HCDA Section 105(a)(17) Assistance to For-Profit Entities
- HCDA Section 105(a)(19) Provision of technical assistance to public or nonprofit entities to increase the capacity of such entities to carry out eligible neighborhood revitalization or economic development
- HCDA Section 105(a)(22) Assistance to public and private organizations, agencies, and other entities to facilitate economic development
- **HCDA Section 105(a)(26) Lead-based Paint Hazard Evaluation and Reduction**

Priorities

Priorities will be projects that meet the CDBG-MIT criteria for eligible economic development assistance and do the following:

- Create jobs for predominantly LMI individuals
- Reduce risks to life, property, and critical environments
- Stabilize and grow the tourism industry through key infrastructure improvements to ports and commercial areas that will increase the Territory's capacity to receive tourists
- Remove hazardous materials from key commercial areas
- Harden infrastructure to mitigate against future disasters in key commercial areas
- In conjunction with improvements, utilize job placement programs for trainees
- Increase the capacity of ports, harbors, and other marine infrastructure

The VIHFA will develop a competitive application process to select eligible projects that meet the criteria described above. The competitive application process will be open to all eligible applicants and up to two applications may be submitted per entity. Depending on demand, no applicant will be awarded for their subsequent application until all successful eligible applicants have been awarded funding at least once. Applicants are encouraged to incorporate nature-based solutions, including natural or green infrastructure, into their proposed projects.

Projected Start and End Dates

Commercial hardening and financing activities may involve complex projects with an expected timeline of 2021 for up to 12 years from the program start date.

7.4.2 Small Business Mitigation Improvements

The Mitigation Improvements for Small Business Program is intended to minimize operational down time and accelerate recovery of small businesses after a disaster.

Mitigation measures may include but are not limited to:

- Dry Floodproofing of Non-residential Structures
- Generator installation
- Solar power installation
- Weatherization

- Drainage Improvements
- Communication Systems

Allocation and Maximum Award

Allocation Amount: **$7,000,000.00**

Eligible Applicants

- Small businesses as defined the SBA at 13 CFR part 121 or businesses engaged in “farming operations” that meet the U.S Department of Agriculture Farm Service Agency criteria described at 7 CFR 1400.500

Eligible Activities

- HCDA Section 105(a)(1) Acquisition of Real Property
- HCDA Section 105(a)(2) Public Facilities and Improvements
- **HCDA Section 105(a)(3) Code Enforcement**
- HCDA Section 105(a)(4) Clearance, Rehabilitation, Reconstruction, and Construction of Buildings
- HCDA Section 105(a)(5) Architectural Barrier Removal
- HCDA Section 105(a)(8) Public Services
- HCDA Section 105(a)(11) Relocation
- HCDA Section 105(a)(12) Planning
- HCDA Section 105(a)(14) Activities Carried Out through Nonprofit Development Organizations
- HCDA Section 105(a)(15) Eligible nonprofit organizations
- HCDA Section 105(a)(12) Planning
- HCDA Section 105(a)(17) Assistance to For-Profit Entities
- HCDA Section 105(a)(19) Provision of technical assistance to public or nonprofit entities to increase the capacity of such entities to carry out eligible neighborhood revitalization or economic development
- HCDA Section 105(a)(22) Assistance to public and private organizations, agencies, and other entities to facilitate economic development
- **HCDA Section 105(a)(26) Lead-based Paint Hazard Evaluation and Reduction**

Priorities

Priorities will be projects that meet the CDBG-MIT criteria for eligible economic development assistance and do the following:

- Create jobs predominantly for LMI individuals
- Reduce risks to life, property, and critical environments
- In conjunction with improvements, utilize job placement programs for trainees

The VIHFA will develop a competitive application process to select eligible projects that meet the criteria described above. The competitive application process will be open to all eligible applicants and up to two applications may be submitted per entity. Depending on demand, no applicant will be awarded for their subsequent application until all successful eligible applicants have been awarded funding at least once. Applicants are encouraged to incorporate nature-based solutions, including natural or green infrastructure, into their proposed projects

Projected Start and End Dates

Small business mitigation activities may be carried out from 2021 when project applications are released through 2027.

7.4.3 Entrepreneurship Resilience and Innovation

Total Activity Allocation: $8,000,000

Proposed Use of Funds:

The CDBG-MIT Economic Resilience and Revitalization staff conducted stakeholder meetings concerning entrepreneurial activities within the Territory. Stakeholders represented retail, maritime, historic, and the Enterprise Zone. The expertise of the people interviewed are actively engaged in commerce and trade within the Territory. The meeting identified the following concerns:

- Volatile commercial and retail sector impacted by the 2017 storms, the COVID-19 pandemic
- Inactivity or inertia in improving historic commercial districts
- Lack of economic diversification experienced with COVID-19 pandemic
- Telecommunications slow improvement or lack of thereof;
- Scarcity or Global stringency on financial capital
- Marketing of Local Tourism product is deemed “out-of-date”

Similar concerns were also listed in both the U.S. Virgin Islands Vision 2040 Plan and the Comprehensive Economic Development Strategy (CEDS).

VIHFA has begun addressing stakeholders’ concerns by developing and launching project activities utilizing Community Development Block Grant disaster recovery and mitigation funding. For example, the disaster recovery Neighborhood Revitalization Program and mitigation Commercial Hardening and Financing Program are designed to harden and improve the façade of commercial buildings within the historic districts. The Small Business Mitigation Program addresses improvement of communication resilience.

The Entrepreneurship Resilience and Innovation Program (ERIP) provides a wealth of opportunities to existing and newly established small businesses. The most recent U.S. Census Bureau survey list the number of businesses in the Territory as 2,319 with 1,279 of those businesses being establishments with less than five (5) employees. An aggressive small business platform serves as viable way to overcome economic barriers including diversifying products and services.

ERIP focuses on providing financial capital to sustain and build economic resilience to entrepreneurs, while fostering small business innovation and risk management guidance. Technical assistance training will be afforded by eligible training providers. Eligible program applicants shall identify the need for a specific project activity, the creation or retainment of employees and the development of innovative methods of lessening operational downtime.

VIHFA has identified the following CDBG-MIT Entrepreneurship Resilience Program activities:

7.4.3.1 Small Business Risk Management Grant

Eligible Activity: Technical Assistance (HCDA Section 105(a)(19)); Assistance to neighborhood-based nonprofit organizations, local development corporations, nonprofit organizations (HCDA Section 105(A)(15)); For profit assistance for economic development (HCDA Section 105(a)(17)); Microenterprise Assistance (HCDA Section 105(a)(22), Section 570.201; Special Economic Development Activity (24 CFR 570.203)

National Objective: Low-and Moderate-Income Clientele; Low-and Moderate-Income Jobs, Urgent Need Mitigation

Geographic Area (s) Served: Territory-Wide

Distribution of Funds: Notice of Funding Availability (NOFA) will be issued.

Maximum Award: Awards will be based on cost estimates and a cost reasonableness analysis.

Administering Entity: Virgin Islands Housing Finance Authority

The Small Business Risk Management Grant (SBRM) provides funding towards mitigation activities which lessens operational downtime of commerce/trade. Applicants are allowed to become creative in meeting the needs of the business. Small entrepreneurs and microenterprises shall utilize CDBG-MIT funding on acceptable projects that may expand or sustain a new or existing business. The program also seeks to addresses and identify business innovation activities which allows the applicant to whether natural or manmade disasters.

Funding under this program is open to the following entities:

- For Profit businesses
- Non-profit organizations
- Units of Government of the USVI, including its autonomous and semi-autonomous instrumentalities
- Microenterprises
- Small businesses as defined the SBA at 13 CFR part 121 or businesses engaged in farming operations that meet the U.S Department of Agriculture Farm Service Agency criteria described at 7 CFR 1400.500

Examples of funding usage:

- Mitigation Advertising or Marketing
- Networking/Communications Resilience
- Industry Expansion
- Mitigation Small Business Infrastructure
- Mitigation Workforce Development
- Development of Environmental/Green Business
- Inventory/Machinery/Equipment

*Costs cannot exceed determined grant award.

7.4.3.2 Resilience Small Business Technical

National Objectives: Low-and Moderate-Income Clientele; Low-and Moderate-Income Jobs, Urgent Mitigation Need

Eligible Activities: Technical Assistance (HCDA Section 105(a)(19)); Assistance to neighborhood-based nonprofit organizations, local development corporations, nonprofit organizations (HCDA Section 105(a)(15)); For profit assistance for economic development (HCDA Section 105(a)(17)); Microenterprise Assistance (HCDA Section 105(a)(22), Section 570.201; Special Economic Development Activity (24 CFR 570.203).

Eligible Applicants:

- Certified technical assistance providers
- Public and Private, including non-profit and for profits
- Technical Assistance Providers

Geographic Area (s) Served: Territory-Wide

Distribution of Funds: Notice of Funding Availability (NOFA) will be issued.

Maximum Award: Awards will be based on cost estimates and a cost reasonableness analysis.

Administering Entity: Virgin Islands Housing Finance Authority

The technical assistance component of ERIP is designed to support entrepreneurs by providing specialized training to eligible businesses to build economic resilience and to lessen future business disruptions. The courses taught shall provide strategic methods for entrepreneurs to obtain sustainable business growth and counseling towards preventing drawbacks or snares that may affect start-up businesses or industries. The program's also promotes the creation of low- and moderate-income jobs and business training in green technology.

Selected Technical Assistance (TA) providers will be responsible for utilizing program funding to provide supportive assistance to eligible small businesses. TA providers will receive and manage all applications for businesses and employers seeking technical assistance under the ERIP program.

Funds may be used for but not limited to:

- Development of a mitigation/economic resilience business plan
- Emergency Disaster Business Plan
- Capacity building
- Communication resilience
- Mitigation Marketing
- Skilled workforce development,
- Diversifying operational funding opportunities
- Environmental/Green Technology
- Expansion of products and services being offered
- Information Technology
- Infrastructure Mitigation
- Emergency Commerce
- Inventory

7.4.4 Workforce Development Mitigation

Total Activity Allocation: $8,000,000

Eligible Activity: Public Services (HCDA Section 105(a)(8)), Planning (HCDA Section 105(a)(12)(14))

Eligible Applicants:

- Certified technical assistance providers
- Public and Private, Non-Profit, For-Profit Entities
- Technical Assistance Providers
- Units of Government, semiautonomous or independent

National Objective:

- Low- and Moderate-Income Limited Clientele
- Urgent Need Mitigation
- Low- and Moderate-Income Projection
- At least 50 % of all residents of the Workforce Development Mitigation Program will be Low- and Moderate-Income

Geographic Area(s) Served: Territory-Wide

Distribution of Funds: Notice of Funding Availability (NOFA) will be issued.

Maximum Award: Awards will be based on cost estimates and a cost reasonableness analysis.

Administering Entity: Virgin Islands Housing Finance Authority

Proposed Use of Funds:

The 2019 Territorial Hazard Mitigation Plan references the need for continued capability assessment. The plan examines urgent need to build a certified workforce to meet the needs of the local entities. Funding should be identified for funding opportunities which would assist the capacity building of crucial agencies such as DPNR. Holistically, workforce development planning should also include tourism, transportation, or other careers based on the need of the community.

Workforce development is one of the cornerstones of economic resilience. This program will fund industry sector training needed within the Territory. Emphasis will be placed on training the workforce to better handle or be prepared for unexpected events whether manmade or natural disaster. The program will target at least 50 percent of low-to-moderate income residents.

VIHFA has provided CDBG funding for previous workforce and on-the-job training initiatives. For example, the Skills for Today/On-the-Job Training program targeted 400 low-and -moderate income residents for basic certification in construction and trade industries. The program also provided 240 residents work-based or on the job training in transportation, medical, maritime, information technology, and hospitality. Skills for Today trained and certified over 800 residents. Illustrating the demand for continued workforce training but also focusing on mitigating the employment needs of the Territory's economy.

The Workforce Development Mitigation Program also targets entrepreneurship innovation as critical skills to foster the creation and growth of small businesses. The Workforce Development Program will strengthen collaborations between education and training organizations, and employers with a shared goal of providing solutions to promote growth and stability of the local economy, while mitigating hazardous events that may impact employment and trade. The program's focus is on the current and future needs of the workforce. Industry sector training may include construction, information technology, transportation, leisure and hospitality, medical/healthcare, and personal/home care. The program also allows for training in sector innovation and environmental/green technologies.

The Workforce Development Mitigation Program will prioritize training curricula for on-the-job training participants. Funds from this program may be used to purchase equipment, supplies, and technology required for specific vocational programs only for nonprofit or public training providers that are physically located in the U.S. Virgin Islands. Eligible entities may include:

- Vocational training organizations
- Established providers such as universities.
- Firms and employers with the goal of creating and supporting partnerships to develop workforce training and placement programs for Virgin Islanders

7.5 Resilient Housing Programs

The VIHFA is exploring expansion of existing CDBG-DR development projects to conform to the additional objectives and responsibilities set forth in this Action Plan. Any changes to the existing housing programs will be reflected through an Action Plan amendment. In assessing the community demand (driven by public outreach and stakeholder events), the VIHFA has identified significant increased need for housing in addition to the programs already undertaken through the CDBG-DR program.

All housing construction and repairs are projected to use sustainable building code standards as well as prioritizing opportunities to include advanced housing mitigation solutions.

Table 44. Resilient Housing

Program	Allocation	Community Lifeline Impact	National Objective
Single Family Resilient New Home Construction	$60,000,000.00	Food, Water, Sheltering	LMI UNM
Resilient Multifamily Housing	$100,000,000.00	Food, Water, Sheltering	LMI UNM
Homeless Housing Initiative	$23,000,000.00	Food, Water, Sheltering	LMI
Innovative Resilient Housing	$5,000,000.00	Food, Water, Sheltering	UNM

7.5.1 Single Family Resilient New Home Construction Program

Turnkey Development Program

The Territory has historically relied much more on single-family housing than multi-family housing to meet housing needs and home ownership has traditionally been an attainable goal for USVI residents. However, the cost of single-family housing has risen dramatically, therefore, many residents are unable to become homeowners. This program will be established to increase homeownership opportunities for residents of low-moderate income at or below 80% of AMI and to provide workforce housing for those with income levels between 80% and 120% of AMI. Providing a broader income spectrum will have the benefit of decreasing the concentration of poverty and helping to provide workforce housing for those who would otherwise not be able to reach the aspiration of home ownership. The VIHFA will develop policies and procedures for the Single Family Resilient New Home Construction program that will outline all requirements for funding eligibility.

National Objective: Low- to Moderate-Income Housing; and Urgent Need.

Low- and Moderate-Income Projection: 70%; The program will prioritize LMI applicants able to qualify for homeownership.

Allocation

Allocation Amount: $60,000,000.00

Maximum Award Amount: Awards will be based on the scope of work based on a consistent economy grade of building materials for the Territory, using a national building standard estimating software. Units will be required to meet housing quality standards (HQS) standards. Details of building standards will be further defined in the program guidelines. Per unit costs may not exceed $700,000 (inclusive of mitigation measures such as elevation as needed).

Funds for rehabilitation and construction will be delivered in the form of forgivable construction loans. These loans will be forgivable over a five-year period. Rents must be restricted based on AMI as applicable.

Eligible Activities

- HCDA Section 105(a)(1) Acquisition of Real Property
- HCDA Section 105(a)(4) Clearance, Rehabilitation, Reconstruction, and Construction of Buildings
- HCDA Section 105(a)(5) Architectural Barrier Removal
- HCDA Section 105(a)(8) Public Services
- HCDA Section 105(a)(11) Relocation
- HCDA Section 105(a)(18) Rehabilitation or development of housing

Eligible Applicants

- Units of Government of the USVI
- Public housing authorities
- For-profit Developers/Borrowers
- Not-for-profit Developers/Borrowers

All eligible applicants must support the development of mixed-income (both subsidized and market rate) environments by eliminating neighborhoods of concentrated poverty, eligible applicants may utilize funds for the development of land (including but not limited to infrastructure, grading, installation of utilities, and land preparation) for mixed-income communities. This will help subsidize the extraordinarily high costs of these items due to topographical site conditions. When CDBG-MIT program funds are used to install the subdivision infrastructure, a minimum of fifty-one percent (51%) of the total subdivision households must meet the low- and moderate-income criteria of earning no more than eighty percent (80%) of the AMI. Program funds used directly for home construction must be for homes sold to households with AMI <120%. LMI (those earning no more than 80% of the AMI) households will be prioritized. Eligible developer applicants include both for- and non-profit private developers building on land owned by VIHFA.

Priorities

- Eligible homebuyers for purchasing the newly constructed home are households that earn no more than 80% of the AMI and are mortgage-ready.

- Eligible homebuyers for purchasing the newly constructed home are households that earn no more than 120% of the AMI and are mortgage-ready.

Projected Start and End Dates

The proposed project begins Quarter 3, 2024 through the life of the grant.

Proposed Use of Funds

To enhance the quality of life for U.S. Virgin Islands residents and alleviate strain on the housing stock, this innovative program aims to empower Low- to Moderate-Income (LMI) households to become homeowners through direct financial incentives, effectively fostering a new wave of first-time buyers. By creating this new homeowner stock, the initiative will also relieve some of the pressures on the rental market, Due to a multitude of factors, displaced individuals must resort to informal, often overcrowded living arrangements in existing single-family homes. The unique challenges facing the construction of new single-family homes in the Territory include limited buildable land due to steep grades and high topography, resulting in exorbitant costs for site preparation and construction, particularly in St. Thomas and St. John.

Recognizing the financial hurdles facing potential homeowners, the Virgin Islands Legislature passed legislation in 2005 to raise the income limit for low- and moderate-income individuals participating in the Virgin Islands Finance Authority's Home and Land Ownership program to 3.5 times the median income in the Virgin Islands. Despite the high building costs, the monthly mortgage payment for a new home constructed under this program is projected to be lower than rent for a similarly sized rental unit due to the extremely prohibitive rental market.

Before new homes can be constructed, vacant land parcels require substantial infrastructure improvements, including streets, curbs, sidewalks, flood and drainage systems, lighting, sewer lines, and utilities, located in public areas (not on the homesite). Each housing unit will be built on an individual homesite.

To facilitate the creation of new, ready-to-move-in homes, prospective homebuyers with household incomes up to 120% of the Area Median Income (AMI) must complete the Homebuyer Counseling Program and demonstrate mortgage readiness. The Virgin Islands Housing Finance Authority (VIHFA) will engage developers/contractors to install the necessary infrastructure for the subdivisions on land owned by the U.S. Virgin Islands Housing Finance Authority and construct single-family homes on individual lots. Costs for infrastructure on public land (such as roads, utilities, and lighting) will be funded with Community Development Block Grant Mitigation (CDBG-MIT) funds and excluded from calculations for assisting homebuyers.

The sales prices for homes built on individual homesites and made available to eligible homebuyers will be based on the lesser of total construction costs or current market value, whichever is lower. Construction costs are capped at $350,000 per home (excluding community infrastructure costs). Homebuyers will be required to secure a traditional first mortgage in an amount that ensures affordability. In cases where a gap exists between the sales price and the homebuyer's eligible mortgage amount, VIHFA will provide a mortgage buy-down to cover the difference. Homebuyers must sign a Grant Agreement to ensure compliance with the program's occupancy requirements.

Maximum Award: The award will be based on the scope of work based on a consistent economy grade of building materials for the Territory, using a national building standard estimating software. Units will be required to meet housing quality standards (HQS) standards. Details of building standards will be further defined in the program guidelines. Construction costs will be capped in accordance to VIHFA’s Multifamily Housing Policy..

Circumstances where additional costs may be incurred will be reviewed against cost reasonableness guidelines. Awards for homebuyer assistance will not exceed the total of the down payment and closing costs necessary to make the home affordable, based on underwriting standards.

A review of the maximum award amount of assistance to be provided to each household will include:

- Ensure first mortgage amount is reasonable under current lending standards (the housing expenses (mortgage, taxes and insurance) to income ratio, and total debt (including housing) to income ratios are not too low or too high);
- The mortgage has a fixed rate and is long term so the household will be able to maintain homeownership of over the CDBG-MIT compliance period;
- The amount of assistance is adequate to make homeownership affordable but is not excessively subsidizing the transaction, and
- The down payment and buyer-paid closing costs are reasonable in relation to buyer funds.

Eligibility Criteria:

- Must be a first-time homebuyer.
- Must meet established income requirements.
- Must provide proof of citizenship and residency for the last three tax years.
- Must be pre-qualified for a mortgage loan based on nationally accepted underwriting standards of FHA/VA/Conventional Mortgages.
- Must complete a Homebuyer's Education Program and earn a Certificate of Completion.

Homebuyers who are beneficiaries under this program must agree to occupy this home as their primary residence for a ten-year affordability period by VIHFA's existing affordability period for homeownership programs.

Affordability Period and Resale and Recapture Restrictions

The CDBG-MIT award is secured in a Second Lien and forgiven over a twenty (20)-year period.

The Borrower must live on the property as their main home for at least twenty (20) years. The forgiveness starts when the Deed of Mortgage and Restrictive Covenants is signed at closing. If the Borrower breaks the rules of the Second Lien, VIHFA can take back part or all of the grant.

Each year, the grant is reduced by five (5%) for each full year the Borrower lives in the home, with no credit for partial years. This means the grant gets smaller by five percent each year if the Borrower stays in the home.

If something out of the Borrower's control happens, like a natural disaster or job change, VIHFA might agree to take back less of the grant or forgive the loan. This helps Borrowers who face unexpected challenges.

The goal of the CDBG-MIT program is to encourage long-term residency and stability. By reducing the grant amount over time, it gives Borrowers a reason to stay in their homes and support the U.S. Virgin Islands community.

Resale Provisions

Affordable housing units constructed or offered for sale under this Program shall not be sold during a control period of twenty (20) years from the date of the original sale for a price greater than the sales price which equals the original selling price plus a percentage of the unit's original selling price equal to the increase in the cost of living as determined by the United States Department of Labor's Consumer Price index, plus the fair market value of improvements made to the unit between the date of original sale and the date of resale, plus an allowance for payment of closing costs. The affordable sale price formula may be amended or modified from time to time by the Agency.

A Resale Covenant outlining the resale requirements will be recorded against the property at the time of the original purchase and will remain in place until the control period of twenty (20) years has been satisfied.

Recapture Provisions

Affordable housing units sold to eligible persons and families under the Program and subsequently offered for resale to the public by the original purchaser during the twenty (20) year control period in contravention of paragraph (c) of this Section 212 shall be subject to the following recapture rule:

Affordable housing units shall not be sold, transferred or otherwise disposed of within two hundred forty (240) months from the date of the original purchase thereof under the Program unless (i) the transferee of the affordable housing unit satisfies the eligibility requirements under the Program in effect on the date of sale and transfer or (ii) the original purchaser or his transferee agrees to pay a recapture penalty based on a percentage of the amount of the selling price in excess of the original purchase price ("excess profits") of the unit.

The recapture provisions shall be incorporated in a Second Priority Mortgage in the amount of the subsidy. This mortgage creates a lien on the buyer and the property and shall be subordinate only to the primary mortgage and with the formal approval of the VIHFA.

The resale and recapture requirements will be further outlined in the program's policies and procedures.

The VIHFA outlines the requirements for a project to be eligible for funding in the Multifamily Housing Policy.

7.5.2 Resilient Multifamily Housing Program

The Resilient Multifamily Housing Program will allow for rehabilitation, reconstruction, and the new construction of multi-family developments. The purpose of the rental program is to repair, restore and increase the affordable housing stock predominantly for LMI households.

A minimum of 51 percent of the units must be restricted for a minimum affordability period of fifteen (15) years for the rehabilitation or reconstruction of multifamily rental projects with eight or more units, and a

minimum affordability period of twenty (20) years for the new construction of multifamily rental units with five or more units for LMI individuals earning 80 percent or less of the AMFI at HUD established affordable rents. If a rental project that requires rehabilitation or reconstruction is subject to existing affordability requirements associated with other funding sources, the 15-year and 20-year affordability periods may run concurrently (or overlap) with the affordability requirements associated with such other funding.

The VIHFA will develop policies and procedures for the Resilient Multi-family Housing program that will outline all requirements for a project to be eligible for funding.

Allocation and Maximum Award

Allocation Amount: $100,000,000.00

Maximum Award Amount: $30,000,000.00 million per development

Eligible Applicants

- Public housing authorities
- Units of Government of the USVI, including its autonomous and semi-autonomous instrumentalities
- The VIHFA
- For-profit Developers/Borrowers
- Not-for-profit Developers/Borrowers

Eligible Activities

- HCDA Section 105(a)(1) Acquisition of Real Property
- HCDA Section 105(a)(2) Public Facilities and Improvements
- HCDA Section 105(a)(4) Clearance, Rehabilitation, Reconstruction, and Construction of Buildings (including Housing)
- HCDA Section 105(a)(5) Architectural Barrier Removal
- HCDA Section 105(a)(8) Public Services
- HCDA Section 105(a)(11) Relocation
- HCDA Section 105(a)(12) Planning
- HCDA Section 105(a)(14) Activities Carried Out through Private or Public nonprofits
- **HCDA Section 105(a)(18) Rehabilitation or development of housing**
- **HCDA Section 105(a)(26) Lead-based Pain Hazard Evaluation and Reduction**

Priorities

The priority in the implementation of these initiatives is the benefit to LMI individuals and households. In addition, the following priorities will be considered:

- Projects that leverage public and private financing, such as Low-Income Housing Tax Credits (LIHTC) and other funds
- Projects located in Opportunity Zones
- Projects that use mitigation solutions and other construction technology designed to mitigate disaster risks including but not limited to elevation; retention basins; fire-safe landscaping; firewalls; and landscaped floodwalls

Projected Start and End Dates

The proposed timeline is from HUD approval up to 12 years from the start of the program. New resilient construction may take additional time to complete when considering siting, design, development, and construction timeframes.

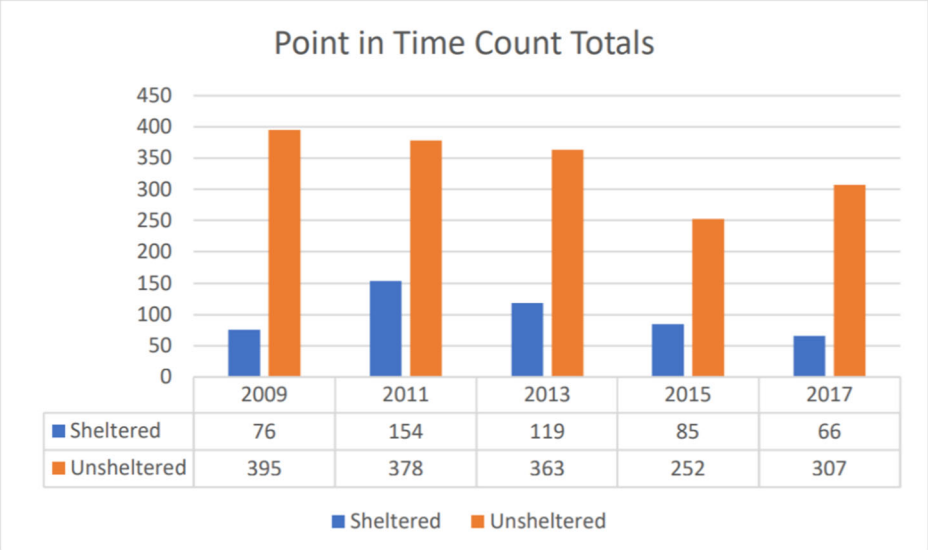
7.5.3 Homeless Housing Initiative--Permanent Supportive Housing Development

According to recent Point in Time Count data (see chart below) the Territory has an unusually high percentage of chronically homeless persons relative to the homeless population as a whole. For example, in 2017, 66 homeless persons were sheltered, versus 307 homeless persons who were unsheltered.

Additionally, previous Point in Time Counts have emphasized the need for more Permanent Supportive Housing. Because Permanent Supportive Housing has proven to be the most effective method of housing those who are chronically homeless, this program will focus on the production of Permanent Supportive Housing units to account for more recent data on the USVI homeless population.

The VIHFA will develop policies and procedures for the Homeless Housing Initiative program that will outline all requirements for a project to be eligible for funding.

Figure 54. USVI Homeless Count Totals



Allocation and Maximum Award

Allocation Amount: $23,000,000.00

Maximum Award Amount: Project awards will be deemed reasonable on a case-by-case basis within the parameters of the program policies and procedures established.

Eligible Applicants

- Units of Government of the USVI, including its autonomous and semi-autonomous instrumentalities (including Public housing authorities)
- For-profit Developers/Borrowers
- Not-for-profit Developers/Borrowers

Eligible Activities

- HCDA Section 105(a)(1) Acquisition of Real Property
- HCDA Section 105(a)(2) Public Facilities and Improvements
- HCDA Section 105(a)(4) Clearance, Rehabilitation, Reconstruction, and Construction of Buildings (including Housing)
- HCDA Section 105(a)(5)
- HCDA Section 105(a)(8) Public Services
- HCDA Section 105(a)(11) Relocation
- HCDA Section 105(a)(12) Planning
- HCDA Section 105(a)(14) Activities Carried Out through Private or Public nonprofits
- **HCDA Section 105(a)(18) Rehabilitation or development of housing**
- **HCDA Section 105(a)(26) Lead-based Pain Hazard Evaluation and Reduction**

Projected Start and End Dates

The proposed timeline is from HUD approval until 2027.

7.5.4 Innovative Resilient Housing

The USVI has an acute shortage of housing units that may be used for temporary housing in the event of emergencies or disasters. The VIHFA desires to establish an innovative resilient housing program to mitigate the risk to loss of life of those who are homeless or residing in substandard housing when disasters strike.

This program will encourage innovative architectural and construction techniques to provide strong, resilient housing with economical development costs.

The VIHFA will develop policies and procedures for the Innovative Resilient Housing Initiative program that will outline all requirements for a project to be eligible for funding.

Allocation and Maximum Award

Allocation Amount: $5,000,000.00

Maximum Award Amount: $5,000,000.00

Eligible Applicants

- Units of Government of the USVI, including its autonomous and semi-autonomous instrumentalities
- Public housing authorities
- For-profit Developers/Borrowers
- Not-for-profit Developers/Borrowers

Eligible Activities

- HCDA Section 105(a)(1) Acquisition of Real Property
- HCDA Section 105(a)(2) Public Facilities and Improvements
- HCDA Section 105(a)(4) Clearance, Rehabilitation, Reconstruction, and Construction of Buildings (including Housing)
- HCDA Section 105(a)(12) Planning
- HCDA Section 105(a)(14) Activities Carried Out through Private or Public nonprofits

Projected Start and End Dates

The proposed timeline for the Innovative Resilient Housing project is from 2022 to 2026.

7.6 Public Services

In addition to public services associated with many of the programs listed above, the MNA and public input process have revealed the need for direct services to the community to increase resilience during and after disasters.

The 2017 disasters exacerbated situations for already vulnerable populations. Within this group the share of unemployment is high resulting in a wide range of social services and subsidies required for these individuals and households. The occurrence of two back-to-back Category 5 storms and the displacement and chaos that followed, has also increased the need for supportive services for vulnerable populations.

To address this need, the program will provide grants through a competitive application process to social services organizations that may enhance the support service network for vulnerable populations through the following types of programs:

- Education and outreach campaigns designed to alert communities and beneficiaries to opportunities to further mitigate identified risks through insurance, best practices, and other strategies
- Health and welfare programs to increase personal resilience to disasters and protect the health and safety of residents during and after disasters
- Apprenticeship/Mentorship programs in key sectors
- Homelessness prevention
- Hurricane and other disaster preparedness
- Technology-based Resiliency Programs
- Housing Counseling

7.7 Territory Planning Program

In addition to using Planning funds for activities such as Action Plan development, public outreach, and coordination, the VIHFA understands through the MNA process that planning studies may be beneficial to identify solutions to disaster risks and promote sound mitigation practices across the Territory.

The requirements at 24 CFR 570.483(b)(5) or (c)(3), which limit the circumstances under which the planning activity can meet a low- and moderate-income national objective, will not apply to CDBG-MIT planning activities; instead, the Territory will comply with 24 CFR 570.208(d)(4) when funding mitigation, planning-only grants, or directly administering planning activities that guide mitigation in accordance with the Appropriations Act. In addition, the types of planning activities that may be funded or undertaken in the MIT-AP will be consistent with those of entitlement communities identified at 24 CFR 570.205, which may include support for local and regional functional land use plans, master plans, historic preservation plans, comprehensive plans, community recovery plans, resilience plans, development of building codes, zoning ordinances, and neighborhood plans.

Studies may include, but are not limited to, climate change, flood control, earthquake mitigation, waste management, drainage improvements, resilient housing solutions, homelessness, surge protection, economic development and sustainability, infrastructure improvement, engineering studies or other efforts to mitigate risks and future damages and establish plans for comprehensive recovery and emergency planning efforts. Further amendments to this Action Plan may convert a portion of these planning funds to execute specific projects contemplated or developed through the planning process.

Table 45. Planning Allocation

Program	Allocation	Community Lifeline Impact	National Objective
Planning	$9,750,000.00	Food, Water, Sheltering Safety and Security Hazardous Materials Communications Transportation Health & Medical Energy	LMI UNM

7.7.1 Allocation and Maximum Award

Allocation Amount: **$9,750,000.00**

7.7.2 Eligible Applicants

- Non-governmental organizations (501(c)(3)) or Not for Profit Entities
- Units of Government of the USVI, including its autonomous and semi-autonomous instrumentalities
- Public or Private Institutions of Higher Learning (Universities)
- Organizations and/or vendors to conduct studies with CDBG-MIT funds

7.7.3 Eligible Activities

- HCDA section 105(a)(12) Eligible planning, urban environmental design, and policy-planning-management-capacity building activities as listed in 24 CFR 570.205.

7.7.4 Priorities

The criteria to select plans for completion will be set forth in the Planning policies and procedures developed by VIHFA.

Planning priorities include the following:

- Promote sound, sustainable mitigation planning informed by an evaluation of hazard risk, especially land-use decisions that reflect responsible floodplain management and consider future possible extreme weather events and other natural hazards and long-term risks
- Integrate mitigation measures into rebuilding activities and achieve objectives outlined in regionally or locally established plans and policies that are designed to reduce future risk to the jurisdiction
- Consider the costs and benefits of the project
- Ensure that activities will avoid disproportionate impact on vulnerable populations such as, but not limited to, families and individuals that are homeless or at risk of homelessness, the elderly, persons with disabilities, persons with alcohol or other drug addiction, persons with HIV/AIDS and their families, and public housing residents
- Ensure that activities create opportunities to address economic inequities facing local communities

- Align investments with other improvements and infrastructure development efforts
- Employ adaptable and reliable technologies to guard against premature obsolescence of infrastructure and to increase the resilience of the economy

7.7.5 Projected Start and End Date

The proposed timeline is from HUD approval through 2028. Plans that relate to projects which may be carried out with CDBG-MIT funds as part of another project will have required plan completion dates that allow time for construction completion within the program timeline.

7.8 VIHFA Administration

VIHFA administrative costs including subrecipient administration costs will not exceed five (5) percent, $38,709,400. Planning and administrative costs combined will not exceed twenty (20) percent. The VIHFA will retain the full 5 percent allocated for administrative costs associated with the CDBG-MIT allocation for purposes of oversight, management, and reporting.

The VIHFA may also set forth caps on administration and project delivery costs for partner entities and subrecipients in subsequent program guidelines and policies and procedures.

7.9 Timely Information on Application Status and Confidentiality

The VIHFA understands the importance of providing all program applicants with current, accurate, and clear information throughout their application process. The processes required to deliver benefits, particularly in housing-related activities, are multi-step complex processes that require extensive documentation. Not only do applicants need to keep up to date on any missing supporting documentation or impediments to their grant award, but the program can also assist applicants in staying aware of other resources that may be available to them. Real time access to information about grant status is a priority, together with effective case management, including the ability to contact their case manager by appointment, mail, email, or phone during operation hours. Parameters will be set so that applicants will understand their expected return response times. Printed status updates to applicants who do not have access to electronic media and phone service will be provided.

In addition to program-wide information available on the CDBG-MIT area of the VIHFA's website, the Program will use printed and electronic materials, various forms of media including television and radio, publications, direct contact, and placement of flyers/posters in public facilities, neighborhood facilities, churches, and community centers to provide timely information. Program information and documents will also be available in multiple languages to accommodate the non-English speaking participants. The website will also contain a contact number to obtain information by phone and to contact a Constituent Services Representative to request information related to applications along with a Web Form Application Status Request. There will be a link on the website to access VIHFA's secure method of requesting specific information related to the status of applications.

Prior to scheduling an in-person appointment for the intake process of their application, program applicants will receive a detailed listing of all required documentation needs. Applicants with physical disabilities and/or a need for translation services will be accommodated as needed. Scheduled updates will be made to keep the applicant updated on missing documentation and application status. Application status will be accessible to the program applicant during the processing of the application, until the eligibility

determination is made, and the grant award is determined via the applicant's preferred contact method, as selected in their application. This determination of grant award will be provided to the applicant in writing.

Applicants will have an opportunity to appeal the determination of eligibility and grant award as well as provide additional documentation to support their appeal through an appeals process that will be provided to all applicants at the initial intake and posted on the Program's website. All applications, guidelines, and websites will include details on the right to file an appeal, and the process for beginning an appeal. Refer to Appendix O of the Implementation Plan– Timely Information on Application Status Policy as well.

7.9.1 Confidentiality/Personally Identifiable Information (PII)

VIHFA is committed to ensuring the privacy and confidentiality of Personally Identifiable Information (PII). The current measures of the VIHFA include distribution of an Employee Handbook during the orientation process for all new employees.

If there is a question of whether certain information is considered confidential, the employee should first check with their supervisor. All employees may be required to sign a non-disclosure agreement as a condition of employment. Employees who improperly use or disclose trade secrets or confidential business information will be subject to disciplinary action, up to and including termination of employment and legal action, even if they do not actually benefit from the disclosed information.

The protection of confidential business information and trade secrets is vital to the interests and the success of VIHFA. Such confidential information includes, but is not limited to, the following examples:

- Compensation data
- Customer lists
- Customer preferences
- Financial information
- Labor related strategies
- New materials research
- Pending projects and proposals
- Proprietary production processes
- Research and development strategies
- Scientific data
- Scientific formulae
- Specific prototypes
- Technological data
- Technological prototypes

A policy regarding confidentiality and personally identifiable information will be distributed to all contractors, consultants, vendors, contractors, auditors, and any personnel engaged on any part of the CBDG-DR program, information received via electronic media and all agreements. This fully updated policy will be included in the Action Plan. Refer to Appendix Q – Employee Handbook: Section 112 – Non-Disclosure/Confidentiality; Appendix R – Personally Identifiable Information (PII) draft policy as well.

Finally, and including all of the aforementioned information, for any application status on any program that requires an application submission, a status update can be obtained by contacting Ms. Antoinette Fleming at (340) 777-4432 or via email at anfleming@vihfa.gov. An additional phone number will be established under CDBG-MIT to provide information to the public, by making a request by email, similar to what is already being done under CDBG-DR's EnVIsion program.

7.10 Exceptions to Maximum Award Amounts

The VIHFA will make exceptions to the maximum award amounts based on its Exception Policy. Each request for an exception to the maximum award amount or other program policies will be reviewed on a case-by-case basis by VIHFA. Requests must be submitted in writing and include a justification for

exceeding the maximum award amount or other policy requirements. The policy exception is not to be implemented until the VIHFA authorizes the exception in writing. Requests will be review by VIHFA and a response will be provided in writing within 45 business days.

7.11 Long-term Operation and Maintenance

The specific funding for long-term Operation and Maintenance (O&M) for infrastructure and public facility projects will depend upon what specific projects are chosen through the procurement process. The chart below is duplicative from Section 7.3 of the MIT-AP.

Program	Project Allocation	Community Lifeline Impact	National Objective
Community Resilience & Public Facilities Construction	$100,000,000.00	Food, Water, Sheltering Communications Safety and Security	LMI UNM
Resilient Critical and Natural Infrastructure	$368,000,000.00	Food, Water, Sheltering Transportation Health and Medical Hazardous Materials	LMI UNM

Community Resilience and Public Facilities Construction projects selected will include items such as community shelters and multipurpose facilities dedicated to disaster preparedness. Such projects will be underwritten by VIHFA staff to ensure that the financial models upon which they are based will include funding for long-term O&M. Such projects may be proposed by departments of the Territorial government acting as subrecipients or to private non-profit or for-profit groups that successfully respond to VIHFA procurement activities. In the case of government owned facilities, the VIHFA will not find them to be eligible unless they provide assurance that sufficient funding has been dedicated from existing local taxation, or other fees or revenue that can reasonably be projected as viable sources for the Territory, with information to be collected by the VIHFA as part of the application process.

Resilient Critical and Natural Infrastructure projects will consist of food, water, sheltering, transportation, health, and medical projects and those relating to the safe and appropriate disposition of hazardous materials. This broad spectrum of potential projects will also be underwritten by VIHFA staff to ensure that the financial models upon which they are based will include funding for long-term O&M. In the case of such projects that address water, transportation and other infrastructure provided by the Territorial Government or quasi-governmental entities such as WAPA, sufficient resources for O&M will have to be dedicated from available and reasonably predictable revenue sources such as taxation and user fees. Food, sheltering, health and medical projects will be required to demonstrate that sufficient reserves have been established to cover long-term O&M.

Because such projects have not yet been identified, the VIHFA will include language in its policies and procedures that clearly requires dedicated revenue streams to be adequate for long term O&M for any proposed projects to be eligible for CDBG-MIT funding.

7.12 Subrecipient Expenses, Program Income, and Timely Payment

The VIHFA is currently updating its Financial Policy and Procedures to provide more detail regarding monitoring subrecipient expenditures, accounting for and managing program income and reprogramming funds in a timely manner.

Program Income is defined as “gross income generated from the use of CDBG-MIT funds.” Examples of program income include, but are not limited to, the following: a) proceeds from the disposition by sale or lease of real property purchased or improved with CDBG-MIT funds, b) proceeds from the disposition of equipment purchased with CDBG-MIT funds, c) net income from the use of rental property owned by the grantee. The VIHFA does not anticipate generating any program income with the utilization of CDBG-MIT funds, and the VIHFA intends to continue to follow its practice of ensuring that any program income will be used or distributed before seeking further withdrawals from the U.S. Treasury. However, should program income be generated, the VIHFA will track the receipts within the VIHFA’s financial records and report the receipts to HUD via the Disaster Recovery Grant Reporting System (DRGR) database as required in the regulations. Any program income received prior to grant closeout shall be utilized for additional eligible CDBG-MIT activities.

The updated Financial Policy and Procedures will further detail how the VIHFA will ensure that all contracts and bills that require payment are timely paid, as well as ensuring that its actual and projected expenditure of funds will be accurately reported in DRGR QPR. In conjunction with this Financial Policy and Procedure update, the VIHFA plans to enhance its SOP documents, and complete a Subrecipient Handbook that will be provided to HUD, all CDBG-MIT grantees, and subrecipients.

Upon ongoing development of the CDBG-MIT Program, this comprehensive CDBG-MIT Subrecipient Handbook builds on lessons learned from CDBG-DR operations. It will encompass administration, programmatic implementation, and compliance and monitoring, including required monitoring of subrecipient expenditures. This Handbook will serve as the guide for CDBG-MIT Program staff, grantees, and subrecipients. The purpose of the handbook will be to assure that all CDBG-MIT funds are properly managed and accounted for, to establish a process for submitting and receiving timely payments; for processing program income, if any; the rules for determining when VIHFA may recapture funds for reprogramming; instructions to ensure that actual and project expenditures are reported in DRGR QPR; and finally it will provide assurances that require grantees and subrecipients to administer their projects and programs in accordance with all CDBG-MIT rules and regulations.

Additionally, VIHFA will provide required training to grantees and subrecipients on how to use the Handbook, in addition to continuing to follow its practices for signed required agreements and approved checklists for vetting potential subrecipients for eligibility before proceeding with any steps to provide CDBG-MIT funds.

Current VIHFA processes will be further enhanced and updated with the integration of subrecipient and grantee communication via the CDBG-MIT area of the VIHFA’s website, advertisements of program milestones, meetings throughout the affected areas of the territory, direct mailings regarding individual application status, and emails. Finally, the VIHFA is considering an application portal for subrecipients and grantees to check the status of submissions in real-time. VIHFA personnel will be responsible for the communication and processing of applications.

The Director of Energy Solutions will oversee the administration of all energy solutions initiatives and projects that are funded by the Authority, including the proposed Vitol Acquisition which is intended to be funded with this CDBG-MIT funding under the Critical and Natural Infrastructure Resilience program. The Director of Energy Solutions and support staff will ensure that the proposed performance measures for this activity are met by soliciting requisite information from the subrecipient and reporting on each performance measure in DRGR. The data for each performance measure will be collected from the documentation noted below.

1. Shoretank Receipts for LPG Deliveries

2. Shoretank Receipts or similar for Diesel Deliveries
3. Current copies of LPG fuel supply contracts and associated Governing Board Approvals
4. Current copies of Diesel fuel supply contracts and associated Governing Board Approvals
5. LPG Inventory Reports
6. Diesel Inventory Reports
7. Monthly T&D and Production Management Report

8.0 Natural Infrastructure

8.0 NATURAL INFRASTRUCTURE

Located in the Leeward Islands of the Lesser Antilles, the U.S. Virgin Islands (USVI) is approximately 40 miles east of Puerto Rico and over 1,100 miles from Miami, Florida. The USVI is a territory comprised of three main islands—Saint Croix, Saint John, and Saint Thomas—and several surrounding islands. The Territory is focused on advancing resilience strategies through carefully managing its natural infrastructure, while also carefully improving infrastructure systems on each of the major islands to maintain the natural resources it currently enjoys. This focus can continue to provide effective solutions for minimizing flooding, erosion, and runoff, by developing man-made systems that work with and mimic natural processes—known as natural infrastructure.

Natural infrastructure approaches include forest, coastal, floodplain and wetland protection, watershed restoration, wetland restoration, permeable pavement, and driveways; green roofs; and natural areas incorporated into designs and conservation easements. A natural infrastructure approach represents a successful and cost-efficient way to protect communities within the Territory. While there is much to be done to further improve the design and restoration efforts in coastal communities, this Action plan will focus on key programs that strengthen and support the natural infrastructure through data-driven solutions that improve resiliency within the Territory.

As outlined within this MIT-AP, regulations and codes are key mechanisms used within the Territory for land use and natural resource management. Many of the resources discussed within the plan are parts of the US Virgin Islands Code and additional requirements may need to be superimposed over, or “overlay”, the base regulations already in place.

Beyond the specific methods needed to assess and compare grey infrastructure against natural infrastructure options relative to their utility to mitigate risk, a framework is required that would provide additional guidance on how to further consider natural infrastructure solutions in its envisioned CDBG-MIT projects within the Territory.

The Territory has and will continue to collaborate with experts in the field of resource management to verify that projects funded through this grant maintain and sustain natural processes, while minimizing impacts to critical habitats, species composition and biodiversity. Further, the Territory will consider natural infrastructure during the CDBG-MIT project selection and program development process.

9.0 Construction Standards

9.0 CONSTRUCTION STANDARDS

In the interest of reducing the risks associated with natural hazards, the Territory will continue to seek to incorporate an industry-recognized standard for building resilient or disaster resistant structures, such as those outlined within the International Code Council construction standards that have been already adopted.

To ensure that housing activities result in resilient, energy efficient affordable housing units, the VIHFA has developed CDBG-DR Construction Standards (Standards) which are required for housing activities and projects that include CDBG-DR funding. These Standards promote energy efficiency and green building practices for new construction or rehabilitation (retrofit) residential projects. The VIHFA subrecipients and developers must utilize the VIHFA Green Building Retrofit Checklist in its entirety based on the type of structure (new construction or rehabilitation of single- or multi-family housing). The VIHFA will also incorporate the "Stronger Home" construction standards developed by FEMA and the Department of Planning and Natural Resources (DPNR).

9.1 Sustainability

All construction will implement methods that emphasize high quality, energy efficiency, sustainability, and mold resistance. All rehabilitation, reconstruction, and new construction will be designed to incorporate principles of sustainability, including water and energy efficiency, resilience, and mitigation against the impact of future disasters.

9.2 Accessibility

The use of recovery funds must meet accessibility standards, provide reasonable accommodations to persons with disabilities, and take into consideration the functional needs of persons with disabilities in the relocation process.

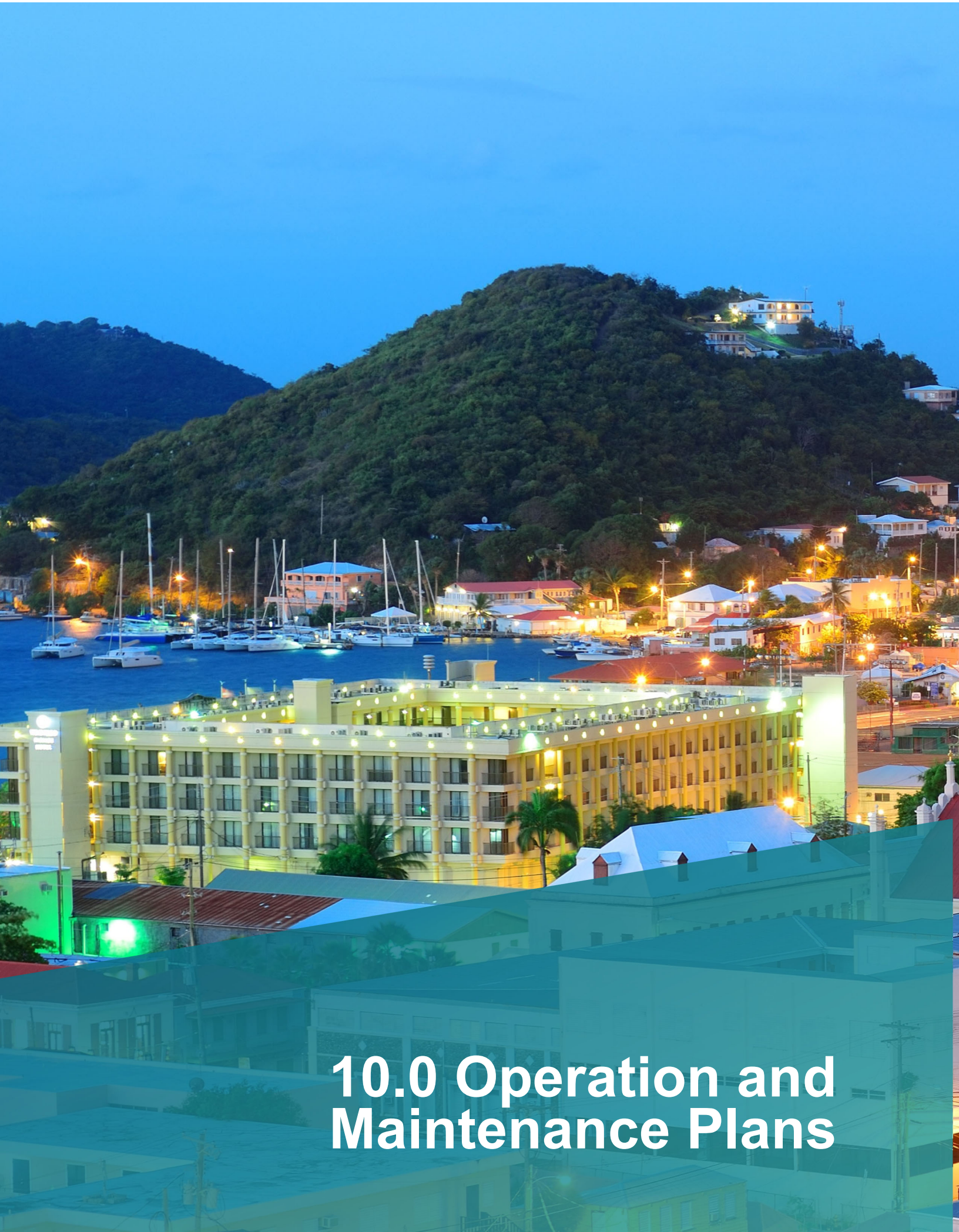
A checklist of accessibility requirements under the Uniform Federal Accessibility Standards (UFAS) is available at: http://www.hudexchange.info/resources/796/ufas-accessibility-checklist/. The HUD Deeming Notice 79 FR 29671 (May 23, 2014) explains when HUD recipients can use 2010 ADA Standards with exceptions, as an alternative to UFAS to comply with *Section 504*.

9.3 Green Building Standards

Within the Territory, all new construction of residential buildings or replacement and/or reconstruction of substantially damaged buildings are expected to incorporate the VIHFA's Green Building Standards recently approved by HUD, and rehabilitation of non-substantially damaged residential buildings must follow guidelines in the HUD Community Planning and Development Green Building Retrofit Checklist. Any construction subject to the Green Building Standards must meet an industry-recognized standard and achieve certification under at least one of the following programs: Energy Star; Enterprise Green Communities; LEED; ICC-700 National Building Standard; EPA Indoor AirPLUS; or any other equivalent comprehensive green building program deemed acceptable to HUD and approved by the VIHFA.

9.4 Broadband Infrastructure

Per 83 FR 8362, any substantial rehabilitation, as defined by 24 CFR 5.100, or new construction of a building with more than four rental units must include installation of broadband infrastructure, except where the U.S. Virgin Islands documents that: a) The location of the new construction or substantial rehabilitation makes installation of broadband infrastructure infeasible; b) the cost of installing broadband infrastructure would result in a fundamental alteration in the nature of its program or activity, and/or pose an undue financial burden; or c) the structure of the housing to be substantially rehabilitated makes installation of broadband infrastructure infeasible.



10.0 Operation and Maintenance Plans

10.0 OPERATION AND MAINTENANCE PLANS

FRN-6109-N-02 allows for flexibility in the use of program income to address on-going operations and maintenance of mitigation projects. Such eligible uses include repair, operation, and maintenance of publicly owned projects financed with CDBG–MIT funds. The Territory will request an appropriate waiver to avail itself of this flexibility for itself and subgrantees as appropriate. Through its implementation of CDBG-MIT programs, the VIHFA will plan for the long-term operation and maintenance of infrastructure and public facilities funded with CDBG-MIT funds.

Each proposed project application must identify the plan for long-term operation and maintenance of infrastructure and public facility projects funded with CDBG-MIT. The proposed project application must describe how it will fund long-term operation and maintenance for CDBG-MIT projects. The VIHFA will also address the following requirements within its policies and procedures on a program-by-program basis, including specific benchmarks instituted to ensure operations and maintenance requirements are met:

1. Resources must be identified for the operation and maintenance costs of projects assisted with CDBG-MIT funds;
2. If operations and maintenance plans are reliant on any proposed changes to existing taxation policies or tax collection practices, those changes and relevant milestones must be expressly addressed; and
3. Any public infrastructure or facilities funded with CDBG-MIT resources must illustrate the ability to account for long-term operation and maintenance needs beyond an initial investment of CDBG-MIT funds.

11.0 Cost Verification

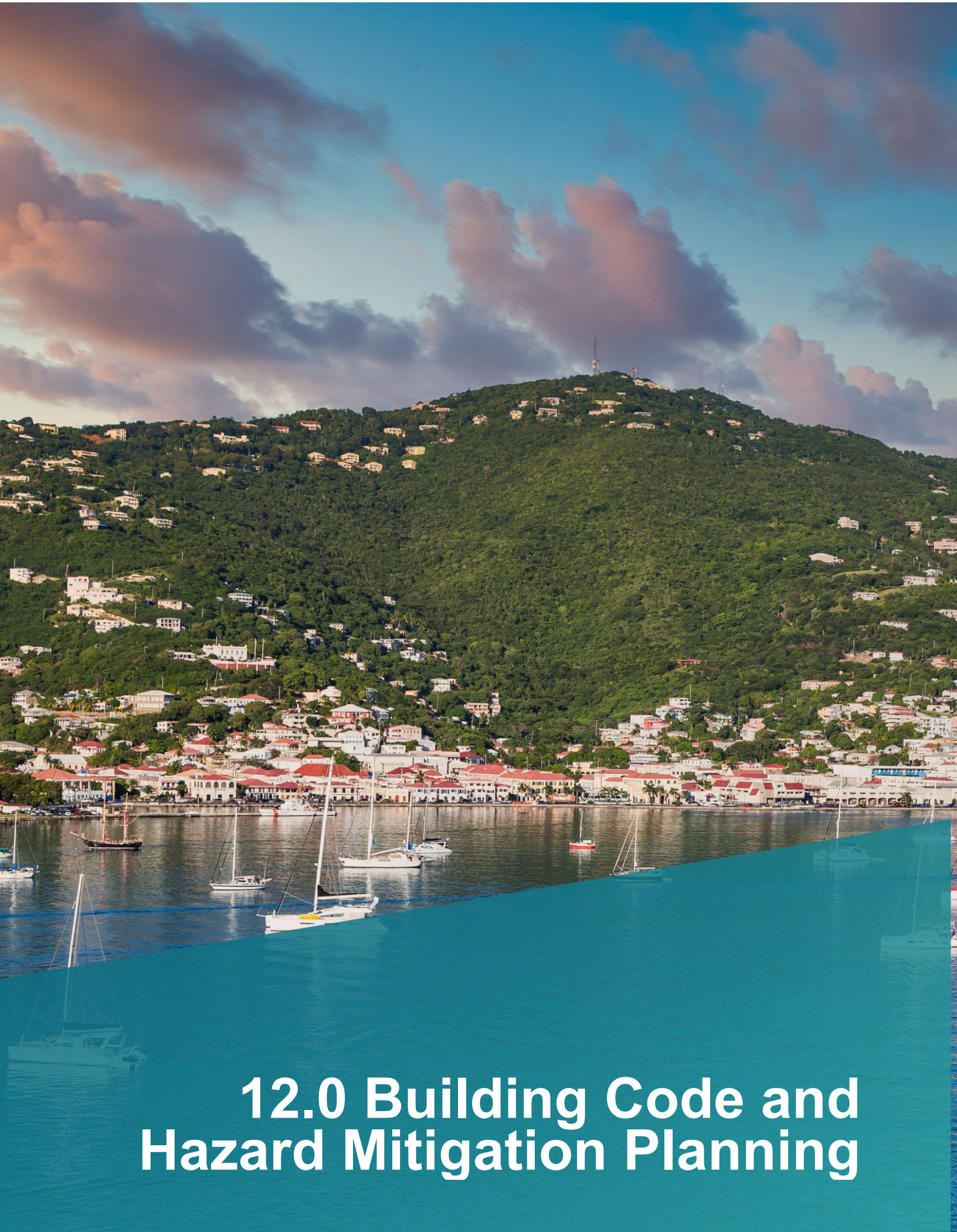
11.0 COST VERIFICATION

At all times, construction costs must remain reasonable and consistent with market costs at the time and place of construction.

If Covered infrastructure projects are implemented in a future change to the Action Plan, the VIHFA will establish specific cost controls for infrastructure, in accordance with accepted HUD standards.

The VIHFA will review projects and test for compliance with financial standards and procedures including procurement practices and adherence to cost reasonableness for all operating costs and grant-funded activities. All program expenditures will be evaluated to ensure they are:

- Necessary and reasonable
- Allocable according to the CDBG contract
- Authorized or not prohibited under territory/local laws and regulations
- Conform to limitations or exclusions (laws, terms, conditions of award, etc.)
- Consistent with policies, regulations, and procedures
- Adequately documented.
- Compliant with all Cross Cutting Federal Requirement including Uniform Administrative Requirements at 2 CFR 200.



12.0 Building Code and Hazard Mitigation Planning

12.0 BUILDING CODE AND HAZARD MITIGATION PLANNING

The Territory is committed to strengthening the resiliency of the islands by implementing strategies and plans; and by adopting ordinances to ensure building codes and mitigation plans are reflective of same. While no funds appropriated under Public Law 114-123 have been allocated for building code and hazard mitigation planning, these areas were already under discussion by territorial and regional agencies and collaborators, stakeholders, partners, and the local communities, prior to Hurricanes Irma and Maria. As a result of such discussions and meetings, plans have been implemented, and changes to the building codes were and still are being addressed to ensure construction and mitigation efforts result in a more resilient USVI. These areas are discussed in more detail hereinabove in Section 2.0 Long-Term Planning and Risk Mitigation Considerations and a copy of current Building Standards are in Appendix ED.

APPENDIX A: SCHEDULE OF EXPENDITURES AND OUTCOMES

The VIHFA maintains a schedule of expenditures and outcomes, periodically updated in accordance with its mandatory reporting to HUD. The schedule of expenditures and outcomes will be located at https://cdbgdr.vihfa.gov/programs/cdbg-mitigation/.

In accordance with the requirements of the Federal Register notice, these projections will be monitored and updated to achieve compliance with the following:

- 50 percent of funds will benefit low-and-moderate income persons
- 50 percent of funds will be expended within six (6) years
- 100 percent of funds will be expended within twelve (12) years of HUD's execution of the grant agreement

CDBG-MIT Expenditure Timeline

Infrastructure & Public Facilities	Community Resilience & Public Facilities	$10M	$22.5M	$30M	$17.5M	$15M	$5M						
	Critical & Natural Infrastructure	$27.6M	$46M	$64.4M	$64.4M	$55.2M	$36.8M	$27.6M	$18.4M	$18.4M	$9.2M		
Economic Resilience & Revitalization	Commercial Hardening & Financing	$1.2M	$1.8M	$2.4M	$2.4M	$1.2M	$1.2M	$600K	$600K	$300K	$300K		
	Small Business Mitigation	$1M	$2.4M	$2.4M	$1M								
	Entrepreneurship Resilience and Innovation Program		$3.2M	$3.6M	$600K	$600K							
	Workforce Development Mitigation Program		$3.2M	$3.6M	$600K	$600K							
Housing	Single Family Resilient New Home Construction	$7.5M	$15M	$15M	$15M	$7.5M							
	Resilient Multifamily Housing	$10M	$15M	$22.5M	$20M	$12.5M	$5M	$5M	$2.5M	$2.5M			
	Homeless Housing Initiative	$2.3M	$3.4M	$3.4M	$5.1M	$5.1M	$3.4M						
	Innovative Resilient Housing	$1.2M	$2M	$1M	$500K	$250K							
Public Services		$1.5M	$3M	$3M	$1.5M	$1.5M	$1.5M	$750K	$750K	$750K	$750K		
Planning		$1.4M	$1.9M	$3.6M	$1.9M	$1.4M	$243K						
Administration		$3.8M	$3.8M	$4.8M	$4.8M	$5.8M	$4.8M	$3.8M	$3.8M	$1.9M	$900K		
	FY	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035

APPENDIX B: AMENDMENTS TO THE ACTION PLAN

Amendments to the action plan will be made to update its needs assessment, modify, or create new activities, or reprogram funds, as necessary. HUD requires amendments to be included in a contiguous document to make easier tracking of program and budget changes.

Substantial Amendments are characterized by the following criteria:

- The addition of a CDBG-MIT Covered Project
- A change in program benefit or eligibility criteria
- The addition or deletion of an activity
- The allocation or reallocation of any change greater than $25 million dollars or a change constituting more than 25% of an activity's budget. Substantial amendments will be available on the U.S. Virgin Islands CDBG-MIT Action Plan website (https://cdbgdr.vihfa.gov/programs/cdbg-mitigation/) for public review and comment for at least 30 days.

Non substantial Amendments are minor changes that do not materially alter the program activities or eligible beneficiaries as described above. The grantee must notify HUD five business days before the effective date of any non-substantial amendments. Non substantial amendments will be numbered in sequence, posted to the VIFHA website, and incorporated into this Action Plan.

This substantial amendment to the Action plan includes the addition of a covered project under the Infrastructure and Public Facilities Program. The narrative is provided in Appendix J. A summary of the changes is provided below.

- **The Infrastructure and Public Facilities Mitigation Program** was updated to incorporate the 'cover project' as an eligible activity granted by HUD under Federal Register Vol. 84, Vol (169 30, August 2019) 84 FR 45370, 45850. Additionally, clarifying language on the LMI and LMA beneficiaries.

- **Covered Project Section** was added with details of the requirements, project cost threshold criteria, and other alternative requirements established by HUD for these type of infrastructure projects. Revisions are included across the document to streamline the narrative for Covered Projects provisions.

APPENDIX C: CERTIFICATIONS

	Certifications Checklist	
	CDBG-MIT Grants under Public Laws 115-123 and 116-20	
	Each State or UGLG receiving a direct allocation in the Notice must make the following certifications (all information about the Action Plan certifications can be found at 84 FR 45869):	**Certification included with Action Plan?**
a.	As grantee, VIHFA, certifies that it has in effect and is following a residential anti-displacement and relocation assistance plan in connection with any activity any activity assisted with CDBG–MIT funding.	YES
b.	As grantee, VIHFA, certifies its compliance with restrictions on lobbying required by 24 CFR part 87, together with disclosure forms, if required by part 87.	YES
c.	As grantee, VIHFA, certifies that the Action Plan is authorized under State and local law (as applicable)[1] and that the grantee, and any entity or entities designated by the grantee, and any contractor, subrecipient, or designated public agency carrying out an activity with CDBG–MIT funds, possess(es) the legal authority to carry out the program for which it is seeking funding, in accordance with applicable HUD regulations and this notice. The grantee certifies that activities to be undertaken with CDBG–MIT funds are consistent with its action plan. [1] **Note:** The Territorial government acts as both the State and Local government. Consultation with stakeholders have been conducted.	YES
d.	As grantee, VIHFA, certifies that it will comply with the acquisition and relocation requirements of the URA, as amended, and implementing regulations at 49 CFR part 24, except where waivers or alternative requirements are provided for in this Notice.	YES
e.	As grantee, VIHFA, certifies that it will comply with section 3 of the Housing and Urban Development Act of 1968 (12 U.S.C. 1701u), and implementing regulations at 24 CFR part 135.	YES
f.	As grantee, VIHFA, certifies that it is following a detailed citizen participation plan that satisfies the requirements of 24 CFR 91.105 or 91.115, as applicable (except as provided for in notices providing waivers and alternative requirements for this grant). Also, each local government receiving assistance from a State grantee must follow a detailed citizen participation plan that satisfies the requirements of 24 CFR 570.486 (except as provided for in notices	YES

	providing waivers and alternative requirements for this grant).	
g.	As grantee, VIHFA, certifies that it has consulted with affected local governments in counties designated in covered major disaster declarations in the non-entitlement, entitlement, and tribal areas of the State in determining the uses of funds, including method of distribution of funding, or activities carried out directly by the State.	YES
h.	As grantee, VIHFA, certifies that it is complying with each of the following criteria:	
	(1) Funds will be used solely for necessary expenses related to disaster relief, long-term mitigation, restoration of infrastructure and housing, and economic revitalization in the most impacted and distressed areas for which the President declared a major disaster in 2015,2016, 2017, and 2018 pursuant to the Robert T. Stafford Disaster Relief and emergency Assistance Act of 1974 (42 U.S.C. 5121 et seq.).	YES
	(2) With respect to activities expected to be assisted with CDBG-MIT funds, the Action Plan has been developed so as to give the maximum feasible priority to activities that will benefit low- and moderate-income families.	YES
	(3) The aggregate use of CDBG-MIT funds shall principally benefit low- and moderate-income families in a manner that ensures that at least 50 percent of the grant amount is expended for activities that benefit such persons.	YES
	(4) As grantee, VIHFA, will not attempt to recover any capital costs of public improvements assisted with CDBG-MIT grant funds, by assessing any amount against properties owned and occupied by persons of low- and moderate-income, including any fee charged or assessment made as a condition of obtaining access to such public improvements, unless: (a) disaster mitigation grant funds are used to pay the proportion of such fee or assessment that relates to the capital costs of such public improvements that are financed from revenue sources other than under this title; or (b) for purposes of assessing any amount against properties owned and occupied by persons of moderate income, the grantee certifies to the Secretary that it lacks sufficient CDBG funds (in any form) to comply with the requirements of clause (a).	YES
i.	As grantee, VIHFA, certifies that it grant will conduct and carry out the grant in conformity with title VI of the Civil Rights Act of 1964 (42 U.S.C. 2000d) and the Fair Housing Act (42 U.S.C. 3601–3619) and implementing regulations, and that	YES

	it will affirmatively further fair housing.	
j.	As grantee, VIHFA, certifies that it has adopted and is enforcing the following policies. In addition, States receiving a direct award must certify that they will require UGLGs that receive grant funds to certify that they have adopted and are enforcing:	
	(1) A policy prohibiting the use of excessive force by law enforcement agencies within its jurisdiction against any individuals engaged in nonviolent civil rights demonstrations; and	YES
	(2) A policy of enforcing applicable State and local laws against physically barring entrance to or exit from a facility or location that is the subject of such nonviolent civil rights demonstrations within its jurisdiction.	YES
k.	As grantee, VIHFA, certifies that it (and any subrecipient or administering entity) currently has or will develop and maintain the capacity to carry out disaster mitigation activities in a timely manner and that the grantee has reviewed the requirements of this notice. The grantee certifies to the accuracy of its Mitigation Financial Management and Grant Compliance certification checklist (Public Laws 115-123) or 116-20 and 115-254 Financial Management and Grant Compliance certification checklist, or other recent certification submission, if approved by HUD, and related supporting documentation referenced at A.1.a under Section V and its Implementation Plan and Capacity Assessment and related submission to HUD referenced at A.1.b under Section V (84 FR 45838) and its Implementation Plan and Capacity Assessment and related submission to HUD referenced at (86 FR 561).	YES
l.	As grantee, VIHFA, certifies that it considered the following resources in the preparation of its action plan, as appropriate: FEMA Local Mitigation Planning Handbook: https:// www.fema.gov/media-library-data/ 20130726-1910-25045-9160/fema_local_ mitigation_handbook.pdf; DHS Office of Infrastructure Protection: https:// www.dhs.gov/sites/default/files/ publications/ip-fact-sheet-508.pdf; National Association of Counties, Improving Lifelines (2014): https:// www.naco.org/sites/default/files/ documents/NACo_ResilientCounties_ Lifelines_Nov2014.pdf; the National Interagency Coordination Center (NICC) for coordinating the mobilization of resources for wildland fire: https:// www.nifc.gov/nicc/); the U.S. Forest Service's resources around wildland fire (https://www.fs.fed.us/managing-land/ fire); and HUD's CPD Mapping tool: https://egis.hud.gov/cpdmaps/.	YES

m.	As grantee, VIHFA, will not use grant funds for any activity in an area identified as flood prone for land use or hazard mitigation planning purposes by the State, local, or tribal government or delineated as a special flood hazard area (or 100-year floodplain) in FEMA's most recent flood advisory maps, unless it also ensures that the action is designed or modified to minimize harm to or within the floodplain, in accordance with Executive Order 11988 and 24 CFR part 55. The relevant data source for this provision is the State, local and tribal government land use regulations and hazard mitigation plan and the latest issued FEMA data or guidance, which includes advisory data (such as Advisory Base Flood Elevations) or preliminary and final Flood Insurance Rate Maps.	YES
n.	As grantee, VIHFA, certifies that its activities concerning lead-based paint will comply with the requirements of 24 CFR part 35, subparts A, B, J, K, and R.	YES
o.	As grantee, VIHFA, certifies that it will comply with environmental requirements at 24 CFR Part 58.	YES
p.	As grantee, VIHFA, certifies that it will comply with applicable laws.	YES
	Warning: Any person who knowingly makes a false claim or statement to HUD may be subject to civil or criminal penalties under 18 U.S. C. 287, 1001 and 31 *U. S. C. 3729.*	

VIHFA certifies that accuracy and validity of the responses provided for the CDBG-MITIGATION Action.

By Official Responsible for CDBG-MIT Grant Implementation:

Signature of Authorized Official

8/17/23

Date

Dayna Clendinen, Interim Executive Director

Virgin Islands Housing Finance Authority

APPENDIX D: COMMUNITY PARTICIPATION AND PUBLIC COMMENT

The VIHFA values the input of its many affected citizens, decision makers, and stakeholders representing the vulnerable communities that suffered the impacts of Hurricanes Irma and Maria. As set forth in the Notice at Page 45852, Section V.A. 3.a.; based upon the allocation designated for the Territory, the VIHFA was required to convene at least three (3) public hearings in the HUD identified MID areas (the entire USVI is a HUD MID area) to obtain citizen views; and to respond to proposals and questions. The Notice further requires that one of the public hearings must be held prior to the publication of public comment of its Plan on the website; and that all hearings are convened in different locations in order to ensure geographic balance and maximum accessibility.

HUD has determined the entire Territory to be a MID area, thus eliminating meeting location concerns. The Territory has utilized the most popular and accessible technology to reach the full breadth of the USVI MID. The technology is inclusive of all media and social media venues, including the internet via Facebook, Zoom, or similar applications, radio, and television.

It has been the primary goal of the public hearing process to create an environment to receive feedback and guidance from citizens and stakeholders throughout the Territory in order to shape project and program design, allocation amounts, and community needs. Further, the driver of community engagement and impacted jurisdictions is to course-correct the Plan and to include elements that may have been overlooked. It is difficult to gauge reactions on sometimes divisive issues, such as new construction or development, which has both significant supporters and understandable hesitance. VIHFA will work to incorporate feedback into program development to ensure that the programs that are funded are effectively meeting the needs of the affected individuals.

This appendix is designed to include all prescriptive authority. Thus, the following sections are included hereunder to meet such compliance with the public engagement regulations under the Notice.

a. (D-1) Community Engagement; the 3 required public hearings
b. (D-2) Website Links for easy access to materials presented at public hearings
c. (D-3) Screen shots, Facebook Views, and Chat Discussions
d. (D-4) Citizen Advisory Committee Participation
e. (D-5) Complaints, Appeals, and Website Information
f. (D-5) Copies of Public Notices

D-1 Community Engagement

The VIHFA convened one public hearing prior to posting the Substantial Amendment Draft Action Plan (Draft), as well as two (2) public townhalls, one in each district. This meeting schedule was advised and reflected the requirements of the governing FRN for a Substantial Amendment. The details and documentation from these hearings are presented herein and/or on the website links that are provided to allow quick access to all information related to the hearings.

Prior to the completion of the Draft, the VIHFA convened public engagements that were designed to inform people (residents, public agencies, decision makers, stakeholders, etc.) of the coming events, the unique opportunity presented by the CDBG-MIT funding, and to encourage the public to present

information regarding the revision to the existing potential mitigation needs in the territory. D-2 Links to Websites and PowerPoint Presentations.

Activity	Date	Details	Type of Meeting	Total Participants	Facebook Reach/Engagement
1. Pre-Publication Public Hearing	06/29/23	Zoom	Virtual	31	
2. First Public Hearing, Post Publication	07/12/23	St. Croix District Townhall Meeting	Town Hall	22	
3. Second Public Hearing, Post Publication	07/19/23	St Thomas/St. John District	Town Hall	24	35,000/ 2,500
Totals				77	

Attendees of Public Hearings Virtual and Sign-In-Sheet are below.

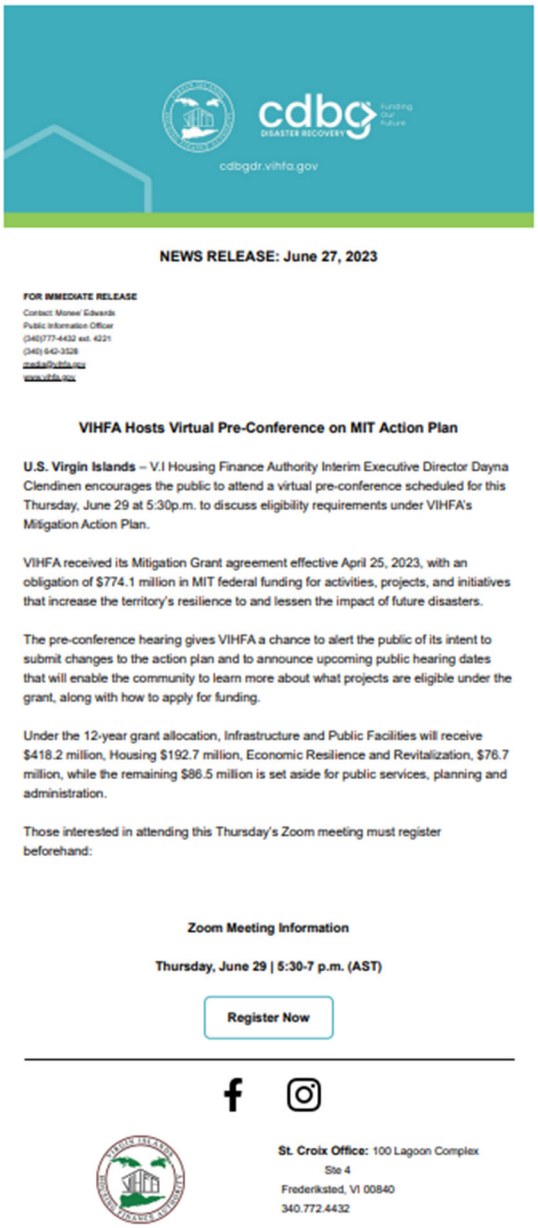
Pre-Publication Public Hearing Virtual Townhall	**First Public Hearing St. Croix Townhall**	**Second Public Hearing St. Thomas/St. John Townhall**
Speakers: Monee Edward, Moderator Ann Hanley Verline Constable Odari Thomas Melba Mathurin Anne-Marie Williams	**Speakers:** Monee Edward, Moderator Ann Hanley Odari Thomas Kyora Veira Andrew Smith	Speakers: Monee Edward, Moderator Odari Thomas Jacob Lewis
Participants: 1. VIHFA IT 2. Melba Mathurin 3. Dayna Clendinen 4. Stacy A. Bourne 5. Anne-Marie Williams 6. Jennell Bryan 7. Bernita Boxill 8. Mike Carter 9. Monique Watson 10. Sam H 11. Desiree Ross 12. Marcos López 13. Jeannine Francis-Brown 14. Ananta Pancham 15. Donnie Dorsett 16. Virginia Clairmont 17. Royan Robinson 18. Kimmonique David	**Participants:** 1. Lauren Nichols 2. Bernita Boxill 3. Ellie Hirsh 4. Devin Flaherty 5. Alicia Tabet 6. Doug Rideout 7. Elisa Sanchez 8. Genevieve Whitaker 9. Emily Weston 10. Tori Thompson 11. Cassandra Dunn 12. Torhera Durand 13. Jelani Newton 14. Vasudaur Boodoosingh 15. Suenietah Boodoosingh 16. Tara Boodoosingh 17. Alvin Canali 18. Lauren Larsen	**Participants:** 1. Jacob Lewis 2. Esther Smith 3. Arlene Blackman 4. Alena Richards 5. Pauline Dawes 6. Dawn Henry 7. Graciela Rivera 8. Sheri Richardson 9. Joan Swan 10. Theresa Tucker 11. Bernita Boxill 12. Delyn Willet 13. David Cannonier 14. Atanya Springette 15. James Gainey 16. Merian Pena Guerrero 17. Anthony King 18. Ashanti Lej

19. Ajani Corneiro 20. Ann Hanley 21. Kim Waddell 22. Richard Dorsey 23. 1340#-##19 24. Jamale Griffin 25. M Evans 26. Kyora Veira 27. Odari Thomas 28. Bob Jackson 29. Marcos López 30. Manuel Benitez 31. Monique Watson	19. S. Harlow 20. Imani Evans 21. Aimee Griles-Carino 22. Aminah Saleem	19. Dan Olis 20. Yvonne Watson 21. Avery Lewis 22. Pete Gingrass 23. Lionel Blucher 24. Winston Clyne

D-2 Links to Websites and PowerPoint Presentations

CDBG-Mitigation Webpage	CDBG-MITIGATION | CDBG (vihfa.gov)
CDBG-Mitigation Substantial Amendment 1 Draft (English)	VIHFA-CDBG-MIT-Amended-AP-Vitol-07.05.2023-redux.pdf
CDBG-Mitigation Substantial Amendment 1 Draft (Spanish)	Translated-copy-of-CDBG-MIT-Action-Plan-with-VITOL-Covered-Project-revisions_SpanishVersion.pdf (vihfa.gov)
Pre-Publication Public Hearing Presentation on June 29, 2023	0629-2023-Public-Hearing-Mitigation-Substantial-Amendment.pdf (vihfa.gov)
Public Hearing Presentation on July 12, 2023	PowerPoint Presentation (vihfa.gov)
Public Hearing Presentation on July 19, 2023	PowerPoint Presentation (vihfa.gov)
Link to Facebook video of Public Hearing on July 19, 2023	https://fb.watch/mcZmbgOqDr/

06/27/23 Press Release



cdbg DISASTER RECOVERY

cdbgdr.vihfa.gov

NEWS RELEASE: June 27, 2023

FOR IMMEDIATE RELEASE

Contact: Monee' Edwards
Public Information Officer
(340)777-4432 ext. 4221
(340) 642-3328
media@vihfa.gov
www.vihfa.gov

VIHFA Hosts Virtual Pre-Conference on MIT Action Plan

U.S. Virgin Islands – V.I Housing Finance Authority Interim Executive Director Dayna Clendinen encourages the public to attend a virtual pre-conference scheduled for this Thursday, June 29 at 5:30p.m. to discuss eligibility requirements under VIHFA's Mitigation Action Plan.

VIHFA received its Mitigation Grant agreement effective April 25, 2023, with an obligation of $774.1 million in MIT federal funding for activities, projects, and initiatives that increase the territory's resilience to and lessen the impact of future disasters.

The pre-conference hearing gives VIHFA a chance to alert the public of its intent to submit changes to the action plan and to announce upcoming public hearing dates that will enable the community to learn more about what projects are eligible under the grant, along with how to apply for funding.

Under the 12-year grant allocation, Infrastructure and Public Facilities will receive $418.2 million, Housing $192.7 million, Economic Resilience and Revitalization, $76.7 million, while the remaining $86.5 million is set aside for public services, planning and administration.

Those interested in attending this Thursday's Zoom meeting must register beforehand:

Zoom Meeting Information

Thursday, June 29 | 5:30-7 p.m. (AST)

Register Now

St. Croix Office: 100 Lagoon Complex
Ste 4
Frederiksted, VI 00840
340.772.4432

Public Hearing

Day: June 29, 2023

Place: Zoom

Time: 5:30 PM AST

Link to Media Campaign, Town Hall Presentation with Presentation Snapshots

Upcoming: Disaster Recovery Mitigation Town Halls (campaign-archive.com)

Link: Don't Forget! St. Croix Disaster Recovery Mitigation Town Hall (campaign-archive.com)

Day: July 12, 2023

Place: UVI Great Hall, St. Croix

Time: 5:30 PM AST

Link to Town Halls: VIHFA CDBG-DR Mitigation Public Hearing | Virgin Islands Housing Finance Authority (VIHFA) was live. | By Virgin Islands Housing Finance Authority (VIHFA) | Facebook

or https://fb.watch/mcZmbgOqDr/

Day: July 19, 2023

Place: UVI Administration & Conference Center

Time : 5 :30 PM AST

D-3 Screen Shots, Facebook Views, and Chat Discussions

Public Hearing 2, Post Action Plan Publication convened on July 12 at the University of the Virgin Islands Great Hall: Question and Comment Period, July 12, 2023

The first Post Publication Public Hearing Townhall was hosted for the St. Croix District. Venue time and importance was advertised to encourage maximum participation. The following captures the question-and-answer period portion of the Townhall. Participants were asked to hold questions to the end of the presentation. While this meeting was not electronically recorded, participants, and their questions and feedback were recorded. Additionally, participants' names and email addresses were captured along with the questions asked and answered at the meeting.

The following is the summary of questions and responses of both VIHFA and the VI WAPA representatives. Participants were afforded the ability to self-identify before providing their questions. VIHFA Media Team collected the names and emails of the participants to complete follow-up notices and email of the presentation.

Question1. Does WAPA already have a 3rd party?

VIHFA August Response: A 3rd party currently operates the facility. VIWAPA will continue on with the current 3rd party while also exploring other potential operators.

Question 2. Will there be a reduction in fuel costs? How much does it cost to operate?

WAPA August Response: The alternative to operating on propane is significantly more expensive because diesel is approximately twice the cost of propane on an energy equivalent basis. If WAPA does not buy the Propane Supply Infrastructure, its only option will be to operate on diesel. The operating cost of the facility is approximately $16 million per year that is paid to a third party provider to provide operations and maintenance services for the Propane Supply Infrastructure.

Question 3: Who is VITOL?

VIHFA August Response: VITOL is the company that currently owns the LPG facilities on both islands.

Question 4: How would this impact water production?

VIHFA August Response: The production of water utilizes a considerable amount of energy. Thus, securing the energy lifeline through this acquisition also secures the utility's ability to produce potable water.

Question 5. How does owning it benefit WAPA?

VIHFA August Response: The proposed activity substantially addresses the threats to the Energy Lifeline as it provides the utility with additional fuel storage capacity contained in resilient concrete bunkers and the ability to operate on propane which will allow it to utilize its newest and most efficient generators which should improve grid liability. Additionally, in the current arrangement, WAPA must exclusively purchase propane from Vitol. Once the facility is owned by WAPA, they will be able to source fuel from other suppliers.

Question 6. How many projects does WAPA have in the pipeline?

WAPA August Response: WAPA has a multitude of projects in its pipeline; including transmission & distribution undergrounding, installation of composite poles, microgrids for St. Thomas, St. Croix, and St. John, water expansion, water system replacement, new generation development. The acquisition of the Propane Supply Infrastructure is currently the only project in WAPA's pipeline associated with CDBG-MIT funding.

Question 7. What about power hardening?

WAPA August Response; WAPA continues to execute its FEMA funded projects to move transmission & distribution infrastructure underground as well as install composite poles. Composite pole installation is 90% complete in the Territory.

Question 8. Is the long-term plan deisel, propane fuel? What about renewable energy?

WAPA August Response: The long-term plan is propane as the primary fuel source for the Territory's generation backbone. WAPA has signed power purchase agreements for wind and solar projects that are expected to generate 25% of the Territory's electricity, and WAPA intends to pursue additional power purchase agreements once the projects behind the current power purchase agreements are in operation.

Question 9. How does WAPA plan to fund maintenance?

WAPA August Response: Operations and Maintenance of the Propane Supply Infrastructure has been provided by a third-party provider since the assets were placed into service in 2017, so the cost of operations and maintenance is not a new cost to WAPA. WAPA is current with payments for the third-party operations and maintenance of the facility. WAPA's only source of revenue is its regulated rate that is approved by the Virgin Islands Public Services Commission (PSC). The PSC has not questioned WAPA's cost of operations and maintenance, so WAPA expects to continue to collect revenues through its regulated rates to pay for operations and maintenance.

Question 10. With solar wind energy coming online, is it wise to do this investment now?

WAPA August Response: The executed power purchase agreements for wind and solar are expected to produce 25% of the Territory's electricity and will not be in full operation for 18-24 months. Subsequent renewable resources are expected to come online after the 18-24 month period. Propane-fired generation will be need to supply the Territory's electricity during that period. Even if the Territory achieves enough renewable resources to provide 100% of the

Territory's electricity, multiple days of cloud cover will still require fossil-fuel generation to generate electricity. Propane is the Territory's cheapest fossil fuel generation.

Question 11. Are there plans to relocate the plant to the south shore away from residential areas on St. Croix?

WAPA August Response: No.

Question 12. Was the plan scrapped because of the building of WAPA's VITOL Plant?

WAPA August Response: No. Moving the Richmond power plant to the Southshore would entail significant costs that ratepayers would have to pay.

Question 13. Who at VIHFA goes through the application or proposal?

VIHFA August Response: Odari Thomas, Staff Engineer at VIHFA provides technical oversight along with other Infrastructure program staff.

Question 14. How much was originally set aside for MIT?

VIHFA August Response: Approximately $774M.

Question 15. Are you going to be reducing the other categories to fund this project?

VIHFA August Response: This project is proposed to be funded from the Infrastructure Category through the Critical & Natural Infrastructure Resilience Program. The amount of money allocated to that program remains unchanged from the original MIT Action Plan.

Question 16. Is this going to be a monopoly? If someone can do the job better, would they be allowed to apply for funding?

VIHFA August Response: VIWAPA is the only electric utility in the territory and are best positioned to bolster the security of the energy lifeline in accordance with the goals of mitigation funding.

Question 17. Is WAPA going to ask for more funding?

WAPA August Response: The Propane Supply Infrastructure funding is currently the only requested CDBG-MIT funding request pending from WAPA. As WAPA continues to evaluate energy security for the Territory, it may identify additional CDBG-MIT fund eligible projects; however, there are no projects currently in the pipeline.

Queston 18. Is there anything in the foreseeable future that could stop the acquisition?

VIHFA August response: VIHFA is working with VIWAPA to provide all necessary information to get this acquisition successfully approved. Moreover, if there are Environmental findings

during the required Environmental Review then the project is ineligible under the grant and cannot receive HUD funds.

Suggestion 1: Conduct a St. John townhall on this.

VIHFA August Response: Noted.

Public Hearing Number 3 - Post Action Plan Publication convened on July 19, 2023 at the University of the Virgin Islands Administration and Conference Center:

Transcript of Question and Comments Period

The following transcript captures the question and period portion of the Town Hall, Public Hearing. This meeting is recorded and available on the VIHFA media page on Facebook. Participants were afforded the ability to self-identify before providing their questions. VIHFA Media Team collected the names and emails of the participants to complete follow-up notices and email of the presentation.

Guest 1: So good evening, everybody. My first question goes to WAPA and I guess the (VIHFA) Authority as well. You mentioned that it's $145 million that will be now going to WAPA. How would that affect the overall funding in the infrastructure category in terms of the plan that you guys were looking at when you designated the total sum of money to that category?

VIHFA Response: So, I'm assuming you're referring to the project list. That is incorporated in the original action plan. Okay, great. So, the thing to note about that were, I think, that list consists of about 50 or more projects. And those were all potential projects. None of those projects were guaranteed for funding. They were all proposed with coordination from the other entities of activities that, you know, would like to be done, but those were not guaranteed for funding.

The only project that we are proffering at this time, guaranteed for funding, is the VITOL acquisition, uh, through this substantial amendment. Um, any other project would have to go through the standard application process for it. And, this is the standard application process, by the way, for a covered project.

You start off with the substantial amendment. But, to answer your question directly, that list was just proposed projects. None of those were guaranteed for funding.

Guest 2: Hi, good afternoon. I'm so confused.

VIHFA Response: Hopefully I can clarify. Sure.

Guest 2: This morning I heard Mr. Avery and the young lady on the radio asking for feedback for people to come out and, you know, learn something about this granting, and then I come here and I get a, a WAPA presentation. I wasn't expecting that, but let's just say that you have damn near a billion dollars, right?

VIHFA Response: $774 million.

Guest 2: Okay. Close enough. And you are giving $150 to WAPA. That leaves us with $500 million. So, I'm just, I'm just wondering how do we partake, or how do we, you know, how me that I came here thinking that maybe I could write a grant for whatever. How do I participate in the remainder of this funding?

VIHFA Response: Okay. So, what I would encourage you to do is have you read the action plan that's published on our website.

Guest 2: As I said, I was listening to my administrator saying that we don't participate. There were 25 people in St. Croix. And there's 15 here today. Gotcha. Maybe 12. Gotcha. And he was, he was very emotional about coming down and trying to part, be, be part of understood this grant that is here that we can work together now.

VIHFA Response: Yes.

Guest 2: I'm a professor and a police officer.

VIHFA Response: Agreed.

Guest 2: How does, how does a professor and a police officer work within this to get something for my students, for the police department? How, how does that work?

VIHFA Response: Great. So, what I would encourage you to do first is to familiarize yourself with the Federal Register Notice, which is identified on one of the earlier slides.

It is published on our website under the mitigation tab. And that is the governing document that basically identifies how this pool of money can be utilized. Then I would also encourage you to read the action plan, which is again published on our website in the mitigation tab. That tells you how the different threats are, because it all has to do with the risks that are identified in that mitigation needs assessment.

So, if you can proffer a project that will address a risk that is identified in that mitigation need assessment, then we can pursue the other eligibility criteria and determine if that project is eligible for funding. And that's the governing guidelines for qualifying for this pool of funding. The reason that we're here for WAPA, is because there has been a risk that was identified to the energy lifeline.

WAPA actually lost tank number 10, so correct me if I'm wrong, in St. Thomas through the Irma Maria disaster, that tank sustained damage and we are trying to mitigate the risk of WAPA's fuel supply being impacted again adversely for future disasters.

Guest 2: So, the risk [is]?

VIHFA Response: No, we, as I indicated previously, we have four buckets of activities, and if you can identify a project that satisfies the risk in the mitigation need assessment and falls into one of those four pools of activities and meets a national objective along with the other eligibility criteria, then it will qualify for funding.

Thank you.

Hi. Good evening.

Guest 3: I'm gonna' identify myself 'cause I'm here from the office of Senator Potter. Who's in charge of the disaster, recovery and infrastructure committee in the legislature. One of the things that we discussed in our office is the fact that you have varying levels of comprehension. You have varying levels of just people being frustrated.

So, one of the, the, the charges that the senator has given is we need to work closely with you. One, to break it down and don't send people to your website because that's not going to' happen. They're not going to' comprehend some of what you're saying.

So today I would like to ask, how do we, Senator's office and maybe anybody else in here who would be willing to assist really kind of get involved with this project to make it more explainable and more attainable for just the general public to help them understand what parts of it really applies to them individually or as a community.

How do we do that?

VHFA Response: So, to answer the first comment about not sending people to the website, per the Federal Register Notice, we are required to publicize on the website. So, unfortunately, we won't be able to accommodate that request. Secondly, our Director, Director Clendinen, is greatly appreciative of all the public turnout, and interest in that pool of funding.

And I'm sure that she will be more than happy to work with Senator Potter's office, uh, and any of his constituents in order to proffer educational opportunities to educate the public. So, I would encourage you or the chief of staff or someone else from his office to reach out to, uh, Director Clendinen or you can reach out to our media team at the address, , that is indicated on the slide.

And I'm sure that we'll be able to foster a collaborative effort to help the public understand. Thank you very much.

Guest 4: That WAPA has always been, current with their fuel payments to VOTOL. Did I hear that correctly or not?

VIHFA Response: No, I said WAPA is current.

Guest 4: Oh, they, okay. Alright. And to that question with WAPA purchasing the assets, Are they still going to be required to purchase the fuel from VITOL or would they be going on the open market to purchase fuel?

VIHFA Response: Okay, so, , I will answer and then I'll defer to, [Jacob A Lewis], Jake, may be able to elaborate more eloquently than I may. But, acquiring this asset will give WAPA the ability to purchase fuel on the open market. Um, in hopes that that will allow them to source it more competitively. Currently, the way the agreement is structured is WAPA has to only purchase fuel from one fuel supplier, uh, who I will not name publicly, but, um, I will defer to Jake if he has any additional insight that he can offer, um, on that aspect.

WAPA Response: Thank you Odari. And good evening everyone. Thank you for your question. So, just to clarify, Odari's answer, in terms of WAPA being current with VITOL, that was actually when you were describing the operation and maintenance. But you are exactly correct that WAPA is current on payments for fuel under its fuel supply agreement, and it's also current on the operation and maintenance costs associated with the current operation of the facility.

When this facility is acquired, we will be able to procure propane fuel from anyone that we want to. Currently, we're only able to procure fuel through VITOL as a sole provider. So, this will be the first time that we'll have the ability to bring in a competitive market and get the absolute best price possible.

We are in advanced negotiations with several potential providers, uh, and expect to have a contract in place with a new provider, uh, very shortly, uh, and in time to replace supply immediately once the transaction is completed and based on those negotiations, we do expect a substantial reduction, particularly in the cost to transport propane to the territory.

VIHFA Response: Sir, thank you.

Guest 4: With WAPA being able to purchase the assets, right?

VIHFA Response: Yes.

Guest 4: How do you overall see that financially WAPA is going to benefit from this $145 million purchase? Besides the fact that, okay, now you, you have this asset, but in terms of day-to-day operation, cause you still have to purchase the fuel.

And my recollection is you weren't really able to meet the fuel cost. The government had to do something with the governor and, and I don't remember the name of the bill that they had to pass to help pay for the fuel. So, my question is, even with us paying for the asset, how do you see that being able to structurally place WAPA in a place where they're going to be able to afford fuel moving forward.

WAPA Response:: So again, appreciate the question. It's a great question. So, if you go back several years, there have been many times where WAPA hasn't been able to pay for its fuel in a timely fashion and you are correct that over the past year or so, uh, the government of the Virgin Islands did provide financial support to WAPA to help it procure its fuel.

During the last year, fuel prices in particular, diesel prices were at all-time highs, at levels that were substantially above what is in customer's current rates and the [central] government providing that financial support allowed WAPA to procure the fuel it needed. Without having to pass that cost on directly to its customers.

The biggest reason that this transaction is so important from a financial perspective for WAPA is that, again, historically, yes, of course has had problems financially meeting the biggest part of the VITOL contract, which is what was the infrastructure payment, which its inability to make those payments, as at times has led to VITOL refusing to provide fuel and that left the authority only able to use one fuel, which is diesel, which is much more expensive, and that is a tremendous risk to WAPA and to the territory.

And so, if WAPA were to lose access to this asset, its fuel costs would go up based on today's fuel prices, about 60%. Ultimately that would have to be a cost that would be born by WAPA's customers which none of us want. We're also in the process very close to completing some major projects, particularly here on St. Thomas, for the installation of new generators that are much more efficient and cost effective than our older generators that are in operation today. Our most recent installation prior to that only burned propane. So, without access to this fuel, we lose all the economic benefits of those new generators, right?

And so, it really is critical to getting the cost for fuel down that can be supported in current rates, and then setting a foundation from which there is the potential for rates to be reduced in the future. None of that is possible if we lose access to these assets, and I will point out, we did have our budget hearing last night.

WAPA did present a budget that showed, based on the completion of some of these projects, the ability to pay for its fuel supply without the funding from the government that we received in the prior year.

VIHFA Response: And, I'd also like to add that what Jake touched upon is the newer generators that WAPA has burn propane and the newer generators are more reliable than the older ones.

So, approving this project, not only in terms of a financial perspective is advantageous, but also specifically from a reliability perspective, will allow WAPA to continue utilizing its newer, more reliable generators. Thus, reducing the risk to the inhabitants of the territory, and addressing that threat of unreliability to the energy lifeline.

Guest 4: Okay. So, I'm going to' step away from WAPA for a minute. The general mitigation, can, how the plan is outlined right now. Can an individual apply for funding or do you have to be some type of an organized entity?

VIHFA Response: Are you talking about like a single person?

Guest 4: Yeah, an individual, yes. Like the young man who spoke before, can an individual apply, or do you have to be a legally organized entity?

VIHFA Response: To the best of my knowledge, I believe that you have to be an organized entity. And again, the, the category for mitigation funding, it has to meet those criteria, right? And one of the other things is we have to assess the effectiveness of the projects, quantifiably and report on that. So obviously, organized entities are easier to assess.

Guest 5: Hmm. In terms, um, (inaudible)

VIHFA Response: I'll be honest with you, for housing, I am not sure. So, I would encourage you to submit that question to our media team. And there are specific program managers for each activity pool that are specialists in those areas, and they will be able to specifically respond to those types of questions.

Guest 6: Hi. Good evening. I'm here to represent Ville Homeowners Association. Okay. We are a condo association and I'm on the board. My name is Yvonne Watson and I heard about this meeting.

On the administrator's corner. Yes. Very interested, and so I'm here today. I would like to know, like the young lady asked if, how does this apply to housing?

Because we need a retaining wall and for the past several years, I've been trying to lobby various, senators so that, we could get assistance in having a retaining wall because the developers who sold these condos to us, they did not include a retaining wall. And now we are having a lot of erosion and I'm very concerned as a homeowner.

So that's what I'm here to find out. How can this money, you know, help with our association. And who do I connect to?

> VIHFA Response: As I mentioned previously we have specific program managers for the individual activities, and this public hearing, uh, was garnered specifically to get information for the substantial amendment that incorporates the VITOL acquisition.
>
> So, I will have to kind of refocus the meeting towards questions pertaining to the VITOL acquisition, but I do encourage you, please submit those questions to media@vihfa.gov and um, and they will be able to get a response for you. Do we have any other questions regarding the VITOL acquisition specifically?

Guest 7: Hi, good evening. I'm here for Faith Organization. Sure. Could we be involved in this program project. Again, it would probably depend on what type of activity you're proposing. This, again, this project or this amendment is only to incorporate the VITOL, but there is a public services and facility activity that is a part of the mitigation funding and it may be able to take advantage of that public service, you say?

Where would I find that? Would I go up in there?

> VIHFA Response: Yes, public services and facilities. Oh, this is a 12-year grant cycle. 12 years. So, you have time April 23rd, 2023, I think, which is when we executed the grant agreement with HUD. So, there is time.

Guest 9: Good evening, Mr. Thomas.

> VIHFA Response: Hi, good evening

Guest 9: And good evening to everyone. Good evening, Avery Lewis. One of the things I don't want you to make the people feel discouraged for coming here this evening because you know, a lot of them heard not only me and radio this morning. They heard Monee Edwards from your team on the radio encouraging people to come out to be part of it.

One of the things we need to sit tonight is one of the reason why WAPA is here is because WAPA is getting, you know, a chunk of this money to mitigate their process. So, we need to let them know that there was an original plan, are we making an amendment to it?

But, you know, they're still eligible. They still could find out if their need is a viable project that could be paid for by the CDBG-DR. Funding MIT, in this case, MIT yes. Mitigation projects. So, you know, those, you know, I want, nobody feel like, okay, everyone does already tell us come and we don't have no input. So, the other projects that's going to be taken under, taken by this whole seven hundred and seventy-four million WAPA is only looking a hundred and fifty-five

forty-five, one forty-five for now. And then, yeah, we want efficient power. We want good things. So, [now], that you know, and they, they may have some projects in their mind. Right. Maybe, their road deteriorated. They, you know, they want to improve the drainage or something, so, right. They want to do whatever they have to do to department of public works.

So, to private contractor will bring, bring it forward o be included in this. So definitely make sure that, just like the young lady talked about, uh, retaining wall and so forth. I don't know the faith organization want to do something to attract other people to build infrastructure for the church. I don't know. Right. But, you know, just keep them engaged.

VIHFA Response: Actually, Mr. Lewis [that] is actually a very, salient point. So, what I would encourage participants who may not necessarily have a VITOL acquisition related question to do is to take note of this process. If they work for, or if they're proposing an activity, that meets the threshold of a covered project. They will have to go through this similar process,

Guest 9: Thank you.

VIHFA Moderator: One second, I just want to redirect because for the public hearing that we had on St. Croix last week, we had some really good questions. And I just wanted to make sure that the information got out here in St. Thomas as well. So, if WAPA does not acquire these funds from us, what could happen?

VIHFA Response: As Mr. Lewis indicated, it can put WAPA in a position where they are forced to utilize a more expensive and, uh, less environmentally friendly fuel source, namely diesel to generate their power and that may possibly result in escalating fuel costs for them. But I will defer for him to give you all of the bad news himself.

WAPA Response: Brothers, by a different mother. Pleasure to meet you. So again, good question. So, if I apologize, so if this project is not completed for WAPA, um, then WAPA will be at very significant risk of losing access to these facilities altogether. These facilities really are the backbone of the power generation system in the territory. And the biggest immediate impact would be a dramatic increase in the authority's fuel cost, would also, as Odari mentioned, make us more susceptible to fuel supply chain disruptions, reduce our fuel capacity storage capacity, which could unfortunately, uh, increase the duration, or the length of time to, you know, recover from future disasters.

But losing access to these facilities and all the benefits they produce is the most likely outcome.

Guest 10: Or you'll be able to acquire the, the resources?

WAPA Response: So, the transaction will close, uh, as soon as the funds, as soon as the HUD process completes and those funds are made available, and that transaction will, the transaction will close immediately thereafter. And that will be the end of the project.

Guest 11: The comments that you've received during the, the hearing, what purpose or how do you use those comments in terms of determining whether or not HUD is going to, um, approve this, um, project amendment, like, do you have to address each comment? Like how does that work? Like what value is a public input? That's what I'm trying to understand.

VHFA Response: Right. So, the purpose of all of this public comment period, actually, which again is outlined, uh, for a specified period in the Federal Register Noticeis to solicit and gather the feedback from the community that will be documented and forwarded to HUD when they are considering whether or not they will approve this amendment.

So right now, we're in the middle of the 30-day roughly thereabout, 30-day, public comment period. And it's important to note, that not only is the public's comments being solicited, but we also are soliciting the comments from what is called the "T C T", the Technical Coordination Team, which is mandated by our grant agreement with HUD, that is comprised of our federal partners of which there are various entities, but most notably it's, headed that TCT is headed by the Department of Energy. They're, the spearhead. So, the TCT as a whole is also going to be providing their comments on this amendment. And all of that will be incorporated and submitted, to HUD for consideration. So, it's not only our eyes working on it, not only WAPA's eyes looking at it, we do have participation from our federal partners on the mainland.

VIHFA Moderator: I have no more questions. We would like, again, to thank everyone for coming out tonight. The public comment period is closing August 7th, so we recorded your questions here tonight. If you have any more questions or comments that you would like to make, we ask that you send it to media@vihfa.gov and title it, CDBG - Mitigation Action Plan Amendment, if I remember that clearly.

There it is. Ooh, my glasses, sorry. Substantial Amendment One. So, the title is Substantial Amendment one, CDBG, MIT Action Plan. What I will do, I recorded everyone's emails here. I recorded everyone's emails. I will forward you the, the presentation tomorrow as well as the email address so you can forward us your questions, right?

So, you're welcome. So again, thank you so much. On behalf of Interim Executive Director Clendinen, thank you and have a good night. Thank you.

D-4 Citizen Advisory Committee

In compliance with the Federal Register Notice, the VIHFA developed a Citizen Advisory Committee (CAC). The CAC will convene periodically (no less than twice a year) and review the mitigation needs of the Territory. The purpose of the CAC is to provide increased transparency in the implementation of CDBG-MIT funds, to solicit and respond to public comment and input regarding the VIHFA's mitigation activities, and to serve as an on-going public forum to continuously inform the VIHFA's CDBG-MIT projects and programs.

The CAC's review of the MIT Action Plan Substantial Amendment No 1. and Public Hearing Presentations are provided below. CAC members were asked to supply both Comments/Questions along with Suggestions. VIHFA and the WAPA supplied responses as noted below.

<u>CAC Member 1 (Colette Monroe): Public Comments, Questions and Suggestions</u>

Comment 1: **The acquisition of the propane supply infrastructure as outlined in #4 Amendment is in the best interest of the entire community.**

Suggestions: None provided.

Comment 2: **The newer generating units are designed to be more reliable, which will result in fewer power outages.**

Suggestions: None provided.

Comment 3: **The newer units, being able to operate on either propane or diesel, will provide additional "energy security" for the islands.**

Suggestions: None provided.

Comment 4: **Lower fuel costs by utilizing propane will prevent a rise in the price per kWh. According to the BCA, current diesel prices are nearly double that of propane prices.**

Suggestions: None provided.

Comment 5: **By having the option of either propane or diesel, the territory will have additional fuel supply, without resupplying, in the event of a storm or disaster situation where delivery may be interrupted.**

Suggestions: None provided.

Comment 6. **Once the acquisition is complete, WAPA will have the ability to go to the market and shop for a more competitive price for propane, which includes propane transportation costs, instead of being required to purchase propane solely from VITOL. A better price on propane will result in savings for WAPA and in theory, a savings for the consumer who is paying about three times the national average for electricity and the second highest electrical rate in the entire U.S.**

Suggestions: None provided.

Comment 7: **The acquisition will help resolve a long-standing issue for the Authority, thereby freeing up WAPA resources to focus on grid modernization and other sorely needed utility infrastructure improvements.**

Suggestions: None provided.

Comment 8: **Propane is a cleaner (and cheaper) fuel. The acquisition will allow WAPA to stay in compliance with the EPA Consent Agreement which requires WAPA to monitor air quality near the plants and issue reports on plant emissions. Cleaner fuel source is a better option environmentally.**

Suggestions: None provided.

.

CAC Member #2 (Samantha Harlow) - Comments, Questions, Suggestions and Responses

Comment 1: **We need to do better at letting the public know about these actions and the locations that we will hold public events. St. Croix public hearing was poorly attended. Try reaching out to more radio shows and having more direct interviews. Attached is a recommendation of media outlets to try.**

Suggestions:

Interviews	Time	Programme
WDHP 1620 AM	M-F, 7AM – 11AM	VI in the Morning w/ S Williams
WAXJ 103.5 FM	Sa, 1PM – 4PM	Keep IT 100 w/ Davina Mar
WAXJ 103.5 The Reef	Sa, 9AM – 9:30AM	VI Envision w Genevieve Whitaker
Radio One	M-F, 9AM – 12PM	The Morning Mix w/ L. Davis
Caledonia (WSTX 100.3 FM)	M-F, 12:30 – 5:30P	Ninjah P Sounds Show w/ Ninjah P
Caledonia (WSTX 970 AM)	Tu/Th, 8AM – 10AM	Reflections w/ Doug Canton
Caledonia (WSTX 970 AM)	Sa, 1PM – 3PM	Community Digest w/ Adbul Ali
Caledonia (WSTX 970 AM)	Th, 10AM-12PM	In Session w/ Robert Moorhead
Papi Love Radio 91.9(FM)	M-F, 7AM – 10AM	El Manicomia de la Manana
WJKC Isle 95 (FM)	9AM – 12PM	Big Phat Morning Show
Da Vybe	Mo, 7PM – 9PM	Anita & You in Da Evening
WSTA	Sa, 11AM – 12PM	Big Bad Morning Show w/ Silcott
WSTA	Th, 10AM-12PM	Roosevelt David
WTJX 93.1 FM	M-F, 8AM –10AM	Analyze This w/ Neville James

VIHFA: List categorized by station

VIHFA Response: VIHFA advertised our St. Croix Public Hearing event through the following platforms.

- Press release - sent to the media and 600+ constituents on our mailing list on 7/8/2023, 7/10/2023 and 7/12/2023.
- Social media post and boosting - July 7th through July 19th; Resulting in 35,000 Reach and 2,500 direct engagements which equates to Likes, Shares, Comments (See below.)
- VI Consortium: July 7th through July 12th
- STX Source: July 7th through July 12th
- STX Avis: July 10th through July 12th
- Daily News:
- Radio Appearances - July 10th through July 12th on “the Reef, DaVybe,” Isle 95 and Rhumba
- Radio Ads, published the week of on all STX radio stations.

Comment 2: **Sec-1.1.5: Are there plans in place for sargassum influx mitigation where the water supply issue is concerned? The influxes have negatively impacted the water desalinization operations in the past and that has the potential to impact**

both residential, business, and the Power generation portion of WAPA as end-users.3.

Suggestions: A contingency plan for sargassum influx mitigation needs to be in place to address the potential for the negative impact of the same. Failure to do so, considering the emphasized importance of the desalinized water on power generation operations, would be negligent on the part of the authority.

VIHFA Response: Sargassum Seaweed Removal Program is currently listed as Project #5 in the CDBG-MIT Action Plan under "Appendix G: Proposed Projects List for Potential Consideration Under CDBG-MIT FUNDING". Although the project is currently slated to address the risks posed to the Safety and Security lifeline, the assessment can be expanded to include the risks posed to the Energy Lifeline as it pertains to sargassum's impact on power generation and water production. Additionally, the Authority no longer utilizes desalination to produce drinking water but instead relies on the reverse osmosis process which can be adversely impacted by Sargassum. In fact, the Authority recently obtained funding from FEMA to address the latest influx of Sargassum at its power plants earlier this year.

WAPA Response: FEMA also is working closely with the Authority to address future influx of sargassum. FEMA, along with WAPA undertook a comprehensive review of options to address the impact of sargassum. All options were considered and evaluated, including the most time and cost intensive option, which would be relocating the water intake farther offshore from its current location. The FEMA and WAPA team settled on installation of bubble screens to keep sargassum away from the water intakes. The bubble screens produce a curtain of bubbles that prevent the influx of sargassum into the water intake.

Comment 3: **A contingency plan for sargassum influx mitigation needs to be in place to address the potential for the negative impact of the same. Failure to do so, considering the emphasized importance of the desalinized water on power generation operations, would be negligent on the part of the authority.**

Suggestions: None provided.

VIHFA Response: See responses to Comment 2.

Comment 4: **Sec-1.2.1. Figure 73: What years are being illustrated? Please clarify.**

VIHFA Response: Correction to the "Relative Cost for Propane Fuel" graphic was made.

WAPA Response

From the Covered Project Narrative as it relates to Figure 73…with added language to clarify timing of the savings.

"**Obtain Lower Propane Transportation Costs** – The fuel supply contract associated with the Propane Supply Infrastructure is above-market based on initial competitive market supply indications. Ownership of the Propane Supply Infrastructure will enable WAPA to secure propane transportation service at a competitive market rate. Savings from lower propane transportation cost are not reflected in the comparative rate analysis for diesel versus propane operations shown above. The transportation cost for shipping propane to the Territory is part of the fuel charge that WAPA collects from its customers in rates, and all else being equal customer rates would therefore be lower. Savings from securing competitive market rate propane transportation cannot be achieved without ownership of the Propane Supply Infrastructure."

The figure shown below reflects illustrative annual savings for sourcing competitive propane supply at a range of lower transportation costs versus the transportation cost that WAPA currently pays. The timing of realization of these savings depends on when the acquisition of the Propane Supply Infrastructure closes. Note that the costs shown below reflect transportation costs per gallon and are independent of the commodity price of propane.

Comments 5:

Section 1.2.; pg. 204. Why the large differential in supply days? There needs to be greater parity since one of our ports are locally controlled and any disruption of the same would render St. Croix fuel less in under two months.

Suggestions: None provided.

VIHFA response:

This is referring to the "Fuel Security" benefit in the narrative. The Authority is not favoring one district over the other. The difference is attributable to the physical difference in fuel storage capacity in each district (STX does not have the same number of tanks/storage volume as STT) as well as the difference in burn rate between the two plants.

Comment 6:

Section 1.2.1; pg. 206: Does not account for pollution levels vs better investment of green energy. Also does not account for rise in price of LPG over time as demand for the same rises as more utilities phase out diesel.

Suggestion: If this point is to be well received, there needs be data illustrating the pollution levels with LPG vs green energy alternatives, since that was one of the main points raised in the St. Croix townhall meeting held in July.

WAPA Response: WAPA is investing in renewable energy. It recently signed Power Purchase Agreements for solar and wind projects that will generate approximately 25% of the Territory's electricity once fully in service. The Authority intends to pursue additional renewable energy resources once the developers complete the projects supporting the Power Purchase Agreements that were just executed. The projects related to the recently signed agreements are expected to be in service in 18-24 months. Ultimately, fossil-fuel generation is needed to back renewable energy assets because of the intermittent production of renewable energy from wind and solar assets. There is currently insufficient battery storage capacity installed in the Territory to address multiple days of cloud cover. When the fossil-fuel backbone is needed, propane is a much cleaner burning fuel.

Regarding the rising price of propane – a structural increase in propane is not necessarily a foregone conclusion. For example, the price per barrel of propane today is the same as it was in 2004, so over a period of almost 20 years the price of propane is unchanged. The price fluctuated above and below today's price, but historical pricing does not point to a structural rise in propane prices. Additionally, multiple factors impact the price of propane, not just increased use of propane for power production. On the demand side, the largest demand for propane is driven by the Far East because propane is used to manufacture plastics. The supply of propane also influences the price of propane, so increases in supply of propane can moderate the impact of increasing demand for propane.

Comment 7: **Sec- 1.3.5: Is there any MIT happening to upgrade the local hospitals' abilities to respond to events like explosions of facilities like these and/or the refinery?**

Suggestions: None provided.

VIFHA Response: The Infrastructure and Public Facilities Activity Category contains two programs, Community Resilience & Public Facilities and Resilient Critical & Natural Infrastructure. *The Health and Medical Lifeline can be assessed to determine what, if any, types of improvements are needed to bolster the hospital's ability to respond to such disasters. The Mitigation Needs Assessment can then be updated to reflect the identified needs and the hospitals will subsequently be able to apply under the aforementioned programs for funding to implement the needed improvements.*

Comment 8: **Sec- 1.4.0: Independent sources of electricity with no additional fuel cost or dependency that lends to vulnerability to market price fluctuations, should be the focus of the brunt of electricity infrastructure MIT efforts.**

WAPA Response: See answer to Comment 6.

D-5 Response to Citizen Complaints, and Appeals & Website Information

The VIHFA shall provide a written response to every complaint relative to CDBG-MIT within fifteen (15) working days of receipt. The Territory will conduct an Appeals Process to be further developed for applicants and will require any subrecipients to adopt a similar process. The process will be tiered whereby applicants will be able to appeal a decision and receive further review from another level. All sub-contractors and local government grantees will be required to develop an appeals and complaint procedure to handle all complaints or appeals from individuals who have applied for or have an interest in CDBG-MIT funding. A written appeal may be filed when dissatisfied with program policies, eligibility, level of service or other issue by including the individual facts and circumstances as well as supporting documentation to justify the appeal. Generally, the appeal should be filed with the administrating entity or sub-contractor. The appeal will be reviewed by the administrating entity with notification to the VIHFA for the purpose of securing technical assistance. If the appeal is denied or the applicant is dissatisfied with the decision, an appeal can be made to the VIHFA directly. If the VIHFA denies the appeal, the final step in the internal appeals process is to appeal to the Office of Disaster Recovery (ODR).

In programs that serve individual applicants, applicants may appeal their award determinations or denials that are contingent on Program policies. However, it should be noted that the VIHFA does not have the authority to grant an appeal of a statutory or HUD-specified CDBG-MIT requirement.

A comment period of at least thirty (30 days, as required by HUD, shall be provided for citizens, affected local governments, and other interested parties an opportunity to comment on the Substantial Amendments to the Action Plan.

In accordance with CDBG-MIT requirements, the VIHFA has developed and will maintain a comprehensive website regarding all disaster recovery activities assisted with these funds. The VIHFA will post all Action Plans and amendments on the VIHFA's CDBG-MIT website at: https://vihfa.gov.

The website gives citizens an opportunity to read the plan and to submit comments. This website is featured prominently on, and is easily navigable from, VIHFA's homepage. The VIHFA will maintain the following information on its website: action plan, any substantial amendments, all performance reports, citizen participation requirements, and activities/program information that are described in the action plan, including details on contracts and ongoing procurement opportunities and policies, including opportunities for minorities, women and other disadvantaged persons, veteran, and other historically underutilized businesses (HUB). Paper copies of the Action Plan Amendment w**ill be available in both English (including large, 18pt type) and Spanish as nee**

MEDIA EMAIL COMMENTS

Comment 1: **The draft revised mitigation action plan of July 5, 2023 focuses on acquisition of energy infrastructure by the Government of the United States Virgin Islands, which appears to be the primary reason for amending the action plan.**

The proposed action may reduce fuel costs by removing dependency on a single fuel supplier (Vitol) but does not substantially change the current threats to the Energy Lifeline.

VIHFA Response: The proposed activity substantially addresses the threats to the energy lifeline as it provides the utility with additional fuel storage capacity contained in resilient concrete bunkers and the ability to operate on propane which will allow it to utilize its newest and most efficient generators which should improve grid liability.

Comment 2: **The revised action plan should identify new projects that can address the four listed threats. One possibility is establishment of waste to energy projects as micro-grids.**

Waste would be materials generated only in the U.S. Virgin Islands (regular solid waste, recycled restaurant oil and grease, and plant debris (landscaping, disaster damage, agriculture waste).

VIHFA Response: The Project is proposed to be funded under the critical & natural infrastructure resilience program. The intent of that program is to harden public infrastructure that is critical to the territory's ability to mitigate risks to public health and safety before an extreme weather event occurs. Conventional generation is the backbone of the territory's electric grid and will be relied upon both as renewables are incorporated into the utility's generation portfolio and for power production in the immediate aftermath of a disaster. Thus, bolstering the capacity of the utility by providing them with resilient fuel storage directly mitigates risks to public health and safety.

Comment 3: **The Virgin Islands Waste Management Authority explored development of waste to energy projects and thus may be able to provide cost estimates for a cost benefit analysis.**

VIHFA response All proposed activities must be a response to lifeline risks identified in the Mitigation Needs Assessment as is informed by the Territorial Hazard Mitigation Plan.

Comment 4: **The treatment of Natural Infrastructure in the action plan remains inadequate. Both the utility of natural infrastructure for mitigation purposes and the lack of a 'framework' to guide consideration of "natural infrastructure solutions" were noted in the 2021 action plan.**

This 2023 amendment repeats the information from the 2021 action plan but ignores natural infrastructure even as part of the maintenance strategy for refurbished or new grey infrastructure (section 7.11, page 150).

This 2023 amendment should include a framework for Nature-based Solutions, which includes natural infrastructure, and a list of projects.

VIHFA response: The proposed incorporation of this activity does not necessarily preclude the inclusion of natural infrastructure activities at a later date so long as those activities address risks to a lifeline.

Comment 5: **Please note that the Foundation for Development Planning, Inc. (FDPI) is interested in participating in development of the nature-based solutions/natural infrastructure framework for disaster risk reduction in the U.S. Virgin Islands.**

VIHFA Response: Noted.

//

D-6 Copies/ Screenshots of Citizen Participation/Public Notice

VIHFA engaged the local publications and media outlets to notify and encourage maximum citizen participation. The substantial amendment to the MIT Action Plan was advertised through the following platforms. Press releases on newspapers and radio were combined with the use VIHFA's with a reach of over 600 constituents. Press releases were targeted for the Public Hearing Townhalls on 06/2, 7/10/2023, 7/12/2023, 7/14/2023 and 7/19/2023. Samples or Tear Sheets of the public notices are provided below. Additionally, VIHFA's media team performed social media posts and boosting from 07/07/23 through 07/19/23. The combination of these efforts resulted in a 35,000 Reach and 2,500 direct engagements which equates to Likes, Shares, Comments.

- VI Consortium: July 7th through July 12th
- STX Source: July 7th through July 12th
- STX Avis: July 10th through July 12th
- Daily News:
- Radio Appearances - July 10th through July 12th on "the Reef, DaVybe," Isle 95 and Rhumba

Below are tear sheets and notices in the local publications.

Sample placement in St. Croix Avis

Workers in Maine will get paid family and medical leave starting in 2026

PORTLAND, Maine (AP) — Most Maine workers will get up to 12 weeks of paid time off for family or medical reasons as part of a supplemental budget Democratic Gov. Janet Mills signed into law on Tuesday.

The spending bill included $25 million in startup costs for the state program which allows workers — starting in 2026 — to receive paid leave to deal with illness, to care for a relative, or for the birth of a child.

Maine joins a dozen other states that have paid family and medical leave programs. The focus of legislation has been at the state level after failure to gain traction in Congress.

The program caught the attention of the White House, where press secretary Karine Jean-Pierre applauded the state's action.

"Paid family and medical leave improves the lives of working families and strengthens our workforce and economy," she said, adding that the Biden administration has worked to make the federal government a model by supporting federal workers in accessing needed leave.

Putting it in personal terms, Mills said that she deeply understood the need for the program — having dealt with the loss of a husband following a debilitating stroke, the realities of raising five stepdaughters on her own and caring for her own aging parents, all while working full time.

"I know firsthand the challenges of providing care to loved ones while trying to manage all the unexpected ups and downs that are simply facts of life," she previously wrote in a newspaper oped.

The Democratic-led Legislature already approved a nearly $10 billion essential services budget that went into effect on July 1. That budget was approved along party lines in March. Democrats said, to prevent any late partisan attempt to use a government shutdown as a bargaining tactic.

The budgetary addendum, about $445 million dealing with extras, likely won't go into effect until late October because it failed to muster a two-thirds majority in the Legislature it would've needed to go into effect immediately.

It includes language to start the paid leave program that will be funded through a payroll tax split between workers and employers and capped at 1% of wages. Qualifying conditions include the birth or adoption of a child, a serious illness, care for a sick relative or transition from military deployment.

Businesses with fewer than 15 employees are not required to make employer contributions to the program. Companies that already offer comparable benefits can just stick with their current plans.

Key to support were several tax-related proposals including one that raised the amount of pension income that's exempt from state income taxes from $30,000 to $35,000. Lawmakers also included money to double the pay of childcare workers, as well as funding for the governor's proposed Dirigo Business Tax Incentive Plan, which would replace the existing Pine Tree Development Zones.

The governor initially balked at the paid leave proposal, which was opposed by the Maine State Chamber of Commerce and others in the business community, but the bill was tweaked to win her support.

"I am over the moon," said state Sen. Mattie Daughtry, D-Brunswick, after taking a congratulatory call from the White House and attending the signing ceremony. She sponsored the bill with Rep. Kristen Cloutier, D-Lewiston.

Utah high court scrutinizes process that sliced state's most Democrat-heavy county into 4 districts

SALT LAKE CITY (AP) — The Utah Supreme Court grilled attorneys representing the state on Tuesday over their claim that courts shouldn't intervene in the Republican-controlled Legislature's decision to carve up Democratic-leaning Salt Lake County into four congressional districts.

Justices didn't rule after oral arguments held on Tuesday, but appeared skeptical of the state's argument that districting process couldn't be subject to a broad judicial review.

The fight asks if state courts can evaluate whether district maps drawn by elected officials violate the state constitution and is the latest battle over how states draw such maps. It follows a recent landmark U.S. Supreme Court ruling denying legislatures absolute power to do so.

Utah is among the states in which Republicans and Democrats have battled over whether partisan gerrymandering violates the law and imperils people's right to choose their representatives in a democracy.

Utah differs from those other venues, however, because voters in 2018 approved an initiative creating an independent redistricting commission designed to ensure maps weren't drawn to favor one party over another. Its power was stripped a year and a half later by the Legislature, which divided Salt Lake County — where Joe Biden won in 2020 by 11 points — into four congressional districts.

Seven voters and two advocacy groups — the League of Women Voters of Utah and Mormon Women for Ethical Government — sued the Legislature last year over the maps passed in 2021. In their lawsuit, they argue the Republican-drawn map "takes a slice of Salt Lake County," which is the state's most Democratic-leaning, "and grafts it onto large swaths of the rest of Utah."

"The effect is to disperse non-Republican voters among several districts, diluting their electoral strength and stifling their contrary viewpoints," their attorneys argue in court documents.

Attorneys for Utah want the state Supreme Court to dismiss the case and argue districting is solely a matter for the Legislature to decide, beyond the purview of the courts. If the case proceeds, a judge could potentially rule the maps unconstitutional and initiate a court-directed process to redraw districts.

The case is the latest high-profile redistricting battle and follows two U.S. Supreme Court rulings on maps drawn by state Legislatures. In 2019, the court ruled that district maps — and partisan gerrymandering claims challenging them — were outside the purview of federal courts and for states to decide.

KALALLOO MAN
It's Peas Soup Wednesday
Join the Kalalloo Man this Wednesday, July 11 under the Taman Tree, located in Bassin Triangle, C'sted; 12pm sharp.
Call or text 340-514-8939, to place your orders!
Remember Supply is Limited!
Pigtails, Turkey, Sweetened or Unsweetened, whichever way you choose!

Samples: Daily News

Photo by THE NEW YORK TIMES

A "Daddy's Little Meatball" shirt — which comes in Daddy, Mommy and Nonna's varieties — at a souvenir shop in New York on July 3.

In New York City, who is 'Daddy's Little Meatball?'

By ANNA KODÉ
The New York Times

NEW YORK — On an afternoon in June, Erica Scalise was walking through Little Italy in Manhattan when the window of a kitschy souvenir shop gave her pause. Hanging in the display was a white T-shirt with a phrase printed in the red and green colors of Italy's flag: "Daddy's Little Meatball."

"It was 15 bucks," Scalise said. "I was like, How can I not pick this up?" She bought the shirt and has felt no buyer's remorse.

Scalise, a 25-year-old writer who lives in Chicago, was visiting New York to scope out apartments. She had left the city abruptly when the pandemic started in 2020, so she was excited to return.

The "Daddy's Little Meatball" T-shirt "felt like this totem that I can bring back to Chicago," she said. "I can wear it and tell people, 'I got it in New York and I'm moving back there, and I love New York!' " When she sports it now, people often stop her on the sidewalk to ask about the shirt, she said. She wears it proudly, but she said she wouldn't want her ex to catch her in it.

The shirts usually cost $10 to $25 and have become a sort of twist on the iconic "I (heart) NY" tops. But while "I (heart) NY" appeals mainly to tourists, "Little Meatball" — which comes in Daddy, Mommy and Nonna's varieties — is often worn in a campy way, like an inside joke among New Yorkers.

Rainer Turim said he considered buying one a few weeks ago, as he wove through tourists on Canal Street. "I want one as an artifact of New York City," said Turim, a 23-year-old writer and artist who lives in the East Village.

"I wouldn't catch myself dead wearing an 'I heart NY' shirt," said Turim, who grew up in New York. "But wearing a 'Mommy's Little Meatball' shirt, I feel like there's a New York City pride in wearing that. Those are a little more 'if you know, you know' kind of shirts."

Though the shirts have been sold primarily in gift shops in Little Italy, they are spreading to stores in Chinatown, Times Square and other neighborhoods.

The shirts are easily found online as well. Their product descriptions often read as overly earnest; according to one site, "This shirt isn't just a garment; it's a statement of love, a symbol of the strong and unbreakable connection between a father and their little meatball."

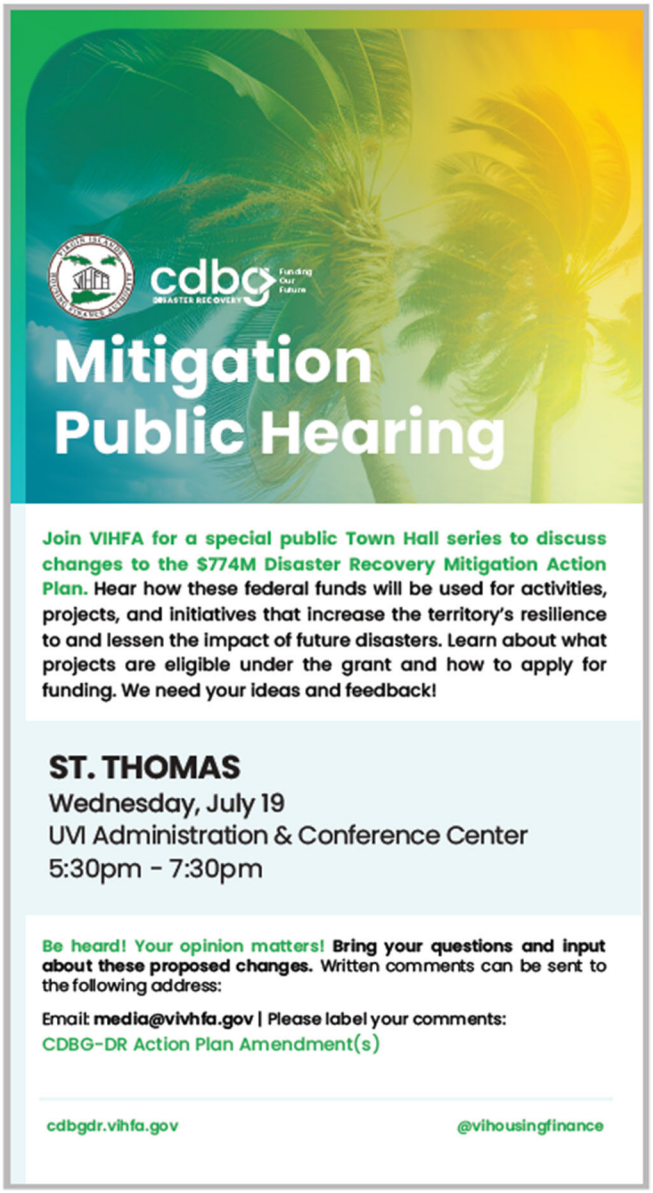
For Scalise, the shirt is a cheeky nod to her heritage. "I'm 100% Italian," she said. "I think it's so funny to also make fun of Italians. We're so dramatic and proud to be Italian. But I also feel like I would love everybody to wear this shirt because it's a hilarious way for people to embrace the culture."

The shirt "seems to be both stereotyping and not, at the same time," Marcel Danesi, an emeritus professor of anthropology at the University of Toronto, wrote in an email. "It is a pithy, but highly connotatively charged, one-line joke." He said that the shirt's memelike nature added to its strength, as humor can often be more effective at communicating identity, personality or aspiration than other, grander displays.

Several employees at souvenir shops in Chinatown said that the shirts were a relatively recent addition. They started carrying them after noticing their popularity at stores in Little Italy.

One employee at a Chinatown gift shop said that the store started carrying the "Daddy's Little Meatball" shirt just two months ago. It has sold "Mommy's Little Meatball" for the past couple of years, he said, but he has noticed sales for both increasing this summer.

Ajit Biswas, who works at a gift shop on Canal Street, said that the store sold about 10 to 15 of the shirts every day, adding that "Mommy's Little Meatball" is the more popular option.



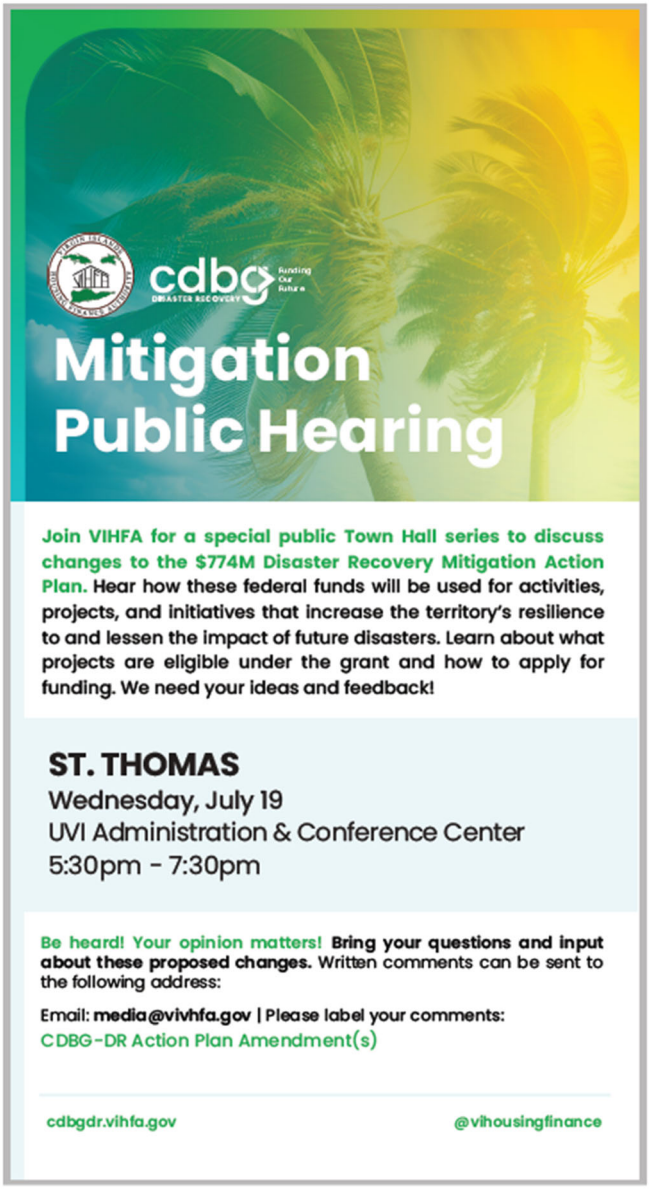


Photo by MILK STREET

A tomato and cucumber salad with capers and feta.

One easy step boosts tomatoes for this Mediterranean salad

By CHRISTOPHER KIMBALL
The Associated Press

From Israel to Spain to Morocco, produce is so flavorful that many salads need only ripe tomatoes and cool cucumbers to be delicious. But the watery, bland vegetables in the average American supermarket too often disappoint to work this way.

That's why we use a simple trick to give them a boost — salting the chopped vegetables for about 10 minutes before dressing them. Besides seasoning the vegetables throughout, salting draws out moisture, which concentrates their flavors and gives them a more substantial, meatier texture.

Just half a teaspoon of salt for about a pound of chopped tomatoes and cucumbers was plenty for this refreshing salad in our book "Tuesday Nights Mediterranean," which features weeknight-friendly meals from the region. For additional flavor inspiration, we merged two Mediterranean classics, Greek horiatiki and the shopska salata of the Balkan countries.

For additional punch, we soak slices of red onion and rings of fresh chile in vinegar to soften their bite, then whisk the infused vinegar with olive oil and garlic to make the dressing. Briny capers add another layer of texture, and creamy feta cheese contrasts with the crisp, cool vegetables.

Good-quality feta is key here. The pre-crumbled stuff is loaded with artificial preservatives and lacks flavor, so look for varieties sold in blocks and crumble it yourself.

After assembling the salad, don't wait to serve it. The flavors and textures are best when fresh.

Tomato and Cucumber Salad with Capers and Feta

Start to finish: 30 minutes
Servings: 4 to 6

12 ounces ripe tomatoes, cored and cut into 6 to 8 wedges
1 English cucumber, cut lengthwise into eighths, then crosswise into 2-inch lengths
Kosher salt and ground black pepper
½ small red onion, thinly sliced
1 Fresno or jalapeño chile, stemmed and sliced into thin rings
3 tablespoons red wine vinegar
2 ounces feta cheese, crumbled (½ cup)
1 tablespoon drained capers
3 tablespoons extra-virgin olive oil
1 medium garlic clove, finely grated
½ cup lightly packed fresh flat-leaf parsley, chopped

In a colander set in a large bowl, toss together the tomatoes, cucumber and ½ teaspoon salt; let stand for 10 minutes. Meanwhile, in a small bowl, stir together the onion, chili, vinegar and ¼ teaspoon salt; let stand for 10 minutes.

Transfer the tomatoes and cucumbers to a serving bowl, discarding their liquid, then sprinkle with the feta. Using tongs, lift the onion and chili out of the vinegar mixture, squeezing gently and allowing the vinegar to drain back into the bowl, then scatter them over the tomatoes and cucumber; reserve the vinegar. Sprinkle the capers over the salad.

To the reserved vinegar, add the oil, garlic, a pinch of salt and ¼ teaspoon pepper, then whisk to combine. Drizzle the dressing over the salad and sprinkle with parsley. Toss to combine at the table.

Press Release issued on 07/06/23

Upcoming: Disaster Recovery Mitigation Action Plan Town Halls

V.I Housing Finance Authority Interim Executive Director Dayna Clendinen encourages the public to attend in-person public hearings scheduled for Wednesday, July 12, on St. Croix and Wednesday, July 19, on St. Thomas to discuss eligibility requirements under VIHFA's Mitigation Action Plan.

VIHFA received its Mitigation Grant agreement effective April 25, 2023, with an obligation of $774.1 million in MIT federal funding for activities, projects, and initiatives that increase the territory's resilience to future disasters.
The public hearings provide notification of VIHFA's intent to amend the action plan and help the community to learn more about eligible projects along with how to apply for funding.

St. Croix Office: 100 Lagoon Complex
Ste 4
Frederiksted, VI 00840
340.772.4432

Press Release issued on 07/12/23

Join Us Tomorrow

V.I Housing Finance Authority Interim Executive Director Dayna Clendinen encourages the public to attend in-person public hearings scheduled for Wednesday, July 12, on St. Croix and Wednesday, July 19, on St. Thomas to discuss eligibility requirements under VIHFA's Mitigation Action Plan.

St. Croix Office: 100 Lagoon Complex
Ste 4
Frederiksted, VI 00840
340.772.4432

Copyright (C) 2023 VIHFA. All rights reserved.

Press Release issued 07/19/23

Missed the Mitigation Town Halls?

You can still watch this important discussion about the eligibility requirements and changes to the $774 million Mitigation Action Plan; just click the button below.

Watch Now

Don't forget to send your questions or comments, to media@vihfa.gov and make sure to place "CDBG-DR Action Plan Amendment" in the subject line!

St. Croix Office: 100 Lagoon Complex
Ste 4
Frederiksted, VI 00840
340.772.4432

Copyright (C) 2023 VIHFA. All rights reserved.

APPENDIX E: REFERENCES

U.S. Census Bureau. (n.d.). *Understanding the Population of the U.S. Virgin Islands*. Retrieved from https://www.census.gov/content/dam/Census/programs-surveys/sis/resources/2020/sis_2020map_usvi_k-12.pdf

Artiga, S., Hall, C., Rudowitz, R., & Lyons, B. (2018). Health Care in Puerto Rico and the U.S. Virgin Islands: A Six-Month Check-Up After the Storms. Retrieved from https://www.kff.org/medicaid/issue-brief/health-care-in-puerto-rico-and-the-u-s-virgin-islands-a-six-month-check-up-after-the-storms-report/

Austin, D. A. (2018). *Economic and Fiscal Conditions in the US Virgin Islands.* Washington, D.C.: Congressional Research Service. Retrieved from https://fas.org/sgp/crs/row/R45235.pdf

Blake, E. S. (2007). *The deadliest, costliest, and most intense United States tropical cyclones from 1985 to 2006 (and other frequently requested hurricane facts).* Miami, Florida: National Oceanic and Atmospheric Administration, National Weather Service, National Hurricane Center.

Caribbean Exploratory Research Center. (2019). *Community Needs Assessment: Understanding the Needs of Vulnerable Children and Families in the U.S. Virgin Islands Post Hurricanes Irma and Maria.* Retrieved from https://cfvi.net/wp-content/uploads/2019/03/CFVI-CERC-Community-Needs-Assessment-E-Report_February-2019_Bookmarked.pdf

Centers for Disease Control and Prevention. (2021). COVID-19. Retrieved from https://www.cdc.gov/coronavirus/2019-ncov/index.html

Centers for Disease Control and Prevention. (2021). *COVID-19 in the U.S. Virgin Islands*. Retrieved from https://wwwnc.cdc.gov/travel/notices/covid-unknown/coronavirus-usvirgin-islands

Centers for Disease Control and Prevention. (2021). U.S. Virgin Islands COVID-19 Travel Information. Retrieved from https://wwwnc.cdc.gov/travel/destinations/clinician/none/usvirgin-islands

Chowdhury, M. A. (2019). Health Impact of Hurricanes Irma and Maria on St. *American Journal of Public Health, 109*(12), 1725-1732. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6836793/

Community Research Services, LLC. (2015). *A Housing Demand Study – Territory of the Virgin Islands.* Retrieved from https://www.cr-services.com/wp-content/uploads/2015/06/Executive-Summary-USVI-Housing-Demand-Study-VIHFA.pdf

Federal Emergency Management Agency. (2001). Understanding Your Risks: Identifying Hazards and Estimating Losses. *State and Local Mitigation Planning How-toGuide*.

Federal Emergency Management Agency. (2004). Using HAZUS-MH for Risk Assessment: How-to. *FEMA 433*. Retrieved from http://www.fema.gov/media-library/assets/documents/5231?id=1985

Federal Emergency Management Agency. (2007). *Risk Management Series Design Guide for Improving Critical Facility Safety from Flooding and High Winds.* Retrieved from https://www.fema.gov/sites/default/files/2020-08/fema543_design_guide_complete.pdf

Federal Emergency Management Agency. (2009). Protecting Manufactured Homes from Floods. Retrieved from https://www.fema.gov/media-library-data/20130726-1502-20490-8377/fema_p85.pdf

Federal Emergency Management Agency. (2015). 2015 International Building Code. Retrieved from https://www.fema.gov/media-library-data/1488284217191-c97654abdef952a68a9c7e8fc9282b62/2015_IBC_compilaton_of_wind_resistanc_provisions.pdf

Federal Emergency Management Agency. (n.d.). FEMA Territory Plan Review Guide and FEMA Territory Plan Review Tool.

Federal Emergency Management Agency. (n.d.). Local Mitigation Planning Handbook. *5-1*. Retrieved from https://www.fema.gov/media-library-data/20130726-1910-25045-9160/fema_local_mitigation_handbook.pdf

Federal Emergency Management Agency. (n.d.). *Risk Management Series Design Guide for Improving Critical Facility Safety from Flooding and High Winds.* Retrieved from https://www.fema.gov/media-library-data/20130726-1557-20490-1542/fema543_complete.pdf

Giles, C., & Rodriguez, C. H. (2020, September 1). Tensions rise among residents and travelers as US island territories work to stop COVID-19 spread. *USA Today*. Retrieved from https://www.usatoday.com/story/travel/destinations/2020/08/31/puerto-rico-travel-us-virgin-islands-travel-economy-covid-19/5638122002/

Government of the United States Virgin Islands. (2021). *COVID-19 Timeline*. Retrieved from https://www.vi.gov/usvi-covid-19-timeline/

Johns Hopkins University & Medicine. (2021). *COVID-19 United States Cases by County*. Retrieved from Coronavirus Resource Center: https://coronavirus.jhu.edu/us-map

Leshem, E., Gastanaduy, P. A., Trivedi, T., Halpin, A. L., Pringle, J., Lang, F., . . . Hall, A. J. (2016). Norovirus in a United States virgin islands resort: outbreak investigation, response, and costs. *Journal of Travel Medicine*. Retrieved from https://academic.oup.com/jtm/article/23/5/taw040/2579312

McGuire, J. W. (1925). Geographic dictionary of the Virgin Islands of the United States. *103*. (W. G. Office, Ed.) Department of Commerce. Retrieved from http://www.columbia.edu/cu/libraries/inside/projects/ebooks/prd/testing/Islands/html/pages/FID3.html

Mohammed, H., Ramos, M., Armstrong, J., & Muñoz-Jordán, J. L. (2010). An outbreak of dengue fever in St. Croix (US Virgin Islands). *PLoS ONE, 5*(e13729). Retrieved from https://www.researchgate.net/publication/47718787_An_outbreak_of_dengue_fever_in_St_Croix_US_Virgin_Islands_2005

National Centers for Environmental Information. (2019). Billion-Dollar Weather and Climate Disasters: Table of Events. National Oceanic and Atmospheric Administration. Retrieved from https://www.ncdc.noaa.gov/billions/events

National Oceanic and Atmospheric Administration. (2013). Storm Surge Overview. National Hurricane Center. Retrieved from https://www.nhc.noaa.gov/surge/

National Oceanic and Atmospheric Administration. (2020). Saffir-Simpson Hurricane Wind Scale. National Hurricane Center. Retrieved from https://www.nhc.noaa.gov/aboutsshws.php

National Oceanic and Atmospheric Administration. (n.d.). *FAQ - Tide Predictions and Data.* Retrieved from https://tidesandcurrents.noaa.gov/faq2.html

National Oceanic and Atmospheric Administration. (n.d.). *FAQ – Tide Predictions and Data.* Retrieved from https://tidesandcurrents.noaa.gov/faq2.html

National Oceanic and Atmospheric Administration. (n.d.). *Tides and Currents Data.* Wilmington, NC. Retrieved from https://tidesandcurrents.noaa.gov/waterlevels.html?id=8658120&units=standard&bdate=19500101&edate=20171231&timezo ne=GMT&datum=MSL&interval=m&action=data

National Resources Conservation Service Caribbean Area. (n.d.). Dealing with Drought. Retrieved from https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/pr/technical/?cid=nrcseprd390019#:~:text=In%202015%2C%20Puerto%20Rico%20and,Rico%2C%20eastern%20parts%20of%20St.&text=Over%2086%25%20of%20Puerto%20Rico,increased%20the%20threat%20of%20wildfires

National Resources Conservation Service Caribbean Area. (n.d.). Farmland Classification. Retrieved from https://www.nrcs.usda.gov/wps/PA_NRCSConsumption/download?cid=nrcseprd1569436&ext=pdf

National Resources Conservation Service Caribbean Area. (n.d.). USDA & National. Retrieved from https://www.nrcs.usda.gov/wps/portal/nrcs/detail/pr/newsroom/features/?cid=nrcseprd1257018

New Jersey Office of Emergency Management. (2019). 2019 New Jersey State Hazard Mitigation Plan Update. Retrieved from http://ready.nj.gov/mitigation/2019-mitigation-plan.shtml

Pearce, L. D. (2000). *An Integrated Approach for Community Hazard Impact, Risk and Vulnerability Analysis: HIRV.* Doctoral Dissertation, University of British Columbia.

Smith, K. (1996). *Environmental Hazards: Assessing Risk and Reducing Disaster.* London and New York: Routledge.

Southeast Climate Adaptation Science Center. (2020). 2020 Drought Conditions in the U.S. Retrieved from https://secasc.ncsu.edu/2020/07/22/2020-drought-conditions-in-the-u-s-carribbean/

STARRII. (2018, August 14). US Virgin Islands Advisory Data and Products: Post-Hurricanes Irma and Maria. *Contract No. HSFE60-15-D-0005*(Task Order 70FBR218F00000074). Retrieved from https://feedback.region2coastal.com/NationalDisasters/HurricaneMaria/Data/Advisory/USVI/Report/USVI_Report_(Final).pdf

The St. John Source. (2020). Dengue's V.I. Reappearance Makes Mosquito Control Paramount. Retrieved from https://stjohnsource.com/2020/01/02/dengues-v-i-reappearance-makes-mosquito-control-paramount/

U.S. Department of Housing and Urban Development. (2017). United States Virgin Islands Comprehensive Housing Market Analysis. Retrieved from https://www.huduser.gov/portal/publications/pdf/USVI-comp.pdf

U.S. Department of Housing and Urban Development. (2018). Allocations, Common Application, Waivers, and Alternative Requirements for Community Development Block Grant Disaster Recovery Grantees.

Retrieved from https://www.federalregister.gov/documents/2018/08/14/2018-17365/allocations-common-application-waivers-and-alternative-requirements-for-community-development-block

U.S. Energy Information Administration. (2020). U.S. Virgin Islands Territory Profile and Energy Estimates. Retrieved from https://www.eia.gov/state/analysis.php?sid=VQ

U.S. Global Change Research Program. (n.d.). Chapter 20: U.S. Caribbean. In *Fourth National Climate Assessment.* Retrieved from https://nca2018.globalchange.gov/chapter/20/

U.S.V.I. Bureau of Economic Research. (2018). U.S. Virgin Islands Annual Tourism Indicators. Retrieved from http://usviber.org/wp-content/uploads/2016/11/TOUR18-2.pdf

United States Army Corps of Engineers. (n.d.). *American Recovery and Reinvestment Act of 2009 Civil Works Construction.* Retrieved from https://www.usace.army.mil/Portals/2/docs/recovery/ComprehensiveConstruction.pdf

United States Census Bureau. (2013). Table 4a. Population, Housing Units, Land Area, and Density by Island and Census Subdistrict for the U.S. Virgin Islands: 2010. Retrieved from https://www.census.gov/data/tables/time-series/dec/cph-series/cph-t/cph-t-8.html

United States Census Bureau. (2019). TIGER/Line Shapefile, 2017, state, United States Virgin Islands, Current Estate State-based Shapefile (U.S. Virgin Islands only). Retrieved from https://catalog.data.gov/dataset/tiger-line-shapefile-2017-state-united-states-virgin-islands-current-estate-state-based-shapefi

United States Department of Agriculture. (n.d.). Disaster Assistance Programs. Retrieved from https://www.fsa.usda.gov/programs-and-services/disaster-assistance-program/

United States Geological Survey. (n.d.). *The Modified Mercalli Intensity Scale.* Retrieved from https://www.usgs.gov/natural-hazards/earthquake-hazards/science/modified-mercalli-intensity-scale

United States Government Accountability Office. (2019). 2017 Hurricane Season Federal Support for Electricity Grid Restoration in the U.S. Virgin Islands and Puerto Rico. *Report to Congressional Requesters*(GAO-19-296). Retrieved from https://www.gao.gov/assets/gao-19-296.pdf

United States Government Publishing Office. (2018). Federal Register. Retrieved from https://www.govinfo.gov/content/pkg/FR-2018-08-14/pdf/2018-17365.pdf

United States Virgin Islands Housing Finance Authority. (2018). Community Development Block Grant Disaster Recovery Program Action Plan. Retrieved from https://cdbgdr.vihfa.gov/wp-content/uploads/2020/03/USVI-CDBG-DR-Initial-Action-Plan.pdf

US Geological Survey. (2003). Puerto Rico Seismic Hazard Map. Retrieved from https://www.usgs.gov/media/images/puerto-rico-seismic-hazard-map

US Geological Survey. (2020). Caribbean Tsunami and Earthquake Hazards Studies. Retrieved from https://www.usgs.gov/centers/whcmsc/science/caribbean-tsunami-and-earthquake-hazards-studies?qt-science_center_objects=0#qt-science_center_objects

USVI Hurricane Recovery and Resilience Task Force. (2018). Report 2018. Retrieved from https://reliefweb.int/sites/reliefweb.int/files/resources/USVI%20Task%20Force%20Initial%20Report.pdf

USVI Office of Disaster Recovery. (2019). *2019 Territorial Hazard Mitigation Plan.* Retrieved from https://www.usviodr.com/wp-content/uploads/2019/09/2019-Territorial-Hazard-Mitigation-Plan_Revisions_29May2020-6.12.20.pdf

VIHFA Virgin Islands Community Disaster Response Mitigation Survey. (n.d.). Retrieved from https://tinyurl.com/y7t35cpf

Virgin Islands Source. (2020). Virgin Islands Drought is Over. Retrieved from https://stthomassource.com/content/2020/09/03/virgin-islands-drought-is-over/

World Health Organization. (2021). Coronavirus. Retrieved from https://www.who.int/health-topics/coronavirus#tab=tab_1

APPENDIX F: SUMMARY OF VIHFA OUTREACH WITH STAKEHOLDERS TO ALIGN AND COORDINATE EFFORTS

NOTE: Lists do not reflect all meetings and details of meetings, it serves as a snapshot of ongoing efforts to coordinate with and listen to stakeholders and agencies in developing a CDBG-MIT Action Plan for the territory that is a fit with input from Virgin Islanders and matches HUD requirements

Media Awareness and Engagement Campaign

Press releases sent to the media platforms and over 600 constituents on our mailing list on 7/8/2023, 7/10/2023 and 7/12/2023.

Social media posts and boosting conducted from July 7th through July 19th. These efforts resulting in 35,000 reach with 2,500 direct engagements which equates to "Likes", "Shares" and "Comments" as of 8/11/2023 (See below.)

- VI Consortium: July 7th through July 12th
- STX Source: July 7th through July 12th
- STX Avis: July 10th through July 12th
- Daily News:

Radio Appearances were conducted from July 10th through July 12th on "the Reef, DaVybe," Isle 95 and Rhumba. Additionally, all radio advertisements were published the week of on all STX radio stations.

Citizen Participation

Public Hearings were convened prior to the action plan publication and on both islands as per the Federal Register Notice requirements for the Substantial Amendment. A list of hearings and dates follow.

Public Hearing Number 1 – July, 07, 2023, Pre-Plan Publication: July 7. 2023

Public Hearing Number 2 – July 12, 2023, St. Croix

Public Hearing Number 3 – July 19, 2023, St. John/St. Thomas/Water Island

Citizen Advisory Committee Engagement

Engagement of the Citizen Advisory Committee was initiated at the first Public Hearing Meeting where the CAC committee members were provided the public hearing schedule. This effort was also enhanced with a scheduled meeting of the CAC that convened on Thursday, August 3, 2023 via TEAMS. The CAC feedback and consultation is recorded in Appendix D-4. The committee is comprised of the following people.

Member	Type	District/Location

Kerten Peters	VIHFA Staff/ Affected By Storm/Home Damaged	St. Croix
Makiijah Crabbe	VIHFA Staff/Affected By Storm	St. Thomas
Nellie Varlack	Community Member	St. Thomas
Daria Scott	Community Member	St. Thomas
Anquanette Gaspard	Community Member	St. Croix
Samantha Harlow	Community Member	St. Croix
Vacant	Community Member	St. John
Ishani Chinnery	Senator Marvin Blyden Rep	St. Thomas
Jamila Russell	Senator Donna Frett-Gregory Rep	St. Croix
Colette Monroe	Governor Albert Bryan Rep	Water Island
Jessica Whyte	Non-Profit Partner	St. Thomas
Vacant	Non-Profit Partner	

U.S. Virgin Islands Energy Technical Coordination Team

VIHFA engaged the local and federal regulatory partners to convene a quarterly Energy Lifeline Technical Coordination Team. Participants included the following.

Agency	Acronym
U.S. Department of Energy	DOE
U.S. Department of Interior	DOI
U.S. Department of Transportation	DOT
U.S. Virgin Islands Department of Planning and Natural Resources	DPNR
U.S. Environmental Protection Agency	EPA
FEMA Environmental and Historic Preservation	FEMA EHP
FEMA Interagency Recovery Coordination	FEMA IRC
FEMA Mitigation	FEMA Mitigation
FEMA Process for Public Assistance	FEMA PA
FEMA Recovery Support Function Leadership Group	FEMA RSFLG
U.S. Housing and Urban Development	HUD
Lawrence Berkeley National Laboratory (LBNL)	LBNL
National Renewable Energy Laboratory (NREL)	NREL
Sandia National Laboratories	SNL

U.S. Treasury	Treasury
U.S Virgin Islands Office of Disaster Recover	VI ODR
U.S. Virgin Islands Energy Office	VIEO
U.S. Virgin Islands Housing and Finance Authority	VIHFA
U.S. Virgin Islands Water and Power Authority	WAPA

May 10, 2023 – USVI-Energy TCT Quarterly Meeting to Re-establish group, introduce Vitol Acquisition.

July 11, 2023, Meeting convened to discuss Plan.

July 14, 2023 Opening of TCT Comment Period on Substantial Amendment

July 26, 2023 Close of TCT Comment Period on Substantial Amendment

July 28, 2023, USVI-Energy TCT Quarterly Meeting to Presentation of Substantial Amendment

August 03, 2023 VIHFA meeting w/ VIWAPA to discuss TCT Comments

August 04, 2023, VIHFA meeting with National Labs on Performance Measures Requirements

August 07, 2023. VIHFA meeting with National Labs and VIWAPA on Performance Measures Requirements

Meeting Agenda and Minutes, May 10, 2023,

U.S. Virgin Islands Energy Technical Coordination Team

AGENDA

DATE: Wednesday May 10, 2023
TIME: 11:00-12:00 EST
LOCATION: Microsoft Teams
FACILITATOR: Pete Gingrass, US Department of Energy

11:00-11:15	**Welcome, Introductions, and Brief Updates** Roll call will be taken and opening remarks will be given by DOE and FEMA IRC. ***Facilitator***: Pete Gingrass, US Department of Energy, Angela Barton, FEMA IRC
11:15-11:25	**Overview of DOE's Grid Deployment Office** DOE will provide a brief presentation on the Grid Deployment Office and the programs under its umbrella. ***Facilitator***: Pete Gingrass, US Department of Energy
11:25-11:50	**TCT Member Updates** TCT team members will have an opportunity to provide updates on their agency's ongoing efforts relative to the work of the Energy TCT and bring attention to topics that require coordination among the broader Energy TCT. • Brief overview of energy projects • Challenges/barriers • Assistance requests If there are any challenges that members are facing, they can solicit help from the broader TCT. ***Facilitator***: Pete Gingrass, US Department of Energy
11:50-12:00	**Action Items and Next Steps** Any other business can be discussed. The next meeting date will be in August. Suggestions for future meetings or structure: Email pete.gingrass@hq.doe.gov

Meeting Agenda and Minutes, July 28, 2023

U.S. Virgin Islands Energy Technical Coordination Team

AGENDA

DATE: Friday July 28, 2023
TIME: 11:00-12:00 EST
LOCATION: Microsoft Teams
FACILITATOR: Pete Gingrass, US Department of Energy

11:00-11:10	**Welcome, Introductions, and Brief Updates** Roll call will be taken and opening remarks will be given by DOE and FEMA IRC. ***Facilitator***: Pete Gingrass, US Department of Energy, Angela Barton, FEMA IRC
11:10-11:35	**TCT Member Updates** Presentation on the substantial amendment to the CDBG-MIT action plan to incorporate WAPA Vitol Propane Acquisition. ***Facilitator***: Odari Thomas, VIHFA; Andy Smith, WAPA
11:35-11:55	**Questions & Answers** ***Facilitator***: Pete Gingrass, DOE; Odari Thomas, VIHFA; Andy Smith, WAPA
11:55-12:00	**Action Items and Next Steps** Any other business can be discussed. The next meeting date will be in November. Suggestions for future meetings or structure: Email pete.gingrass@hq.doe.gov

VI WAPA Correspondence to TCT

VIRGIN ISLANDS
WATER AND POWER AUTHORITY

P.O. BOX 1450,
ST. THOMAS, USVI
00804-1450
TELEPHONE: (340) 774-3552
FAX: (340) 715-6574

OFFICE OF THE EXECUTIVE DIRECTOR

August 7, 2023

VIA ELECTRONIC MAIL

Pete Gingrass, PMP
Senior Project Manager, Puerto Rico and Other Territories
Grid Modernization Division, Grid Deployment Office
U.S. Department of Energy
303.727.0528 cell
Email: Pete.gingrass@hq.doe.gov

Dear Mr. Gingrass:

Thank you for forwarding the correspondence you received from the U. S. Environmental Protection Agency (EPA) following our recent Technical Coordination Team (TCT) meeting held on July 28, 2023. The TCT meeting was held to review the HUD CDBG-Mitigation grant funding request from the Virgin Islands Housing Finance Authority (VIHFA) on behalf of its subrecipient, the Virgin Islands Water and Power Authority (WAPA or the Authority), for the acquisition of the Territory's Propane Supply Infrastructure.

The correspondence from the EPA noted EPA's support and engagement with the U. S. Virgin Islands to ensure good environmental governance, healthy communities, and a transition toward green economies. WAPA is aligned with the EPA's stated objectives and is making significant strides toward increasing renewable penetration in the Territory. Working with the Virgin Islands Energy Office (VIEO), the Virgin Islands Public Services Commission (PSC), the Legislature of the Virgin Islands, and the Government of the Virgin Islands (GVI), WAPA initially implemented a Net Metering program to provide homeowners incentive to adopt rooftop solar and storage. This program quickly exceeded the installed capacity targets of the program. WAPA subsequently transitioned to a Net Billing program to continue to support and encourage adoption of rooftop solar and energy storage. Participating in the Net Billing program has also been robust and remains robust. There are currently approximately 900 applications in the queue for Net Billing installations.

WAPA is also currently working with the VIEO to administer on-bill financing for low to moderate income customers to receive funding for rooftop solar and energy storage supported by federal grant funding. WAPA is also coordinating with the VIEO on the VIEO's grant application for EPA grant funding for the development of significant residential rooftop solar and storage.

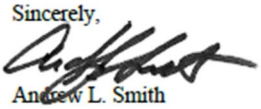
In addition to rooftop solar and storage, the Authority is also pursuing utility-scale renewables for the Territory. WAPA recently signed 25-year fixed price Power Purchase Agreements (PPAs) for solar and wind energy with energy storage that will provide approximately 25% of the Territory's electricity once fully in service. The projects are expected to reach full commercial operation in 18-24 months. WAPA intends to pursue additional utility-scale renewable resources after it integrates the projects backing the solar and wind PPAs. In addition to the recently signed solar and wind PPAs, WAPA continues to execute on several microgrid projects that include renewable energy and storage and is currently in the design and engineering phase of its microgrid projects.

The aforementioned initiatives, being driven either directly by WAPA or supported by WAPA, help transition the Territory to a greener economy. However, WAPA will need conventional electricity generation to provide a bridge to the Territory's renewable energy future. As discussed, the wind and solar PPA projects represent only about 25% of the Territory's electricity needs and are 18-24 months from being fully in service. Subsequent utility scale renewable energy projects are likely 4+ years from being fully in service. Likewise, the EPA grant funding program mentioned above is expected to award its competitive grants in mid-2024, with rollout of the program, if the Territory is a successful applicant, thereafter.

In the meantime, WAPA can produce electricity using one of two fuels — propane or diesel. Propane is a much cleaner-burning fuel than diesel. In fact, if WAPA were to operate solely on diesel, it would exceed its EPA emissions limits after approximately three months. WAPA's propane generation is also newer and more efficient than its diesel-fired generators, so WAPA also burns larger quantities of fossil fuel (approximately 40% more) when operating on diesel than it burns when operating on propane. WAPA's ability to operate on propane depends on access to the Propane Supply Infrastructure on St. Thomas and St. Croix, which it is currently seeking HUD CDBG-Mitigation grant funding to acquire. Without access to the Propane Supply Infrastructure, WAPA can only operate on diesel. Accordingly, acquisition of the Propane Supply Infrastructure is critical to ensuring that WAPA can operate in its most environmentally friendly way while renewable energy assets are developed. Finally, energy storage can provide a backstop to renewable energy generation, but the U. S. Virgin Islands is exposed to significant risk of tropical storms and hurricanes. Energy and electricity are critical FEMA Community Lifelines (services that FEMA seeks to return to service quickly following natural disasters to ensure that the community can function and provide basic services). If severe weather results in multiple days of cloud cover in the Territory, conventional generation will be needed, based on the intermittency of renewables and installed capacity of energy storage today, to provide electricity service to the Territory and maintain the FEMA Energy Lifeline.

I would like to express WAPA's gratitude, and my thanks personally, for your support as well as the support of your team in helping us secure the energy future for US Virgin Islanders.

Sincerely,



Andrew L. Smith
Executive Director/CEO

APPENDIX G: PROPOSED PROJECTS LIST FOR POTENTIAL CONSIDERATION UNDER CDBG-MIT FUNDING

Grantee has vigorously engaged in carefully evaluating potential MIT-AP projects and will continue to do so in accord with 84 FR 45840 which states:

> "The Administration cannot emphasize strongly enough the need for grantees to fully and carefully evaluate the projects that will be assisted with CDBG–MIT funds. One of the goals of CDBG–MIT is to set a nationwide standard that will help guide not just future Federal investments in mitigation and resilience activities—to include the mitigation of community lifelines, but state and local investments as well. The level of CDBG– MIT funding available to most grantees cannot address the entire spectrum of known mitigation and resilience needs. Accordingly, HUD expects that grantees will rigorously evaluate proposed projects and activities and view them through several lenses before arriving at funding decisions, including ensuring that already committed public or private resources are not supplanted by CDBG– MIT funds."

Various departments of the USVI Territorial Government have expressed interest in using CDBG-MIT funds for projects that reduce risks to indispensable services. Grantee has been engaged with such departments in examining potential projects, with continuing discussions ongoing in order to gather additional details on how such proposals fit within the defined MIT-AP Activity Categories, which are Infrastructure and Public Facilities, Economic Resilience and Revitalization, Housing, Public Services, Planning and Administration.

However, most of such proposed "department driven" projects are in the early stages of development, meaning that a need has been identified and a desire for the project expressed, but because funding has not yet been committed to such projects, the detailed design work necessary to generate clear and accurate pricing has not yet occurred. Therefore, the projected costs of such projects are only rough estimates and careful vetting by the grantee will be necessary as ideas are developed further, before final decisions are made. The varied nature of potential activities under the general project categories are such that applications will be reviewed in detail by the Grantee, given the competitive nature and variety of possible mitigation activity options.

Grantee believes the USVI will be best served by establishing general project categories targeted on reducing risks to indispensable services and then utilizing a fully open and fair procurement program to provide competition to all applicants—whether they are government departments or competitively procured private/public partnerships. Such an approach is consistent with federal procurement standards and will provide the best leveraging of federal resources. Such general project categories are defined in the MIT-AP.

Grantee is included in this list of some of the many projects that have been recommended by departments of the Territorial government and other community leaders and stakeholders.

Section 3 of the MIT-AP, entitled "Connection of Mitigation Programs to Identified Risks" provides very relevant insights into the connection between programs and identified risks—projects that are eventually chosen through the procurement process will be required to have such direct connections to risks identified in the MIT-AP.

With some potential projects that have been identified, some details have been provided, which are reflected in the following chart. Potential projects that have been identified and require additional information prior to being considered further include:

No.	Potential Projects	Risk and Mitigation Needs
1	**Kidney Dialysis Center**(s) for the Territory	*This project could mitigate risk to Health and Medical Lifeline.* This project aligns with other reported stakeholder needs and could be set up as a public-private partnership with adequate resources that would allow operations after a hurricane or similar disaster, rather than having to transport all patients off island following a disaster.
2	**Training Hotel(s)** to educate local workforce on hospitality industry, which the proposed project would promote economic growth and employment in the Territory and with facilities designed to provide additional options for shelter during emergencies	*This project could mitigate risk to Food, Water, Shelter Lifeline.* This project aligns with other reported stakeholder needs, and addresses lack of educational options in this field in the territory, with facility potentially to be designed to also serve as a community center and/or shelter during hurricanes or similar disaster.
3	Further support to the ongoing **GIS/Naming project**	This project aligns with other reported stakeholder needs, and would add to work currently being coordinated through the Lt. Governor's Office to allow U.S. government entities, visitors, and territorial government to have better and more complete information
4	Dual purpose **parking garages** for Charlotte Amalie and Christiansted that could be designed as hardened facilities to house communications cell trailers and essential emergency vehicles	*This project could mitigate risk to Transportation and Communications Lifelines.* This project aligns with other reported stakeholder need and could provide a key resource for sheltering stored equipment that will be needed following disasters.
5	**Sargassum seaweed removal program** to address the large volume of foreign seaweed that has been more regularly appearing on beaches	*This project could mitigate risk to Safety and Security.* This project aligns with other reported stakeholder needs and could be seen as beneficial to economic growth by improving beaches and potentially generating new jobs, as well as the benefit of removing the vast amounts of the seaweed in order to prevent impediments to search and rescue activities.
6	**Investing in paths and walking trails** to improve options for safe walking and biking within the Territory	*This project could mitigate risk to both the Health and Medical and Transportation Lifelines.*

No.	Potential Projects	Risk and Mitigation Needs
		This project aligns with other reported stakeholder needs, and potentially improves access to portions of the Territory, especially for LMI individuals who may rely less on motor vehicles for transportation and may benefit from being able to have safer walking and biking corridors.
7	**Hardened Solar Powered Agricultural Storage Facilities** to provide options for storing essential foodstuffs for use in emergencies	*This project could mitigate risk to Food Water Shelter Lifeline.* This project aligns with other reported stakeholder needs and addresses potential food security issues within the territory that have been identified following previous disasters.
8	**Mobile kitchens** for community use that can be stored in secure locations and then deployed following disasters	*This project could mitigate risk to Food Water Shelter Lifeline.* This project aligns with other reported stakeholder needs and empowers communities to work together to be more self-sufficient and self-sustaining following a disaster, as identified by the public following previous disasters.
9	**Restoring water catchment systems** in the territory	*This project could mitigate risk to Food Water Shelter Lifeline.* This project aligns with other reported stakeholder needs and facilitates mitigation by storing additional water resources in advance of disasters to further supplement what is already being done by WAPA.
10	**Mobile communications centers** to establish cell connections and facilitate planning following disasters, potentially on trailers or otherwise similarly portable to make deploying them easier	*This project could mitigate risk to Communications and Health and Medical Lifelines.* This project aligns with other reported stakeholder needs, and addresses identified issues with communication that have been made clear following prior disasters when cell coverage has been severely impacted, preventing timely medical assistance and rescue efforts.
11	**St Thomas Skate Park and Recreational Facility**, likely to be engineered to use features in the park as means for better drainage and flood control	*This project could mitigate risk to Health and Medical Lifeline.* This project aligns with other reported stakeholder needs and could be a means for better controlling potential flood zones through careful planning as well as providing healthy recreational opportunities to youth looking for activities, especially when options are more limited following a disaster.
12	**WAPA Vitol Acquisition** of propane facilities, structured in such a way as to better position	*This project could mitigate risk to the Energy Lifeline.*

No.	Potential Projects	Risk and Mitigation Needs
	WAPA to control costs and potentially pass along rate savings to customers	The proposed activity substantially addresses the threats to the energy lifeline as it provides the utility with additional fuel storage capacity contained in resilient concrete bunkers and the ability to operate on propane which will allow it to utilize its newest and most efficient generators which should improve grid liability. This project aligns with other reported stakeholder needs and could also lower energy costs, although more extensive mitigation activities in this area are anticipated for the Territory electrical grid once HUD releases the pertinent guidance that is anticipated.
13	**Acquiring satellite phones and radios** for communication within the VIHFA organization following disasters and in preparing for them	*This project could mitigate risk to Communication Lifeline.* This project aligns with other reported stakeholder needs, and addresses concerns that arose from lost communication options following prior hurricanes being an impediment to necessary services, including rescue coordination and recovery services.
14	**Mobile task force** that can aid in the safety of the vulnerable population before, during and after disasters	*This project could mitigate risk to Health and Medical Lifeline.* This project aligns with other reported stakeholder needs and addresses a vulnerable population that can be forgotten and face the perils of disasters because of their limitations.
15	**A recycling plant or similar program** could have significant benefits beyond job creation - Although costly to ship waste and other recycling products of the island, building a program for handled the products within the Territory and reused in the community should be explored	*This project could mitigate risk to Hazardous Materials lifeline.* This project aligns with other reported stakeholder needs and could be a study undertaken to further consider feasibility.
16	**Improve/restore drainage "guts"** to mitigate flooding while also controlling runoff and erosion	*This project could mitigate risk to Food Water Lifeline.* This project aligns with other reported stakeholder needs, and improves natural infrastructure to mitigate future risks, given identified deficiencies in the current system within the Territory.
17	**Coral Bay STJ Fire Station Relocation** to provide adequate space and facilities for those protecting STJ residents	*This project could mitigate risk to Safety Lifeline.* This project aligns with other reported stakeholder needs and would provide support to a key population center on St. John.
18	**Repair/construct downtown housing to** provide for a larger population in walking distance will produce 24-hour activity, supporting businesses	*This project could mitigate risk to Food Water Shelter Lifeline.*

No.	Potential Projects	Risk and Mitigation Needs
	and improving safety on St. Thomas and potentially St. Croix as well.	This project aligns with other reported stakeholder needs and could encourage economic growth while providing additional housing option for LMI individuals.
19	**Construct new or improved public open spaces** (parks, plazas) that can provide for community gathering and also be designed to hold water and act as drainage/stormwater solutions through proper landscaping and design. This could involve converting parking lots to public green spaces in the waterfront area on St. Thomas is part of this idea	*This project could mitigate risk to Health and Medical Lifeline.* This project aligns with other reported stakeholder needs and could encourage economic growth while providing space for exercise and community activities.
20	**Community education and enforcement** of erosion safeguards and proper use of retaining walls and drainage systems	*This project could mitigate risk to Safety and Food Water Shelter Lifelines.* This project aligns with other reported stakeholder needs, while encouraging safe building and compliance.
21	**Behavioral Health Care Facility** given lack of current options and limitations within current medical facilities in the Territory	*This project could mitigate risk to Health and Medical Lifeline.* This project aligns with other reported stakeholder needs and supports vulnerable populations in the Territory.
22	**Power grid hardening** as the system would be more effective and efficient if the power grid were placed underground territory wide	*This project could mitigate risk to Energy Lifeline.* This project aligns with other reported stakeholder needs but may need to be addressed when new power grid regulations are released by HUD.
23	**Initiative to improving home inspections and enforcement of requirements**, including more stringent inspection requirements	*This project could mitigate risk to Health and Medical Lifeline.* This project aligns with other reported stakeholder needs, while encouraging safe building and compliance.
24	**Ready-made and locally built shipping container shelters**, with stock available on each major island within the territory while homeowners are making repairs following an event	*This project could mitigate risk to Food Water Shelter Lifeline.* This potential public-private partnership project aligns with other reported stakeholder needs, encouraging advance planning to mitigate housing risks and engages the community in building them.
25	**Dredging harbors** on St. Croix and St. Thomas for Quantum class ships	*This project could benefit economic growth by encouraging additional visits each year.* This project aligns with other reported stakeholder needs and identified priorities within the USVI government.

No.	Potential Projects	Risk and Mitigation Needs
26	**Vertical Gardening** centers as a means of improving agricultural efficiency and better securing local food supply	*This project could mitigate risk to Food Water Shelter Lifeline and contribute to economic revitalization by creating new jobs.* This project aligns with other reported stakeholder needs, and potentially improves food security in the territory.
27	**St Croix Ambulatory Center to** serve as potentially expanded surgery center and medical facilities as potential public-private partnership	*This project could mitigate risk to Health and Medical Lifeline.* This potential public-private partnership project aligns with other reported stakeholder needs, providing residents with additional medical support during times of crisis when community facilities may be overwhelmed.
28	**Krum Bay clean up and infrastructure improvements,** to include DPNR enforcement facility and educational center, plus likely public-private partnership for marine industrial facilities	*This project could mitigate risk to Food Water Shelter Lifeline and contribute to economic revitalization by creating new jobs.* This project aligns with other reported stakeholder needs, and potentially improves commerce while encouraging economic growth, providing another site for offloading emergency supplies, and storing boats and other assets during storm events, while also better protecting the WAPA water intake location on St. Thomas.
29	**Supportive Housing** for homeless that can serve as a shelter for this key population during storm events and provide CoC services	*This project could mitigate risk to Food Water Shelter Lifeline.* This project aligns with other reported stakeholder needs and relatively few resources exist for the homeless population in the Territory, who are particularly vulnerable during hurricanes. With support services to be provided on site to provide a continuum of care to the population is important, especially with no mental hospitals or similar facilities currently in place.
30	**Landfill Funding** for St. Thomas and St. Croix facilities	*This project could mitigate risk to Food Water Shelter Lifeline and Hazardous Materials Lifeline.* This project aligns with other reported stakeholder needs and can assist in closing the landfills located on St. Croix and St. Thomas and begin transition to new sites has been identified as a priority for the Territory. With limited budgetary resources and court orders mandating action, the ability to handle debris and waste following hurricanes is essential,

No.	Potential Projects	Risk and Mitigation Needs
		especially given the logistical complications and costs that arise from shipping it off-island.
31	**Critical Road Improvements,** to include Queen Mary Highway on St. Croix, Hospital Gade/Mafolie Road on St. Thomas, Bolongo Road on St. Thomas and Centerline Road on St. Croix.	*This project could mitigate risk to Transportation Lifeline.* This project aligns with other reported stakeholder needs and In identifying roads that are heavily used for improvements, sidewalks and buried utilities and/or resurfacing current roads with a view of coordinating efforts to account for future development will be considered, with goal of preventing additional repairs or cutting in the future.
32	**Water Pipe improvements/replacement across the Territory** to modernize the system to improve efficiency and consistent pipe diameters to facilitate maintenance	*This project could mitigate risk to Food Water Shelter Lifeline.* This project aligns with other reported stakeholder needs and could include both rehab and extensions to identified areas, to both increase pipe size and make the overall system more functional, with consistent pipe diameters that facilitate flow and lessen likelihood of failure, further supporting some improvements already contemplated using non CDBG-MIT funding sources.
33	**Multipurpose Sports Facility on St. Croix** that also is designed to serve as a shelter and supplies distribution hub during times of emergency	*This project could mitigate risk to Food Water Shelter and Health Lifelines.* This project aligns with reported stakeholder needs and could provide an important alternative shelter option to be used instead of schools in disaster events while also providing a site that could safely be used for recreational health activities.
34	**Homeless Study** to better analyze the existing population and identify potential action items to better support this key population	*This project could mitigate risk to Food Water Shelter Lifeline.* This project aligns with other reported stakeholder needs and will enable better support of the unique homeless population in the Territory, who are particularly vulnerable during hurricanes.
35	**Veterans Drive Road Extension** on St. Thomas	*This project could mitigate risk to Transportation Lifeline.* This project aligns with other reported stakeholder needs. Extending Veterans Drive on St. Thomas from the Coast Guard Station to Frenchtown will raise the seawall area in a portion of Charlotte Amalie that floods with some regularity and faces the main harbor; the design also provides an extension of the public space that is used regularly by visitors

No.	Potential Projects	Risk and Mitigation Needs
		and locals alike for exercise and recreation and improves underground infrastructure below the road; part of the goal in extending waterfront improvements beyond downtown is to prepare for sea level rise and better control persistent flooding in this key commercial area, which will lessen the impact of future disasters by reducing the risk of damage to and loss of property in this key commercial area on St. Thomas. This project aligns with current improvements already in place, extending the work done through a key corridor that links downtown Charlotte Amalie to the airport and port facilities
36	**Providing gap financing** to high-impact economic development projects	*This project could mitigate risk to Communications and Energy Lifelines.* This project aligns with other reported stakeholder needs and meets an unmet need within the Territory to support small business growth and public private partnerships that could improve Energy and Communications resources in particular.
37	**Mobile task force** that can aid in the safety of the vulnerable population before, during and after disasters	*This project could mitigate risk to Food Water Shelter Lifeline.* This project aligns with other reported stakeholder needs as often these populations are forgotten and face the perils of disasters because of their limitations.
38	**St. Croix Sunday Market Square LMI housing Units** for affordable co-working and commercial space	*This project could mitigate risk to Food Water Shelter Lifeline.* This project aligns with other reported stakeholder needs and provides additional housing options to LMI individuals.
39	**Youth Activities Center on St. Croix** with various outdoor recreational activity options to engage youth and provide positive opportunities to be active outside that could serve as a shelter during emergency events.	*This project could mitigate risk to Food Water Shelter and Health and Medical Lifelines.* This project aligns with other reported stakeholder needs and meets a key need identified within the community while also providing an alternative venue to shelter LMI individuals and others that is not an existing school.
40	**St. Thomas Fisherman's Association** facility improvement and expansion to provide storage for traps and better options for selling locally caught fish, potentially with additional sites for centralized sales/processing of fish and ideally better facilitating locally caught fish at USVI markets	*This project could mitigate risk to Food Water Shelter Lifeline.* This project aligns with other reported stakeholder needs and enables fishermen to be better prepared to provide food shortly after a disaster, as well as getting their catch more widely distributed.

No.	Potential Projects	Risk and Mitigation Needs
41	**VI Multifamily Housing Developments –** additional projects beyond those previously identified and slated for CDBG-DR	*This project could mitigate risk to Food Water Shelter Lifeline.* This project aligns with other reported stakeholder needs and provides housing options to LMI individuals given identified needs within the Territory.
42	**Infill Scattered Site Single Family Housing –** additional sites on STT, STX, and STJ that require site work and further development planning	*This project could mitigate risk to Food Water Shelter Lifeline.* This project aligns with other reported stakeholder needs and provides additional housing options to LMI individuals given identified needs within the Territory, beyond those already contemplated.
43	**Homes for the Aged** Improvements on both St. Thomas and St. Croix	*This project could mitigate risk to Food Water Shelter Lifeline.* This project aligns with other reported stakeholder needs and provides housing to a vulnerable population in the Territory.
44	**Cultural Arts and Music Center on St. Thomas - Virgin Islands Center for Arts and Technology** would be a nonprofit initiative technology center focused on Vocational Education in film, music and hospitality	This project aligns with other reported stakeholder needs and addresses an identified need within the community, providing education and support to a key population.
45	**Small Business Loans** and programs to strengthen entrepreneurship	*This project could mitigate risk to Food Water Shelter Lifeline.* This project aligns with other reported stakeholder needs and supports economic development that in turn can benefit LMI populations and help the Territory attract new business.
46	**Hardened Bunker Facility** (and possibly new VITEMA center) for strategic operations during disasters, which could also house VIPD and other essential personnel as a communications hub	*This project could mitigate risk to Food Water Shelter and Safety & Security Lifelines.* This project aligns with other reported stakeholder needs and provides additional resources to key organizations to better support LMI populations and others in the Territory from a location that is secure during emergency events.
47	**VIHFA Rental Properties Improvements** for Retaining Walls on St. Thomas	*This project could mitigate risk to Food Water Shelter and Safety & Security Lifelines.* This project aligns with other reported stakeholder needs and supports safe housing options to LMI individuals on St. Croix by hardening existing infrastructure against erosion and runoff risks on properties identified on St. Thomas.

No.	Potential Projects	Risk and Mitigation Needs
48	**Territory Planning Initiatives** for improving codes and planning standards or implement Territory-wide land use plans	*This project could mitigate risk to Food Water Shelter Safety & Security Lifelines.* This project aligns with other reported stakeholder needs and could support land use planning that has stalled previously. In addition, efforts to support education and training about Form-Based Codes (FBC), to assist with adoption and implementation of the draft code within the territory, looking at how new or repaired housing could be built to higher/green standards to be resilient and better withstand future storms, plus looking at the urban design guidance of the draft Form-Based Code to be consistent with the community vision and historic setting, plus conducing community outreach and education on understand and use these codes, and conducting community-based visioning to plan future development could be contemplated.
49	**Improvements/Repairs to St. John Community Health Clinic,** given its proximity and importance to the local population due to the distance from hospital facilities on St. Thomas	*This project could mitigate risk to the Health and Medical Lifeline.* This project aligns with other reported stakeholder needs and addresses a key need for those in the Territory who reside on St. John and must travel to St. Thomas or elsewhere for medical care.
50	**Leveraging CDBG-MIT funding for Local Match**, to take full advantage of funding opportunities for the Territory	*This project could mitigate risk to all Lifelines.* This project aligns with reported stakeholder needs and enables the Grantee to take full advantage of existing funding to address the many identified mitigation needs within the Territory.
51	**Solar Power Homeowner Initiative** provides households the opportunity to acquire renewable solar energy equipment and represents a direct investment in a self-sustaining, regenerative installation that could persist and thrive through physical, economic, and social challenges after a hazard event.	*This project could Mitigate the Health and Safety Lifeline.* This project aligns with other reported stakeholder needs and lessens the strain on homeowners by providing affordable, sustainable, and resilient energy sources to the LMI population.

APPENDIX H: ACRONYMS AND AGENCIES

ADA – Americans with Disabilities Act

AMI – Area Median Income

DR-4335 – Major Disaster Declaration for Hurricane Irma

DR-4340 - Major Disaster Declaration for Hurricane Maria

DRGR – Disaster Recovery Grant Reporting System

DR-4340 - Major Disaster Declaration for Maria

DRGR – Disaster Recovery Grant Reporting System

CDBG-DR - Community Development Block Grant Disaster Recovery

CDBG-MIT – Community Development Block Grant Mitigation

CoC – Virgin Islands Continuum of Care

DHS – Virgin Islands Department of Human Services

DOA – Virgin Islands Department of Agriculture

DOB – Duplication of Benefits

DOC – U.S. Department of Commerce

DoD – U.S. Department of Defense

DOE – Virgin Islands Department of Energy

DOF – Virgin Islands Department of Finance

DOI – U.S. Department of the Interior

DOL – Virgin Islands Department of Labor

DPNR – Virgin Islands Department of Planning and Natural Resources

DPP – Virgin Islands Department of Property and Procurement

DPW – Virgin Islands Department of Public Works

DSPR – Virgin Islands Department of Sports, Parks and Recreation

ED – U.S. Department of Education

EDA – U.S. Economic Development Administration [part of the U.S. Department of Commerce]

EIA – U.S. Energy Information Administration

EPA – U.S. Environmental Protection Agency

FEMA – Federal Emergency Management Agency [part of the U.S. Department of Homeland Security]

FEMA IA – FEMA's Individual Assistance Program

FEMA PA – FEMA's Public Assistance Program

FHWA-ER – U.S. Federal Highways Administration Emergency Relief Program

FVL – Full Verified Loss

GDP – Gross Domestic Product

GIS – Geographic Information Systems

HAZUSMH – FEMA's Hazards U.S. Multi-Hazard

HCDA – Housing and Community Development Act of 1974

HCV – Housing Choice Voucher

HMGP – [FEMA] Hazard Mitigation Grant Program

HMIS – Homeless Management Information System

HQS – Housing Quality Standards

HUD – U.S. Department of Housing and Urban Development

IHP – Individual and Household Programs

ISP – Internet Service Provider

LEP – Persons of limited-English proficiency

LIHTC – Low Income Housing Tax Credit

LMA – Low- to Moderate- income Area

LMI – Low- to Moderate- income Individual

LMR – Land Mobile Radio

LTRG – Long Term Recovery Group

MIT-AP – CDBG-MIT Action Plan

MNA – Mitigation Needs Assessment

NFIP – National Flood Insurance Program

PAAP – FEMA Public Assistance Alternatives Procedures

PDM – FEMA Pre-Disaster Mitigation Grant Program

PFA – Virgin Islands Public Finance Authority

PP FVL – Personal Property Full Verified Loss

PW – [FEMA] Project Worksheet

QPR – Quarterly Performance Report

SBA – U.S. Small Business Administration

STEP – FEMA's Sheltering and Temporary Essential Power Program

STJ – Shorthand for St. John

STT – Cyril E. King International Airport, also shorthand for St. Thomas

STX – Henry E. Rohlsen Airport, also shorthand for St. Croix

THMP – Territorial Hazard Mitigation Plan

TIGER - U.S. Department of Transportation's Transportation Investment Generating Economic Recovery Grants

URA – Uniform Relocation Assistance and Real Property Acquisition Policies Act

USACE – U.S. Army Corps of Engineers

USDA – U.S. Department of Agriculture

UVI – University of the Virgin Islands

VICS – Virgin Islands Community Survey

VIDE – Virgin Islands Department of Education

VIHA – Virgin Islands Housing Authority

VIHFA – Virgin Islands Housing Finance Authority

VITEMA – Virgin Islands Territorial Emergency Management Agency

VIPA – Virgin Islands Port Authority

WAPA – Virgin Islands Water and Power Authority

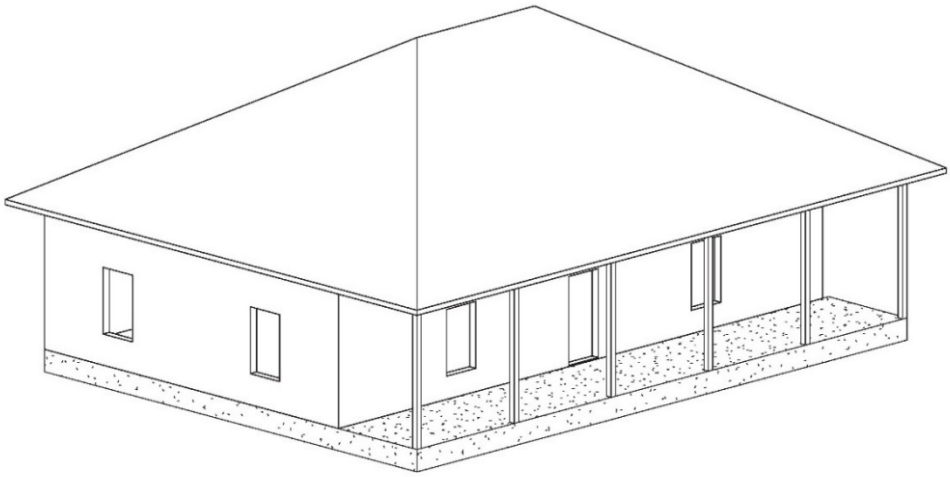
WMA – Virgin Islands Waste Management Authority

APPENDIX I: *CONSTRUCTION INFORMATION FOR A STRONGER HOME*

The Territory is committed to strengthening the resiliency of the islands by implementing strategies and plans; and by adopting ordinances to ensure building codes and mitigation plans are reflective of same. While no funds appropriated under Public Law 114-123 have been allocated for building code and hazard mitigation planning, these areas were already under discussion by territorial and regional agencies and collaborators, stakeholders, partners, and the local communities, prior to Hurricanes Irma and Maria. As a result of such discussions and meetings, plans have been implemented, and changes to the building codes were and still are being addressed to ensure construction and mitigation efforts result in a more resilient USVI. These areas are discussed in more detail hereinabove in Section 2.0 Long-Term Planning and Risk Mitigation Considerations and a copy of current Building Standards are in Appendix ED.

CONSTRUCTION INFORMATION
for a
STRONGER HOME

4th EDITION APRIL 2018
WITH
APPENDIX
INCLUDING SPAN TABLES
REPLACES ALL PREVIOUS EDITIONS



THIS IS A GUIDANCE DOCUMENT ONLY. REFERENCED BY THE U.S.V.I. BUILDING CODE.

ALL CONSTRUCTION MUST COMPLY WITH THE U.S.V.I. BUILDING CODE.

YOU ARE REQUIRED TO OBTAIN THE NECESSARY BUILDING PERMITS FROM THE DEPARTMENT OF PLANNING AND NATURAL RESOURCES.

SIGNED AND SEALED DRAWINGS FOR PERMIT MUST BE SUBMITTED TO THE DEPARTMENT OF PLANNING AND NATURAL RESOURCES (DPNR) DIVISION OF PERMITS.

STRUCTURES LOCATED IN SPECIAL FLOOD HAZARD AREAS SHALL BE DESIGNED BY A U.S.V.I. REGISTERED DESIGN PROFESSIONAL AND CERTIFIED TO COMPLY WITH ASCE 24-14 FLOOD RESISTANT DESIGN AND CONSTRUCTION.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES
BY COMMISSIONER: DAWN L. HENRY
DRAWING TITLE: TITLE SHEET

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:
S-01
Sheet Number 1 of 63

PREFACE

THE U.S. VIRGIN ISLANDS (USVI) AND THE FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) DEVELOPED CONSTRUCTION INFORMATION FOR A STRONGER HOME TO SUPPORT NATURAL HAZARDS RESILIENT HOME CONSTRUCTION IN USVI. THE 2ND EDITION OF THIS DOCUMENT WAS PUBLISHED IN DECEMBER OF 1995 FOLLOWING HURRICANE MARILYN, WITH THE 3RD EDITION BEING PUBLISHED IN FEBRUARY OF 1996. THE RECENT HURRICANE DISASTERS OF HURRICANE IRMA AND HURRICANE MARIA HAVE CAUSED SIGNIFICANT DAMAGE TO USVI AND THIS 4TH EDITION CONTINUES TO ADVANCE RESIDENTIAL CONSTRUCTION MITIGATION MEASURES AND RESILIENCE TECHNIQUES. THE 4TH EDITION STRONGER HOME DOCUMENT USES THE LATEST ADVANCEMENTS IN BUILDING CODE DEVELOPMENT BY REFERENCING THE LATEST BUILDING CODES OF THE 2018 INTERNATIONAL RESIDENTIAL CODE (2018 IRC), 2018 INTERNATIONAL BUILDING CODE (2018 IBC), AND THE AMERICAN SOCIETY OF CIVIL ENGINEERS ASCE/SEI 7-16 (ASCE 7-16): MINIMUM DESIGN LOADS AND ASSOCIATED CRITERIA FOR BUILDINGS AND OTHER STRUCTURES, WHEREAS THE PREVIOUS EDITION WAS BASED UPON THE 1995 COUNCIL OF AMERICAN BUILDING OFFICIALS (CABO) ONE AND TWO STORY FAMILY DWELLING CODE AND THE 1994 UNIFORM BUILDING CODE (UBC).

THE STRONGER HOMES DOCUMENT SERVES AS A GENERAL RECOMMENDATION GUIDANCE FOR RESIDENTIAL CONSTRUCTION. THIS DOCUMENT DOES NOT SATISFY ALL THE BUILDING DESIGN REQUIREMENTS. HOMES DESIGNED USING THIS DOCUMENT MUST FALL UNDER THE PARAMETERS STATED BELOW. ***ALL DESIGN WORK INCLUDING THAT COVERED BY THIS DOCUMENT SHALL BE DESIGNED BY A REGISTERED DESIGN PROFESSIONAL SUCH AS A REGISTERED PROFESSSIONAL STRUCTURAL ENGINEER OR LICENSED ARCHITECT IN U.S.V.I.*** WHEN THESE GUIDANCE DRAWINGS ARE USED FOR A PROJECT, THEY SHOULD BE MODIFIED AS NEEDED IN ORDER TO COMPLY WITH ALL OF THE APPLICABLE CODE REQUIREMENTS FOR A GIVEN PROJECT SITE, THEN SIGNED AND SEALED IN ACCORDANCE WITH U.S.V.I. LAWS, BUILDING CODE, AND DPNR PERMIT REQUIREMENTS.

THE FOLLOWING BOUNDARY CONDITIONS SHALL BE MET IN ORDER TO USE THESE DOCUMENTS. THESE DOCUMENTS ARE NOT VALID IF THE PROJECT PARAMETERS ARE OUTSIDE OF THESE BOUNDARY CONDITIONS:

1. MEAN ROOF HEIGHT OF 30 FEET OR LESS.
2. GABLE OR HIP ROOFS WITH SLOPES RANGING FROM 2:12 TO 12:12 PITCH.
3. ROOF OVERHANG AT EACH SIDE OF BUILDING CANNOT EXCEED 2 FEET.
4. BUILDING WIDTH OF 24 FEET TO 40 FEET.
5. BUILDING LENGTH OF 40 FEET TO 52 FEET.
6. MAXIMUM STORY HEIGHT OF 11 FEET 6 INCHES.
7. BUILDING LOCATED IN THE FOLLOWING TOPOGRAPHY CONDITIONS:
   A. EXPOSURE B WITH NO ABRUPT CHANGES IN GENERAL TOPOGRAPHY AS DEFINED IN ASCE 7-16.
   B. EXPOSURE D WITH NO ABRUPT CHANGES IN THE GENERAL TOPOGRAPHY AS DEFINED IN ASCE 7-16.
   C. EXPOSURE B WITH TOPOGRAPHIC EFFECTS CAUSED BY ABRUPT CHANGES IN TOPOGRAPHY AS DEFINED IN ASCE 7-16, WITH THE BUILDING CONSTRUCTED ON THE UPPER ONE-HALF OF A HIIL, RIDGE, OR ESCARPMENT OR NEAR THE CREST OF AN ESCARPMENT.
8. BUILDING IS ROUGHLY RECTANGULAR IN SHAPE WITH RELATIVE UNIFORM DISTRIBUTION OF SHEAR RESISTANCE THROUGHOUT THE STRUCTURE.
9. BUILDING HAS NO SIGNIFICANT STRUCTURAL DISCONTINUITIES.

THIS FOURTH EDITION STRONGER HOMES REVISION HAS SIGNIFICANT CHANGES THROUGH THE INCORPORATION OF THE LATEST BUILDING CODE DESIGN REQUIREMENTS. SOME OF THE SPECIFIC REVISIONS INCLUDE: HIGHER ULTIMATE DESIGN WIND SPEED CRITERIA AND CONSIDERATIONS FOR SEISMIC DESIGN AS STIPULATED IN ASCE 7-16, AS WELL AS CURRENT REFERENCES TO THE LATEST STRUCTURAL WOOD CONNECTORS. THIS DOCUMENT ALSO INCLUDES AN EXPANDED STRUCTURAL NOTES SECTION AND ADDITIONAL TYPICAL DETAILS. AN UPDATED APPENDIX WITH TABLES AND REFERENCES IS PROVIDED AT THE END OF THIS REVISION WITH DESIGNS IN ACCORDANCE WITH THE LATEST CODES AND STANDARDS (2018 IBC AND ASCE 7-16).

SPECIFICALLY, MOST OF THE SIGNIFICANT CHANGES ARE:

A. MULTIPLE WIND EXPOSURE AND TOPOGRAPHIC EFFECTS ARE CONSIDERED: EXPOSURE B Kzt = 1.0, EXPOSURE B Kzt = 2.0, EXPOSURE D Kzt = 1.0.

B. HIGHER COMPONENTS AND CLADDING (C&C) LOADS ARE CONSIDERED IN AGREEMENT WITH ASCE 7-16.

C. SOUTHERN YELLOW PINE VALUES ARE THE LATEST DESIGN VALUES WHICH WERE RECENTLY REDUCED TO ACCOUNT FOR THE REDUCTION IN STRENGTH THAT HAS BEEN OBSERVED IN FAST GROWTH CULTIVATED TIMBER.

D. MORE SIZES OF LUMBER ARE ANALYZED THAN TYPICAL ON THE MAINLAND ALLOWING FOR MORE CUSTOMIZATION SPECIFIC TO LOADS ENCOUNTERED ON THE ISLANDS.

E. THE RAFTER, ROOF BEAM, AND STUD SPANS ARE TYPICALLY 10% TO 15% SHORTER THAN PREVIOUS EQUIVALENTS.

F. HIGHER ULTIMATE WIND SPEED CRITERIA IN ACCORDANCE WITH ASCE 7-16 COMPARED TO THE 3RD EDITION.

G. ENCLOSURE CLASSIFICATION COVERS BOTH ENCLOSED BUILDINGS AND PARTIALLY OPEN BUILDINGS.

H. RAFTER SPACING LIMITED TO 24" O.C. MAXIMUM.

I. METAL ROOF PANELS HAVE 24 GAUGE THICKNESS, MINIMUM.

J. TWO STORY STRUCTURES IN EXPOSURE B WITH Kzt = 2.0 ARE RECOMMENDED TO BE CONSTRUCTED OF REINFORCED MASONRY WALLS OR REINFORCED CONCRETE WALLS, AND NOT CONSTRUCTED USING WOOD WALLS.

K. MASONRY WALLS TO USE #5 VERTICAL BARS AT 24" O.C. IN GROUTED CMU CELLS.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: PREFACE

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-02

Sheet Number 2 of 63

DRAWING INDEX

SHEET NUMBER	SHEET NAME
S-01	TITLE SHEET
S-02	PREFACE
S-03	DRAWING INDEX
S-04	CONSTRUCTION GUIDE
S-05	STRUCTURAL NOTES
S-06	STRUCTURAL NOTES CONTINUED
S-07	STRUCTURAL NOTES CONTINUED
S-08	STRUCTURAL NOTES CONTINUED
S-09	COMMON ABBREVIATIONS
S-10	CONSTRUCTION CONSIDERATIONS
S-11	WOOD FRAMING ISOMETRIC VIEW AND CONNECTION DETAILS
S-12	**ROOFS**
S-13	FRAMING PERSPECTIVE
S-14	PLYWOOD ROOF SHEATHING
S-15	ROOF COMPONENT ATTACHMENTS
S-16	CORRUGATED ROOF DETAIL
S-17	ROOF NAILER LAYOUT-GABLE
S-18	ROOF NAILER LAYOUT-HIP
S-19	TRUSS/RAFTER CONNECTORS
S-20	RAFTER BEARING
S-21	ROOF GUTTER AT EAVE
S-22	RAKE AND RIDGE DETAILS
S-23	GABLE END FRAMING DETAIL
S-24	GABLE END BRACING WITH KNEEBRACE
S-25	COLLAR TIE TO RAFTERS
S-26	POST CAP CONNECTIONS
S-27	TYPICAL HIP ROOF FRAMING
S-28	**WALLS**
S-29	TOP PLATE TO STUD CONNECTORS
S-30	STRUCTURAL WALL SHEATHING
S-31	WOOD WALL OPENING
S-32	WIND BORNE DEBRIS PROTECTION AT OPENINGS
S-33	SHUTTER STYLES
S-34	CMU WALL CONSTRUCTION
S-35	CMU WALL OPENING
S-36	TYPICAL CMU DETAILS
S-37	**FLOORS**
S-38	FLOOR FRAMING
S-39	FLOOR JOIST FRAMING
S-40	FLOOR FRAMING CONNECTIONS
S-41	WOOD NOTCHING AND BORING LIMITS
S-42	**FOUNDATIONS**
S-43	HEIGHT DEFINITIONS
S-44	WOOD FRAMING FOUNDATIONS
S-45	TYPICAL FOUNDATION DETAILS
S-46	TYPICAL FOUNDATION DETAILS
S-47	TYPICAL FOUNDATION DETAILS
S-48	SILL PLATE ANCHORAGE
S-49	CMU WALL FOUNDATIONS
S-50	CMU PIER FOUNDATION
S-51	POST ANCHORAGE
S-52	FOUNDATION HOLDOWNS
S-53	**CONNECTOR DESIGN TABLES**
S-54	FRAMING CONNECTOR CONVERSION CHART
S-55	WOOD WALL-ENDZONE RAFTER TIE DESIGN TABLE
S-56	WOOD WALL-INTERIOR ZONE RAFTER TIE DESIGN TABLE
S-57	CMU WALL-ENDZONE RAFTER TIE DESIGN TABLE A
S-58	CMU WALL-INTERIOR ZONE RAFTER TIE DESIGN TABLE B
S-59	CMU WALL-ENDZONE RAFTER TIE DESIGN TABLE C
S-60	CMU WALL-INTERIOR ZONE RAFTER TIE DESIGN TABLE D
S-61	ENDZONE WALL FRAMING UPLIFT DESIGN TABLES
S-62	INTERIOR ZONE WALL FRAMING UPLIFT DESIGN TABLES
S-63	WOOD WALL-BAND JOIST UPLIFT DESIGN TABLES
	APPENDIX

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: DRAWING INDEX

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-03

Sheet Number 3 of 63

CONSTRUCTION GUIDE FOR HURRICANE AND SEISMIC RESISTANT ONE AND TWO FAMILY DWELLING CONSTRUCTION IN THE U.S. VIRGIN ISLANDS

THE FOLLOWING CONSTRUCTION DRAWINGS ARE FOR GENERAL USE. THEY ARE NOT SPECIFIC HOME DESIGNS.

THE SUGGESTED SPECIFICATIONS ARE RELATED TO THE STRUCTURAL QUALITIES OF THE NOTED MATERIALS. THE DETAILS PREDOMINANTLY SHOW A WOOD STRUCTURE WITH SHEET METAL ROOFING SUPPORTED BY WOODEN OR MASONRY WALLS, A WOOD OR CONCRETE SLAB-ON-GRADE, AND A CONTINUOUS FOUNDATION AND INDIVIDUAL FOOTINGS FOR A SINGLE FAMILY ONE AND TWO STORY RESIDENCES.

THE DESIGNS, FASTENERS, AND SUGGESTED CONSTRUCTION METHODS COMPLY WITH THE 2018 INTERNATIONAL BUILDING CODE AND ASCE/SEI 7-16, "MINIMUM DESIGN LOADS AND ASSOCIATED CRITERIA FOR BUILDINGS AND OTHER STRUCTURES".

THESE SPECIFICATIONS ARE APPLICABLE TO COMMON VIRGIN ISLAND RESIDENTIAL CONSTRUCTION METHODS. ALL DRAWINGS, INCLUDING DRAWINGS CREATED WITH THESE SPECIFICATIONS, WILL NEED TO BE STAMPED AND SIGNED BY A U.S.V.I. REGISTERED PROFESSIONAL STRUCTURAL ENGINEER OR LICENSED U.S.V.I. ARCHITECT.

ALL CONSTRUCTION MUST COMPLY WITH THE U.S.V.I. BUILDING CODE. YOU ARE REQUIRED TO OBTAIN THE NECESSARY BUILDING PERMITS FROM THE DEPARTMENT OF PLANNING AND NATURAL RESOURCES.

WIND DESIGN CRITERIA

ASCE 7-16, USING A BASIC WIND SPEED OF 165 MILES PER HOUR, A MEAN ROOF HEIGHT OF 30 FEET, A ROOF SLOPE BETWEEN 2:12 AND 12:12 FOR HIP OR GABLE ROOFS AND AN ENCLOSURE CLASSIFICATION OF ENCLOSED OR PARTIALLY OPEN USING AN INTERNAL PRESSURE COEFFICIENT OF 0.18 WITH A BUILDING WIDTH OF 24 FEET TO 40 FEET, AND BUILDING LENGTH OF 40 FEET TO 52 FEET USING A MAXIMUM OVERHANG OF 2 FEET. IT IS ASSUMED THAT NEW OR EXISTING OUTLOOKERS AT GABLE END OVERHANGS ARE A MAXIMUM OF 16 INCHES ON CENTER. HOUSES WHICH FALL OUTSIDE OF THESE PLAN DIMENSIONS MUST HAVE ALL DESIGNS WITHIN THIS DOCUMENT CHECKED BY A DESIGN PROFESSIONAL BECAUSE THE FORCES INVOLVED MAY REQUIRE THESE DESIGNS TO BE ALTERED.

WIND DESIGNS ARE GIVEN FOR BUILDINGS LOCATED IN EXPOSURE B WITHOUT WIND SPEED-UP EFFECTS, AND EXPOSURE D WITHOUT WIND SPEED-UP EFFECTS, AND EXPOSURE B THAT ARE SUBJECTED TO WIND SPEED-UP EFFECTS CAUSED BY ABRUPT CHANGES IN THE GENERAL TOPOGRAPHY (AS DEFINED IN ASCE 7-16). A HILL, RIDGE, OR ESCARPMENT WITH LESS THAN 60 FEET IN ELEVATION CHANGE FOR EXPOSURE B IS NOT CONSIDERED AN ABRUPT CHANGE IN TOPOGRAPHY AND WOULD NOT NEED TO CONSIDER TOPOGRAPHIC EFFECTS. GIVEN THE VARIETY OF TOPOGRAPHY WITHIN THE U.S. VIRGIN ISLANDS, AN ESTIMATED TOPOGRAPHIC FACTOR, Kzt, OF 2 WAS UTILIZED IN DETERMINING THE WIND PRESSURES FOR BUILDINGS BUILT ON THE UPPER ONE-HALF OF A HILL, RIDGE, OR ESCARPMENT OR NEAR THE CREST OF AN ESCARPMENT.

IF THE EXPOSURE IS D WITH TOPOGRAPHIC EFFECTS, CALCULATIONS WILL NEED TO BE PERFORMED AND APPROPRIATE CRITERIA DETERMINED. A HILL, RIDGE, OR ESCARPMENT WITH LESS THAN 15 FEET IN ELEVATION CHANGE FOR EXPOSURE D IS NOT CONSIDERED AN ABRUPT CHANGE IN TOPOGRAPHY AND WOULD NOT NEED TO CONSIDER TOPOGRAPHIC EFFECTS.

SEISMIC DESIGN CRITERIA (TO BE VERIFIED BY A REGISTERED DESIGN PROFESSIONAL IN U.S.V.I.)

CODE: ASCE 7-16

SAINT CROIX

SITE SOIL CLASSIFICATION: SITE CLASS D-"STIFF SOIL"
RISK CATEGORY: II
SEISMIC DESIGN CATEGORY: D
S_S = 0.861g S_{MS} = 0.861g S_{DS} = 0.574g
S_1 = 0.312g S_{M1} = 0.312g S_{D1} = 0.208g

SAINT THOMAS

SITE SOIL CLASSIFICATION: SITE CLASS D-"STIFF SOIL"
RISK CATEGORY: II
SEISMIC DESIGN CATEGORY: D
S_S = 1.236g S_{MS} = 1.236g S_{DS} = 0.824g
S_1 = 0.431g S_{M1} = 0.431g S_{D1} = 0.287g

SAINT JOHN

SITE SOIL CLASSIFICATION: SITE CLASS D-"STIFF SOIL"
RISK CATEGORY: II
SEISMIC DESIGN CATEGORY: D
S_S = 1.245g S_{MS} = 1.245g S_{DS} = 0.830g
S_1 = 0.434g S_{M1} = 0.434g S_{D1} = 0.289g

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: CONSTRUCTION GUIDE

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:
S-04
Sheet Number 4 of 63

STRUCTURAL NOTES

1.0 GENERAL

1.01 DRAWINGS SHOW TYPICAL AND CERTAIN SPECIFIC CONDITIONS ONLY. FOR DETAILS NOT SPECIFICALLY SHOWN, PROVIDE DETAILS SIMILAR TO THOSE SHOWN.

1.02 VERIFY ALL EXISTING CONDITIONS, DIMENSIONS AND ELEVATIONS BEFORE STARTING WORK. NOTIFY DESIGNER OF RECORD OF ANY DISCREPANCY.

1.03 THE DESIGN, ADEQUACY AND SAFETY OF ERECTION BRACING, SHORING, TEMPORARY SUPPORTS, ETC., IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

1.04 ANY BRAND SPECIFIC MATERIALS MAY BE SUBSTITUTED W/ AN EQUIVALENT PRODUCT BY AN ALTERNATE MANUF. IF APPROVED BY THE DESIGNER OF RECORD.

2.0 GEOTECHNICAL

2.01 A QUALIFIED GEOTECHNICAL ENGINEER SHALL VERIFY CONDITION AND/OR ADEQUACY OF ALL SUBGRADES, FILLS AND BACKFILLS BEFORE PLACEMENT OF FOUNDATIONS, FOOTINGS, SLABS, WALLS, FILLS, BACKFILLS, ETC.

3.0 REINFORCED CONCRETE

3.01 PRIOR TO CASTING FOUNDATIONS, PREPARE THE SITE IN ACCORDANCE WITH PLANS, SPECIFICATIONS AND REQUIRED COMPACTION.

3.02 ALL CONCRETE WORK SHALL CONFORM TO ACI 301-16, SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS. DESIGN IS BASED ON ACI 318-14, BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE.

3.03 UNLESS NOTED OTHERWISE, ALL CONCRETE SHALL BE NORMAL WEIGHT AND HAVE THE FOLLOWING MINIMUM 28-DAY COMPRESSIVE STRENGTHS:

	f'_c
FOUNDATIONS	3,000 PSI
SLABS-ON-GRADE	3,000 PSI
WALLS	4,000 PSI

3.04 USE OF CALCIUM CHLORIDE, CHLORIDE IONS OR OTHER SALTS IN CONCRETE IS NOT PERMITTED.

3.05 CHAMFER OR ROUND ALL EXPOSED CORNERS MINIMUM 3/4".

3.06 DETAIL CONCRETE REINFORCEMENT AND ACCESSORIES IN ACCORDANCE WITH SP-066(04): ACI DETAILING MANUAL-2004.

3.07 REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60, UNLESS NOTED OTHERWISE.

3.08 WELDED WIRE FABRIC (MESH) SHALL CONFORM TO ASTM A185 AND SHALL BE PROVIDED IN FLAT SHEETS. LAP EDGES 3 CROSS WIRES MINIMUM.

3.09 PROVIDE CONTINUOUS REINFORCEMENT WHEREVER POSSIBLE; SPLICE ONLY AS SHOWN OR APPROVED; STAGGER SPLICES WHERE POSSIBLE; USE FULL TENSION SPLICE (CLASS "B") FOR CONTINUOUS REINF. AND MATCHING DOWELS U.N.O. LAP SPLICES SHALL BE 57 BAR DIAMETERS FOR BARS SMALLER THAN #7 AND 72 BAR DIAMETERS FOR #7 & LARGER.

3.10 REINFORCING STEEL SHALL HAVE THE FOLLOWING CONCRETE COVER UNLESS NOTED OTHERWISE:

A. CONCRETE CAST AGAINST EARTH (NOT FORMED)	3"
B. FORMED CONCRETE EXPOSED TO THE EARTH OR WEATHER	
#6 THROUGH #18 BARS	2"
#5 BARS AND SMALLER	1½"
C. CONCRETE NOT EXPOSED TO EARTH OR WEATHER	
SUSPENDED SLABS AND WALLS	
#11 BARS AND SMALLER.	1"
BEAMS (STIRRUPS) AND COLUMNS (TIES)	1½"

3.11 DO NOT PLACE PIPES OR DUCTS EXCEEDING ONE-THIRD THE SLAB OR WALL THICKNESS WITHIN THE SLAB OR WALL UNLESS SPECIFICALLY SHOWN AND DETAILED ON STRUCTURAL DRAWINGS. ANY PIPES SHALL BE BETWEEN THE OUTER HORIZONTAL AND VERTICAL LAYERS OF REINFORCMENT.

3.12 DO NOT WELD OR TACK WELD REINFORCING STEEL UNLESS APPROVED OR DIRECTED BY THE STRUCTURAL ENGINEER.

3.13 ALL REINFORCING STEEL PLACEMENT SHALL BE INSPECTED PER IBC 2018.

3.14 REINFORCE SLAB-ON-GRADE AT ALL PENETRATIONS AND AT RE-ENTRANT CORNERS. PLACE THREE #3 BAR x 3'-0 AROUND FLOOR DRAINS. PLACE #4 BAR x 4'-0" (MIN.) AT RE-ENTRANT CORNERS. HOLD REINFORCING 1" CLEAR FROM TOP OF CONCRETE.

3.15 WALLS AND OTHER INTERSECTING ELEMENTS SHALL HAVE CORNER BARS TO PROVIDE CONTINUITY. USE CONCRETE REINFORCING STEEL INSTITUTE (CRSI) STANDARDS OR AS SHOWN ON THE DRAWINGS.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: STRUCTURAL NOTES

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-05

Sheet Number 5 of 63

4.0 SAWN LUMBER

4.01 DESIGN STANDARDS:

AMERICAN FOREST AND PAPER ASSOCIATION, "NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION" (ANSI/AF&PA NDS-2018) WITH "NDS SUPPLEMENT", 2018 EDITION.

AMERICAN SOFTWOOD LUMBER STANDARD VOLUNTARY PRODUCT STANDARD PS20-15.

APA E30– THE ENGINEERED WOOD ASSOCIATION, "ENGINEERED WOOD CONSTRUCTION GUIDE", AND D510 "PANEL DESIGN SPECIFICATION", LATEST EDITIONS.

STRUCTURAL COMPOSITE LUMBER (SCL): EVALUATED IN CONFORMANCE WITH ASTM D 5456 WITH DESIGN VALUES RECOGNIZED IN EVALUATION REPORTS BY ICC EVALUATION SERVICE (ICC-ES) OR PRODUCT REPORTS ISSUED BY APA- THE ENGINEERED WOOD ASSOCIATION.

4.02 ALL WOOD FRAMING MEMBERS INCLUDING BUT NOT LIMITED TO WALL STUDS AND JOISTS, ARE INTENDED TO ACT AS A SYSTEM AS DETAILED IN THE STRUCTURAL DRAWINGS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE SAFETY AND STABILITY OF THE WOOD FRAMING SYSTEMS (I.E. TEMPORARY BRACING IF REQUIRED) DURING CONSTRUCTION.

4.03 ALL SAWN LUMBER SHALL CONFORM TO THE AMERICAN SOFTWOOD LUMBER STANDARD, PS20-15. LUMBER SHALL BE OF THE SPECIES AND GRADE SHOWN BELOW, UNLESS NOTED OTHERWISE:

MEMBER	GRADE	SPACING
WALL STUDS	PRESSURE TREATED: SOUTHERN YELLOW PINE/DOUGLAS FIR No.1 or No.2	REF. APPENDIX
RAFTERS/JOISTS	PRESSURE TREATED: SOUTHERN YELLOW PINE/DOUGLAS FIR No.1 or No.2	REF. APPENDIX
POST/COLUMNS	PRESSURE TREATED: SOUTHERN YELLOW PINE/DOUGLAS FIR No.1 or No.2	REF. APPENDIX
SILL PLATE	PRESSURE TREATED: SOUTHERN YELLOW PINE/DOUGLAS FIR No.1 or No.2	CONTINUOUS
DOUBLE TOP PLATE	PRESSURE TREATED:SOUTHERN YELLOW PINE/DOUGLAS FIR No.1 or No.2	CONTINUOUS

4.04 ALL ATTACHMENTS OF WOOD FRAMING SHALL NOT BE LESS THAN THAT DESCRIBED IN TABLE 2304.10.1 "FASTENING SCHEDULE" WITHIN THE INTERNATIONAL BUILDING CODE, 2018.

4.05 STORAGE OF ALL LUMBER AND TIMBER ON SITE SHALL BE KEPT OFF OF THE GROUND, UNDER COVER, WITH ADEQUATE AIR FLOW, AND PROTECTED FROM DAMAGE.

4.06 ALL LUMBER SHALL BE PRESSURE TREATED IN ACCORDANCE WITH THE LATEST GUIDANCE FROM THE AMERICAN WOOD PRESERVERS ASSOCIATION AND HANDLED IN ACCORDANCE WITH THE MANUFACTURER'S SAFETY DATA SHEETS (MSDS).

4.07 FASTENERS FOR PRESERVATIVE-TREATED AND FIRE-RETARDENT-TREATED WOODS SHALL BE HOT-DIPPED GALVANIZED OR STAINLESS STEEL AND SHALL FOLLOW CURRENT MANUFACTURER'S GUIDELINES BASED ON WEATHER EXPOSURE. STAINLESS STEEL OR HOT-DIPPED GALVANIZED FASTENERS SHALL BE USED TO MATCH THE CONNECTOR TYPE. AT A MINIMUM ALL FASTENERS SHALL BE HOT-DIPPED GALVANIZED MEETING ASTM A153. WHEN FASTENERS ARE USED AT PERMANENTLY EXPOSED EXTERIOR AREAS, FASTENERS SHALL BE STAINLESS STEEL.

4.08 ALL METAL HARDWARE AND FRAMING ACCESSORIES SHALL BE MANUFACTURED BY SIMPSON STRONG-TIE COMPANY, MITEK USP, OR APPROVED EQUAL. ALL ITEMS SHALL BE INSTALLED PER THE MANUFACTURER'S INSTALLATION REQUIREMENTS. ALL CONNECTORS SHALL BE MINIMUM HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A653, ASTM A123, OR HIGHER STANDARDS. STAINLESS STEEL CONNECTORS MAY ALSO BE USED IN LIEU OF HOT-DIP GALVANIZED CONNECTORS. ALL NAIL/BOLT HOLES SHALL BE FILLED WITH THE RECOMMENDED FASTENER UNLESS NOTED OTHERWISE. SUBSTITUTIONS MAY BE MADE WITH APPROVAL FROM THE ENGINEER OF RECORD (E.O.R.).

4.09 WHERE FRAMING HANGERS OR WOOD CONNECTIONS ARE REQUIRED BUT HAVE NOT BEEN SPECIFIED ON THE STRUCTURAL DRAWINGS, CONTACT THE E.O.R. FOR THE APPROPRIATE CONNECTOR TO UTILIZE.

4.10 ALL WALLS SHALL HAVE DOUBLE TOP PLATES AND SHALL BE SPLICED PER THE TYPICAL TOP PLATE SPLICE DETAIL, UNLESS NOTED OTHERWISE. TOP PLATES AT WALL INTERSECTIONS SHALL BE LAPPED AND NAILED WITH (3) 16d NAILS.

4.11 WHERE ROOF MEMBERS OR ROOF TRUSSES ARE CONNECTED TO EXTERIOR WALLS OR WALLS W/ PLYWOOD SHEATHING, THE SPECIFIED HURRICANE CLIP SHALL BE PLACED ON THE SIDE OF THE WALL WITH SHEATHING.

4.12 HOLES FOR BOLTS SHALL BE DRILLED WITH A BIT OF THE SAME NOMINAL DIAMETER AS THE BOLT + 1/16". LEAD HOLES FOR LAG SCREWS SHALL BE DRILLED PER NDS-2018. LEAD HOLES FOR WOOD SCREWS LOADED IN WITHDRAWAL AND LOADED LATERALLY SHALL BE BORED IN ACCORDANCE WITH THE NDS-2018.

4.13 ALL BOLTS, CARRIAGE BOLTS, LAG SCREWS, EXPANSION BOLTS, AND EPOXY BOLTS SHALL BE INSTALLED WITH STANDARD CUT WASHERS AND NUTS THAT BEAR DIRECTLY ON THE WOOD. ALL NUTS SHALL BE TIGHTENED AT THE TIME OF INSTALLATION AND RE-TIGHTENED IF NECESSARY, DUE TO WOOD SHRINKAGE, PRIOR TO CLOSE-IN OR AT THE COMPLETION OF THE PROJECT. BOLTS AND LAG SCREWS SHALL CONFORM TO ANSI/ASME STANDARD B18.2.1. WOOD SCREWS SHALL CONFORM TO B18.6.1. ALL BOLTS SHALL CONFORM TO ASTM A307 GRADE A UNLESS NOTED OTHERWISE.
THE MINIMUM STRENGTHS FOR LAG SCREWS AND WOOD SCREWS SHALL BE AS FOLLOWS:

WOOD SCREW DIAMETER-INCHES	MIN. BENDING YIELD STRENGTH (PSI)
0.138 (#6)	100,000
0.151 (#7)	90,000
0.164 (#8)	90,000
0.177 (#9)	90,000
0.190 (#10)	80,000
0.216 (#12)	80,000
0.246 (#14)	70,000
LAG SCREW DIAMETER-INCHES	**MIN. BENDING YIELD STRENGTH (PSI)**
1/4"	70,000
5/16"	60,000
3/8" AND GREATER	45,000

PENETRATION DEPTHS OF THE THREADED PORTION OF THE FASTENER INTO THE MAIN MEMBER SHALL BE A MINIMUM OF 7 TIMES THE SHANK DIAMETER (7D) FOR WOOD SCREWS AND 8 TIMES THE SHANK DIAMETER (8D) FOR LAG SCREWS.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: STRUCTURAL NOTES CONTINUED

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-06

Sheet Number 6 of 63

4.0 SAWN LUMBER CONT'D.

4.14 WOOD STUDS IN EXTERIOR WALLS AND BEARING PARTITIONS MAY BE CUT OR NOTCHED TO A DEPTH NOT EXCEEDING 1/4 OF ITS WIDTH, PROVIDED NOT MORE THAN TWO SUCCESSIVE STUDS ARE NOTCHED OR CUT. BUNDLED STUDS UNDER POINTS OF CONCENTRATED LOADS SHALL NOT BE CUT OR NOTCHED. CUTTING AND NOTCHING OF STUDS TO A DEPTH NOT GREATER THAN 40% OF THE WIDTH OF THE STUD IS PERMITTED IN NON-BEARING PARTITIONS SUPPORTING NO LOADS OTHER THAN THE WEIGHT OF THE PARTITION.

4.15 A HOLE MAY BE BORED IN A WOOD STUD UP TO A DIAMETER OF 33% OF THE STUD WIDTH. BORED HOLES NOT GREATER THAN 60% OF THE WIDTH OF THE STUD ARE PERMITTED IN NON-BEARING PARTITIONS OR IN ANY WALL WHERE EACH BORED STUD IS DOUBLED, PROVIDED NOT MORE THAN TWO SUCCESSIVE DOUBLE STUDS ARE BORED. IN NO CASE, SHALL THE EDGE OF THE BORED HOLE BE NEARER THAN 5/8" TO THE EDGE OF THE STUD, BORED HOLES SHALL NOT BE LOCATED AT THE SAME SECTION OF THE STUD AS A CUT OR NOTCH.

4.16 END NOTCHES NOT EXCEEDING 1/4 THE DEPTH ARE PERMITTED FOR 2X FLOOR JOISTS OR RAFTERS. TAPER CUT FROM THE REDUCED DEPTH OF THE MEMBER TO THE FULL DEPTH AT A MINIMUM SLOPE OF (1) HORIZ/(1) VERT. DO NOT SQUARE CUT AN END NOTCH.

4.17 INTERIOR NOTCHES NOT EXCEEDING 1/6 THE DEPTH OF A 2X FLOOR JOISTS OR RAFTER SHALL BE PERMITTED ONLY IN THE OUTER THIRD OF ANY SPAN. NOTCHED ARE NOT PERMITTED IN THE MIDDLE THIRD OF ANY SPAN NOR IN ANY LINTEL MEMBERS.

4.18 THE LENGTH OF NOTCHED IN FLOOR JOISTS SHALL NOT EXCEED 1/3 THE JOIST DEPTH.

4.19 HOLES BORED IN FLOOR JOISTS OR RAFTERS SHALL NOT BE WITHIN 2 INCHES OF THE TOP OR BOTTOM AND THE DIAMETER OF ANY SUCH HOLE SHALL NOT EXCEED 1/3 THE DEPTH OF THE MEMBER. HOLES SHALL NOT OCCUR WITHIN 12" OF THE EDGE OF ANY BEARING SUPPORT OR CONNECTION.

4.20 NOTCHING OF STRUCTURAL COMPOSITE LUMBER (SCL) BEAMS IS NOT PERMITTED. UP TO 3 ROUND HOLES MAY BE BORED WITHIN THE MIDDLE THIRD OF SPAN AND MIDDLE THIRD OF DEPTH ONLY. CLEAR DISTANCE BETWEEN ANY TWO HOLES SHALL BE NO LESS THAN 2 TIMES THE DIAMETER OF THE LARGER HOLE. MAXIMUM HOLE DIAMETER SHALL NOT EXCEED 1/5 THE BEAM DEPTH NOR 2 INCHES, WHICHEVER IS LESS. HOLES ARE NOT PERMITTED IN CANTILEVERS.

4.21 WHEN NAILS ARE USED AT PERMANENTLY EXPOSED EXTERIOR AREAS, NAILS SHALL BE STAINLESS STEEL (TYPE 316). NAILS THAT ARE NOT EXPOSED TO THE ELEMENTS BUT IN CONTACT WITH PRESERVATIVE TREATMENT LUMBER SHALL BE MINIMUM HOT-DIPPED GALVANIZED MEETING ASTM A153. ALL NAILS FOR STRUCTURAL WORK SHALL BE COMMON WIRE NAILS UNLESS NOTED OR DETAILED OTHERWISE MEETING ASTM F1667. HOLES SHALL BE PRE-DRILLED WHERE NECESSARY TO PREVENT SPLITTING. NAILS SHALL HAVE THE MINIMUM PROPERTIES SPECIFIED IN THE TABLE BELOW:

NAIL TYPE	SHANK DIAMETER-INCHES	MIN. PENETRATION-INCHES	MIN. BENDING YIELD STRENGTH (PSI)
6d	0.113	1.13	100,000
8d	0.131	1.31	100,000
10d	0.148	1.48	90,000
12d	0.148	1.48	90,000
16d	0.162	1.63	90,000
20d	0.192	1.92	80,000

5.0 WOOD STRUCTURAL PANELS

5.01 STRUCTURAL WOOD PANELS SHALL CONFORM TO THE REQUIREMENTS OF ONE OF THE FOLLOWING STANDARDS AND PUBLICATIONS:

A. U.S. PRODUCT STANDARD PS1-09 FOR CONSTRUCTION AND INDUSTRIAL PLYWOOD.
B. U.S. PRODUCT STANDARD PS2-10 PERFORMANCE STANDARD FOR WOOD BASED STRUCTURAL USE PANELS.
C. APA PRP-108 PERFORMANCE STANDARDS.

5.02 ROOF AND WALL PANELS SHALL BE APA RATED, SEE SHEETS S-15 AND S-30 FOR THICKNESS REQUIREMENTS, 5 PLY PLYWOOD WITH A MIN. 32/16 SPAN RATING UNLESS NOTED OTHERWISE ON THE DRAWINGS. ALL SHEATHING SHALL BE PRESSURE TREATED.

5.03 FLOOR SHEATHING SHALL BE TONGUE AND GROOVE APA RATED PRESSURE TREATED 5 PLY 3/4" PLYWOOD SHEATHING WITH MIN. 48/24 SPAN RATING. PROVIDE A-C GRADE PLYWOOD AT ALL DECK SHEATHING LOCATIONS.

5.04 ALL FLOOR AND ROOF SHEATHING SHALL BE INSTALLED WITH THE FACE GRAIN PERPENDICULAR TO THE SUPPORTS.

5.05 ALL SHEATHING PANELS SHALL BE INSTALLED WITH END JOINTS STAGGERED UNLESS NOTED OTHERWISE.

5.06 WHERE BLOCKING IS NOT SPECIFICALLY REQUIRED FOR THE ROOF SHEATHING, PLY CLIPS OR TONGUE AND GROOVE PLYWOOD SHALL BE USED.

5.07 SUB-FLOOR SHEATHING SHALL BE UNBLOCKED UNLESS NOTED OTHERWISE ON THE STRUCTURAL DRAWINGS. SUB-FLOOR SHALL BE GLUED DOWN TO THE SUPPORTING MEMBERS AND GLUED AT THE THE TONGUE AND GROOVE JOINTS.

5.08 ALL NAILS SHALL BE COMMON NAILS. STAINLESS STEEL (TYPE 316) NAILS SHALL BE USED AT PERMANENTLY EXPOSED EXTERIOR AREAS. ALL SCREWS AND NAILS THAT ARE NOT EXPOSED TO THE ELEMENTS BUT IN CONTACT WITH PRESERVATIVE TREATMENT LUMBER SHALL BE MINIMUM HOT-DIPPED GALVANIZED MEETING ASTM A153.

5.09 BLOCKING SHALL BE PROVIDED AT PLYWOOD SHEATHED INTERIOR AND EXTERIOR WALLS. BLOCKING SHALL BE INSTALLED AT ALL WALL PANEL EDGES PERPENDICULAR TO FRAMING MEMBERS.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: STRUCTURAL NOTES CONTINUED

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:
S-07
Sheet Number 7 of 63

6.0 GLUE LAMINATED MEMBERS

6.01 GLUE LAMINATED MEMBERS SHALL CONFORM TO THE REQUIREMENTS OF ONE OF THE FOLLOWING STANDARDS AND PUBLICATIONS:

A. AMERICAN NATIONAL STANDARD FOR STRUCTURAL GLUED LAMINATED TIMBER
B. ANSI A190.1-2017 AND ASTM D3737-12

6.02 THE MINIMUM GLUE LAMINATED TIMBER GRADES SHALL BE AS FOLLOWS:

MEMBER	GRADE
SIMPLE SPAN	24F-V4
CON'T. SPAN/CANTILEVER	24F-V8

6.03 ALL STRUCTURAL GLUE LAMINATED MEMBERS NOTED ON DRAWINGS AS WELL AS ALL MEMBERS EXPOSED TO WEATHER SHALL BE PRESSURE TREATED.

6.04 NO NOTCHING OR BORING OF HOLES IS ALLOWED WITHOUT APPROVAL FROM E.O.R.

6.05 GLUE SHALL BE WET USE EXTERIOR WATERPROOF GLUE.

6.06 WHERE HANGERS ARE REQUIRED BUT NOT SPECIFICALLY SIZED, SIMPSON GLT HANGERS OR USP HGLT HANGERS SHALL BE USED. SUBSTITUTION OF HARDWARE IS ALLOWED WITH APPROVAL FROM E.O.R. ALL ITEMS SHALL BE INSTALLED PER THE MANUFACTURER'S REQUIREMENTS.

7.0 COMPOSITE MEMBERS

7.01 COMPOSITE WOODS SHALL BE MANUFACTURED BY TRUSS JOIST, OR AN APPROVED EQUAL AND BE OF THE TYPE AND SIZE SHOWN ON THE DRAWINGS. THE MATERIAL TYPE AND GRADE SHALL BE AS FOLLOWS:

MEMBER	TYPE	GRADE
BEAM	LSL	E = 1,550,000 PSI, Fb = 2,325 PSI
	LVL	E = 1,900,000 PSI, Fb = 2600 PSI
	PSL	E = 2,000,000 PSI, Fb = 2900 PSI
POST	LSL	E = 1,300,000 PSI, Fb = 1,700 PSI, Fcll = 1,400 PSI
	LVL	E = 1,800,000 PSI, Fb = 2,400 PSI, Fcll = 2,500 PSI

7.02 STRUCTURAL COMPOSITE LUMBER SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM D5456. NO CUTS, NOTCHES, OR BORED HOLES ARE ALLOWED WITHOUT APPROVAL BY E.O.R. WHERE LAMINATED STRAND LUMBER (LSL) MEMBERS ARE UTILIZED AS RIM JOIST, THE MIN. THICKNESS SHALL BE 1 3/4".

8.0 MASONRY

8.01 CONCRETE MASONRY DESIGN AND CONSTRUCTION SHALL CONFORM TO TMS 402/602 BUILDING CODE REQUIREMENTS AND SPECIFICATIONS FOR MASONRY STRUCTURES, 2016.

8.02 PROVIDE NORMAL WEIGHT, HOLLOW, LOAD-BEARING CONCRETE MASONRY UNITS (CMU) CONFORMING TO ASTM C90, GRADE N, TYPE II.

8.03 PROVIDE MASONRY CONSTRUCTION WITH MINIMUM COMPRESSIVE STRENGTH, f'm = 1,500 PSI.

8.04 PROVIDE TYPE "S" MORTAR IN ACCORDANCE WITH ASTM C270.

8.05 VERTICAL REINFORCING SHALL BE HELD IN POSITION WITH BAR POSITIONERS AT TOP OF THE GROUT POUR AT SPACINGS AS SHOWN ON THE PLANS.

8.06 PROVIDE HORIZONTAL JOINT REINFORCEMENT COMPLYING WITH ASTM A82, NO. 9 GAUGE OR HEAVIER, LADDER TYPE, ZINC COATED, PLACED 8" ON CENTER BELOW GRADE AND 16" ON CENTER ABOVE GRADE, UNLESS NOTED OTHERWISE. LADDER RUNGS SHALL BE POSITIONED TO COMPLETELY CLEAR CELL OPENINGS. LAP JOINT REINF. 1 FULL CROSS WIRE SPACING PLUS 2" (18" MIN FOR CROSS WIRE SPACING OF 16" OC), BUT NOT LESS THAN 12".

8.07 PROVIDE RUNNING BONDS WITH VERTICAL JOINTS LOCATED AT CENTER OF MASONRY UNITS IN THE ALTERNATE COURSE BELOW.

8.08 PROVIDE FOUNDATION DOWELS W/ HOOKS SIZED AND SPACED TO MATCH CMU VERTICAL REINFORCING. DOWELS SHALL LAP WALL VERTICALS 48 BAR DIAMETERS, UNLESS NOTED OTHERWISE.

8.09 REINFORCING STEEL SHALL CONFORM TO ASTM A615, GRADE 60, UNLESS NOTED OTHERWISE.

8.10 PROVIDE FINE GROUT FOR REINFORCED MASONRY IN ACCORDANCE WITH ASTM C476 WITH MINIMUM 28-DAY COMPRESSIVE STRENGTH OF 2,000 PSI. GROUT SHALL BE OF FLUID CONSISTENCY, WHICH MEANS AS FLUID AS POSSIBLE FOR POURING WITHOUT SEGREGATION OF THE CONSTITUENT PARTS. GROUT SLUMP SHALL BE 8 TO 10 INCHES. WATER CEMENT RATIO SHALL BE REDUCED AND WATER REDUCERS USED AS REQUIRED TO MAINTAIN SLUMP WHEN PLACED IN LOW ABSORPTION CMU. FILL ALL CELLS BELOW GRADE WITH GROUT. ALL GROUT SHALL BE CONSOLIDATED AT THE TIME OF POURING BY VIBRATING AND THEN RECONSOLIDATED AGAIN BY PUDDLING LATER, BEFORE PLASTICITY IS LOST. TYPICALLY WITHIN 10 TO 15 MINUTES. WHEN GROUTING IS STOPPED FOR ONE HOUR OR LONGER, CONSTRUCTION JOINTS SHALL BE FORMED BY STOPPING THE POUR OF GROUT 1 1/2" BELOW THE TOP OF THE UPPERMOST UNIT.

8.11 CLEANOUT CELLS SHALL BE PROVIDED AT THE BOTTOM OF ALL CELLS TO BE FILLED AT EACH GROUT POUR. ANY OVERHANGING MORTAR OR OTHER OBSTRUCTION OR DEBRIS SHALL BE REMOVED FROM THE INSIDES OF SUCH CELL WALLS. THE CLEANOUTS SHALL BE SEALED BEFORE GROUTING AND AFTER INPSECTION.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: STRUCTURAL NOTES CONTINUED

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-08

Sheet Number 8 of 63

COMMON ABBREVIATIONS

ARCH.	ARCHITECT
B/	BOTTOM OF
BRG.	BEARING
BOTT.	BOTTOM
C/C	CENTER-TO-CENTER
C.J.	CONTROL JOINT
CLR.	CLEAR
COL.	COLUMN
CONC.	CONCRETE
CONN.	CONNECTION
CONT.	CONTINUOUS
COORD.	COORDINATE
CMU	CONCRETE MASONRY UNIT
DIM.	DIMENSION
DIA.	DIAMETER
DIST.	DISTANCE
DWGS.	DRAWINGS
EL.	ELEVATION
E.F.	EACH FACE
EMBED.	EMBEDMENT
ENG.	ENGINEER
E.O.R.	ENGINEER OF RECORD
EQ.	EQUAL
E.S.	EACH SIDE
E.W.	EACH WAY
EXP.	EXPANSION
EXT.	EXTERIOR
FABR.	FABRICATOR
F.F.	FINISHED FLOOR
FFE	FINISHED FLOOR ELEVATION
FTG.	FOOTING
GA.	GAUGE
GALV.	GALVANIZED
HKD.	HOOKED
HORIZ.	HORIZONTAL
H.S.	HEADED STUD
IN.	INCHES
INFO.	INFORMATION
INT.	INTERIOR
K	KIPS
KSI	KIPS PER SQUARE INCH
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
L.W.	LONG WAYS
MANUF.	MANUFACTURER
MAX.	MAXIMUM
MECH.	MECHANICAL
MIN.	MINIMUM
PL.	PLATE
PREFAB.	PREFABRICATED
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
P.T.	PRESSURE TREATED
QTY	QUANTITY
REF.	REFERENCE
REINF.	REINFORCED OR REINFORCING
SCH.	SCHEDULE
S.F.	STEPPED FOOTING
SQU.	SQUARE
STL.	STEEL
STRUC.	STRUCTURAL
S.W.	SHORT WAYS
T/	TOP OF
TYP.	TYPICAL
U.N.O.	UNLESS NOTED OTHERWISE
VCJ	VERTICAL CONTROL JOINT
VMCJ	VERTICAL MASONRY CONTROL JOINT
W/	WITH
WWF	WELDED WIRE FABRIC

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: COMMON ABBREVIATIONS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-09

Sheet Number 9 of 63

CONSTRUCTION CONSIDERATIONS

1. HIP ROOFS ARE AERODYNAMICALLY MORE RESISTANT TO UPLIFT AND GENERALLY PERFORM BETTER IN STRONG WINDS THAN GABLE ROOFS.
2. TIE THE HOUSE DOWN FROM TOP TO BOTTOM WITH HURRICANE/SEISMIC RESISTANT CONNECTORS AND OR THE APPROPRIATE MASONRY/CONCRETE REINFORCIING.
3. SOFFIT AND GABLE END OVERHANGS SHOULD BE ELIMINATED OR REDUCED TO TWO FEET OR LESS.
4. WOOD WALLS MUST BE PERMANENTLY CONNECTED AND PROPERLY BRACED. MASONRY WALLS MUST BE VERTICALLY AND HORIZONTALLY REINFORCED.
5. ALL WOOD MEMBERS, INCLUDING SHEATHING, SHALL BE PRESSURE TREATED.
6. PORCH ROOFS SHOULD BE INDEPENDENTLY FRAMED AND NOT AN EXTENSION OF THE MAIN ROOF SYSTEM.
7. WINDOW AND DOOR OPENINGS MUST BE PROTECTED FROM WIND LOADS AND DEBRIS IMPACT, USING PERMANENT SHUTTERS OR TEMPORARY PLYWOOD OR METAL PANELS.
8. ALL CONSTRUCTION MUST COMPLY WITH THE LATEST BUILDING CODE. YOU ARE REQUIRED TO OBTAIN THE NECESSARY BUILDING PERMITS FROM THE U.S.V.I. DEPARTMENT OF PLANNING AND NATURAL RESOURCES.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

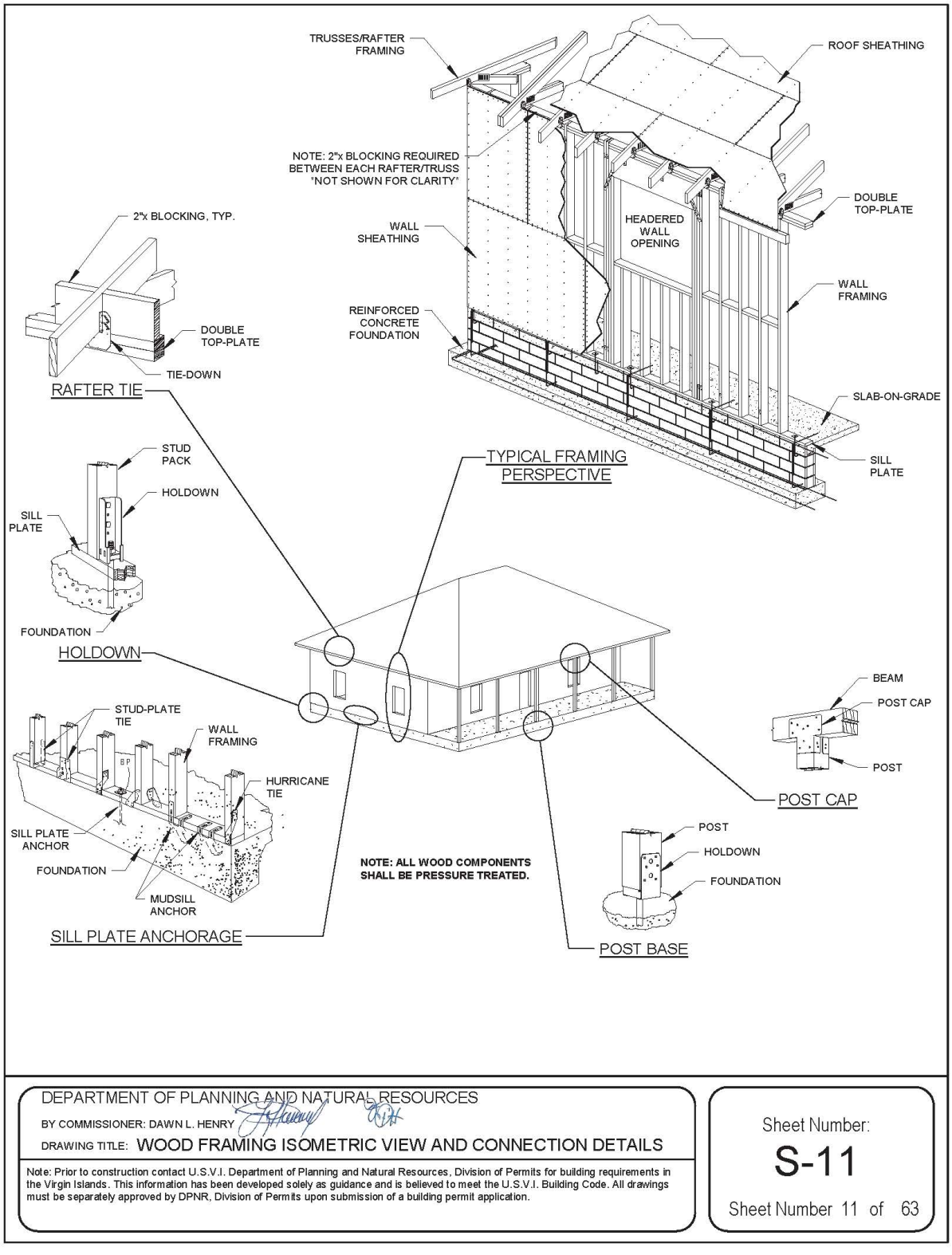
DRAWING TITLE: CONSTRUCTION CONSIDERATIONS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-10

Sheet Number 10 of 63



DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: WOOD FRAMING ISOMETRIC VIEW AND CONNECTION DETAILS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-11

Sheet Number 11 of 63

ROOFS

ROOFS ARE ONE OF THE PORTIONS OF THE RESIDENCE MOST PRONE TO HURRICANE DAMAGE. PROPER ROOF CONSTRUCTION IS ESSENTIAL. ALL LUMBER USED IN ROOF CONSTRUCTION SHOULD BE PRESSURE TREATED, STRUCTURAL GRADE MATERIAL. ADEQUATELY FASTEN CORRUGATED METAL ROOFING. THE SEPARATION OF ONE SHEET COULD LEAD TO FAILURE OF OTHER SHEETS AND EXPOSURE OF THE INTERIOR OF THE HOME TO WIND AND RAIN; THUS RISKING DAMAGE TO PERSONAL PROPERTY AND INJURY TO THE OCCUPANTS.

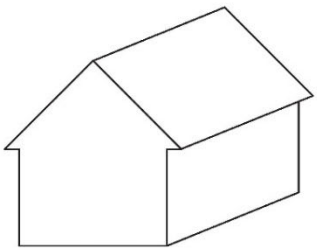
THERE ARE TWO SUGGESTED METHODS OF ROOF CONSTRUCTION. THE FIRST EMPLOYS RAFTERS, THE SECOND TRUSSES. THESE FRAMING MEMBERS ARE TIED TO THE EXTERIOR WALLS AND IN SOME CASES TO THE INTERIOR WALLS OF THE HOUSE. THE ROOF SYSTEM IS COMPLETED WITH PLYWOOD SHEATHING COVERED BY UNDERLAYMENT, USED FOR ADDITIONAL MOISTURE PROTECTION, AND THEN COVERED BY A CORRUGATED METAL ROOFING SYSTEM. THE RECOMMENDED UNDERLAYMENT IS A SELF-ADHERING MODIFIED BITUMEN, COMPLYING WITH ASTM D1970 THAT IS INTENDED FOR USE UNDERNEATH METAL ROOF PANELS. A MORE ECONOMICAL, BUT LESS RELIABLE UNDERLAYMENT MATERIAL IS ASTM D226 TYPE II (#30) OR ASTM D4869 TYPE IV FELT. A TWO LAYER APPLICATION IS RECOMMENDED WHERE THE ROOF SLOPE IS LESS THAN 4:12. PRIOR TO INSTALLATION OF THE FELT, IT IS RECOMMENDED THAT THE PLYWOOD SHEATHING JOINTS BE TAPED WITH SELF-ADHERING MODIFIED BITUMEN TAPE (4 INCHES WIDE, MINIMUM), ROLL TAPE WITH A ROLLER. THE APPROVED CORRUGATED METAL ROOFING SYSTEM SHALL HAVE A TRIPLE OVERLAP OF CORRUGATIONS AT SIDELAPS. A LIQUID APPLIED MEMBRANE ROOFING SYSTEM MAY BE USED IN LIEU OF THE CORRUGATED METAL ROOFING SYSTEM (NOTE: DO NOT INSTALL MODIFIED BITUMEN TAPE AT SHEATHING JOINTS WHERE LIQUID APPLIED MEMBRANE ROOFING OPTION IS INSTALLED).

THE WOOD ROOF STRUCTURE AND CORRUGATED METAL ROOFING CAN BE LIFTED AND SEPARATED FROM THE STRUCTURE BY WIND FORCES CREATED BY A HURRICANE, STRAIGHT LINE WINDS OR OTHER HIGH WIND EVENTS. IF THE METAL ROOFING IS PROPERLY ATTACHED TO THE STRUCTURE BUT THE STRUCTURE IS NOT PROPERLY ATTACHED TO THE WALLS THE ENTIRE ROOF OR PARTS OF THE ROOF MAY BE REMOVED BY THE WIND FORCES. TO AVOID THIS IT IS IMPORTANT TO ADEQUATELY ATTACH THE ROOF TO THE WALLS. IN HOMES WITH WOOD FRAMED WALLS THIS IS ACHIEVED BY USING METAL CONNECTORS TO ATTACH THE TRUSSES OR RAFTERS TO THE TOP PLATES AND THE STUDS, THE STUDS TO THE BOTTOM PLATES, AND TO THE FLOOR SYSTEM AND FOUNDATION. IN MASONRY WALLS, STEEL REINFORCING BARS MAY BE USED IN CONJUNCTION WITH METAL CONNECTORS TO ATTACH THE ROOF STRUCTURE TO THE REINFORCED MASONRY WALLS, FLOOR, AND FOUNDATION.

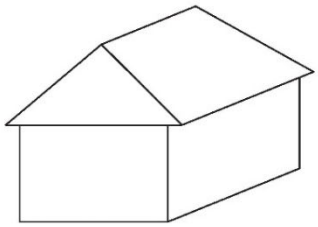
DESIGNS PROVIDED IN THE MAIN BODY OF THIS DOCUMENT USE A STRUCTURAL ROOF BEAM AT THE RIDGE, KNOWN AS A RIDGE BEAM. THIS BEAM MUST BE VERTICALLY SUPPORTED BY COLUMNS, EXTERIOR WALLS, INTERIOR WALLS, OTHER BEAMS, OR A COMBINATION OF THESE METHODS. THE USE OF A BOARD (RATHER THAN A BEAM) AT THE RIDGE REQUIRES SPECIFIC DESIGN CONSIDERATIONS INCLUDING, BUT NOT LIMITED TO THE HORIZONTAL THRUST IMPOSED BY RAFTERS ON SUPPORTS. CEILING JOISTS OR RAFTER TIES ARE REQUIRED AND SHALL BE PROPERLY DESIGNED TO RESIST THRUST LOADS IF RIDGE BOARDS ARE USED IN LIEU OF RIDGE BEAMS.

ATTIC SPACE SHOULD HAVE ADEQUATE VENTILATION TO REMOVE HUMIDITY. THESE VENTS SHOULD BE PROPERLY SIZED AND STRATEGICALLY LOCATED AND INCORPORATE CROSS VENTILATION.

ALL CONSTRUCTION MUST COMPLY WITH THE LATEST ADOPTED BUILDING CODE IN THE U.S.V.I. YOU ARE REQUIRED TO OBTAIN THE NECESSARY BUILDING PERMITS FROM THE DEPARTMENT OF PLANNING AND NATURAL RESOURCES.



GABLE ROOF



HIP ROOF

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

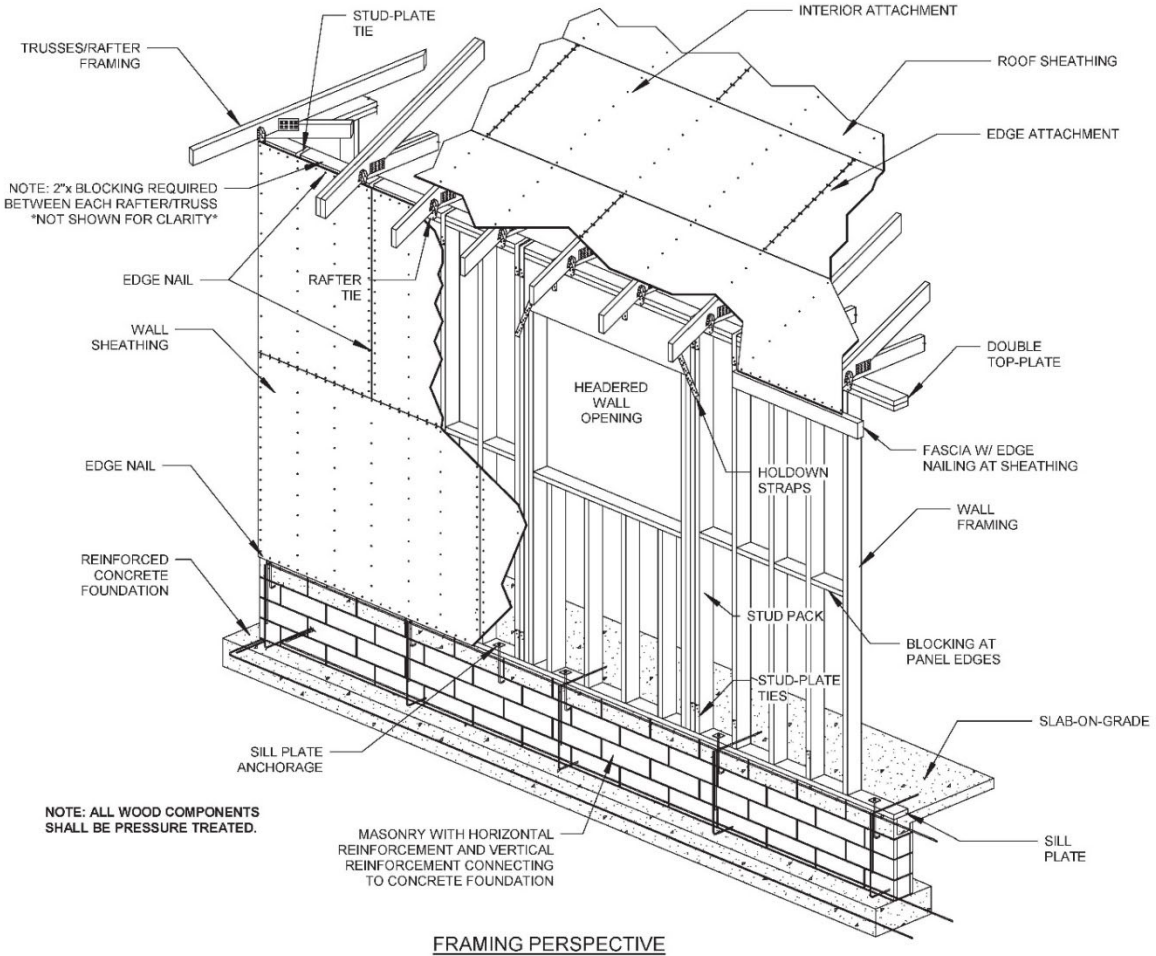
DRAWING TITLE: ROOFS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-12

Sheet Number 12 of 63



FRAMING PERSPECTIVE

COMMON SENSE MEASURES THAT COULD PREVENT LOSSES:

A HOUSE IS ONLY AS STRONG AS ITS WEAKEST CONNECTION. TO BE EFFECTIVE EACH CONNECTION IN THE LOAD PATH MUST BE STRONG ENOUGH TO TRANSFER LOADS WITHOUT FAILURE. IN A TYPICAL RESIDENTIAL HOME, THE LOAD PATH FOR GRAVITY LOADS AND LATERAL LOADS INVOLVES THE FOLLOWING STRUCTURAL ELEMENTS:

1. ROOF SHEATHING ATTACHMENT.
2. ROOF FRAMING-TO-WALL CONNECTIONS.
3. WALL SHEATHING ATTACHMENT.
4. WALL FRAMING ATTACHMENT (TOP PLATE, STUDS, AND HEADERS).
5. IF APPLICABLE, FLOOR-TO-FLOOR ATTACHMENT FOR TWO STORY RESIDENCES.
6. SILL PLATE ANCHORAGE TO FOUNDATIONS.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

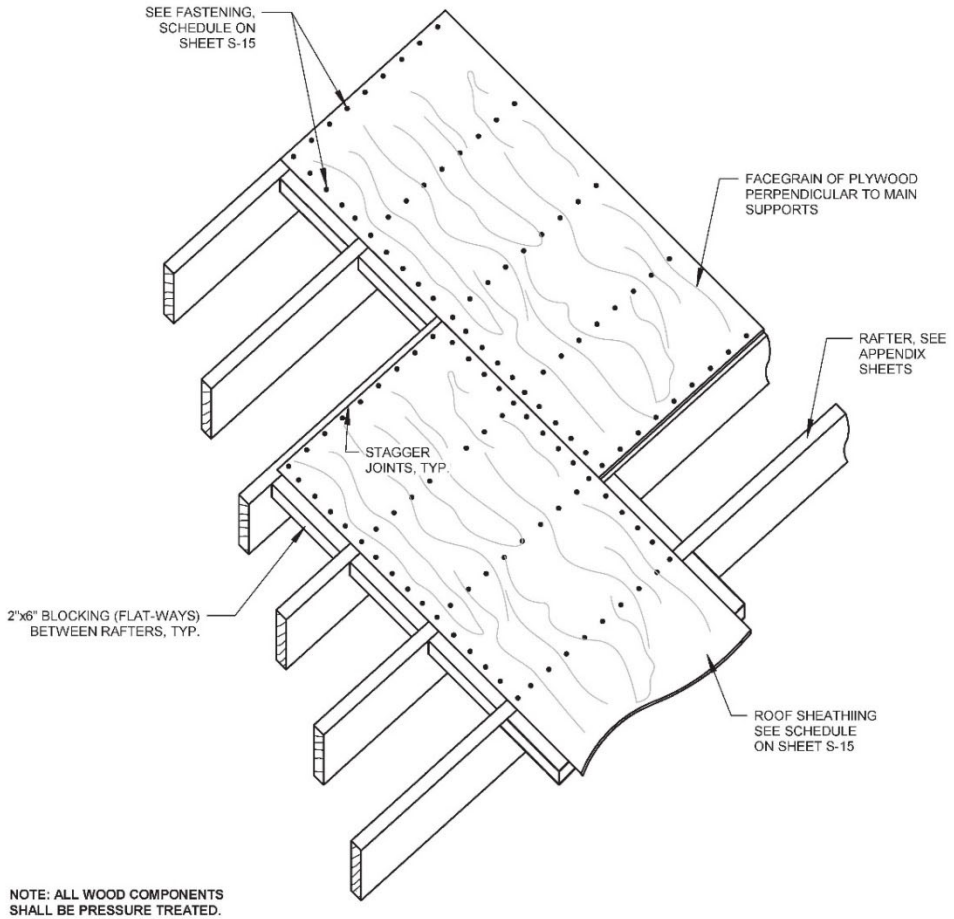
DRAWING TITLE: FRAMING PERSPECTIVE

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-13

Sheet Number 13 of 63



NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.

ROOF SHEATHING

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: PLYWOOD ROOF SHEATHING

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-14

Sheet Number 14 of 63

NOTE: TABLE BASED UPON RAFTERS WHICH ARE SPACED AT 2'-0" O.C. MAXIMUM.

ROOF COMPONENT DESIGNS	WIND EXPOSURE B ON UPPER HALF OF A HILL, RIDGE, OR ESCARPMENT OR NEAR THE CREST OF AN ESCARPMENT	WIND EXPOSURE B	WIND EXPOSURE D
METAL ROOF PANEL FASTENER SPACING ALONG NAILER	5-1/3" O.C. (EVERY OTHER CORRUGATION)	10-2/3" O.C. (EVERY 4TH CORRUGATION)	8" O.C. (EVERY 3RD CORRUGATION)
NAILER SPACING	SEE ROOF PLANS	SEE ROOF PLANS	SEE ROOF PLANS
NAILER FASTENERS INTO OUTLOOKERS AT OVERHANGS	#14 x 5" LONG STAINLESS STEEL WOOD SCREW @ 6" O.C.	#12 x 4-1/2" LONG STAINLESS STEEL WOOD SCREW @ 12" O.C.	#14 x 5" LONG STAINLESS STEEL WOOD SCREW @ 6" O.C.
NAILER FASTENERS AT EACH RAFTER INTERSECTION	TWO #14 x 5" LONG STAINLESS STEEL WOOD SCREWS	TWO #12 x 4-1/2" LONG STAINLESS STEEL WOOD SCREWS	TWO #14 x 5" LONG STAINLESS STEEL WOOD SCREWS
BLOCKING FOR SHEATHING	BLOCKING SHALL BE INSTALLED UNDER THE UNSUPPORTED EDGE OF ALL ROOF SHEATHING WHICH HAS A LIQUID APPLIED MEMBRANE	BLOCKING SHALL BE INSTALLED UNDER THE UNSUPPORTED EDGE OF ALL ROOF SHEATHING WHICH HAS A LIQUID APPLIED MEMBRANE	BLOCKING SHALL BE INSTALLED UNDER THE UNSUPPORTED EDGE OF ALL ROOF SHEATHING WHICH HAS A LIQUID APPLIED MEMBRANE
SHEATHING SIZE: THICKNESS MAY BE DECREASED BY 1/8" IF TEXTURED PLYWOOD IS REPLACED WITH REGULAR PLYWOOD. HOWEVER, MINIMUM THICKNESS SHALL NOT BE LESS THAN 5/8-INCH.	STRUCTURAL 1 TYPE 7/8" TEXTURED PLYWOOD WITH 48/24 SPAN RATING	STRUCTURAL 1 TYPE 23/32" TEXTURED PLYWOOD WITH 32/16 SPAN RATING	STRUCTURAL 1 TYPE 3/4" TEXTURED PLYWOOD WITH 40/20 SPAN RATING
SHEATHING FASTENERS	#14 x 3-1/2" LONG STAINLESS STEEL WOOD SCREWS AT 3" O.C. AT ALL SUPPORT MEMBERS	#12 x 3" LONG STAINLESS STEEL WOOD SCREWS AT 5" O.C. AT ALL SUPPORT MEMBERS	#14 x 3-1/2" LONG STAINLESS STEEL WOOD SCREWS AT 3" O.C. AT ALL SUPPORT MEMBERS

ROOF SHEATHING, NAILER, AND ATTACHMENTS

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

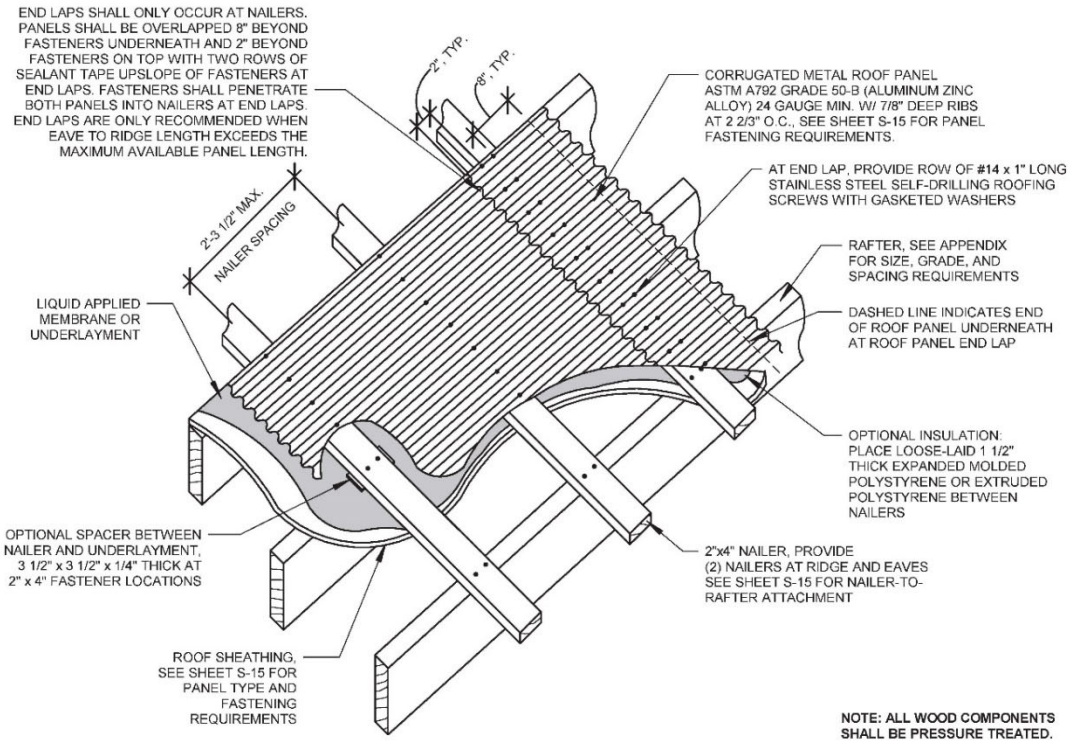
DRAWING TITLE: ROOF COMPONENT ATTACHMENTS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

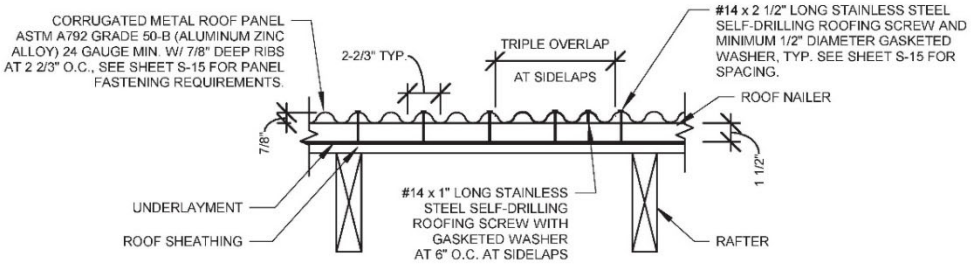
Sheet Number:

S-15

Sheet Number 15 of 63



ROOF COVERING ISOMETRIC VIEW



ROOF COVERING SECTION VIEW

NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED WOOD USED UNDER THE METAL ROOFING TO HAVE USE CATEGORY OF UC3A FOR ABOVE GROUND INSTALLATION AND SHALL BE MANUFACTURED IN ACCORDANCE WITH THE AMERICAN WOOD PROTECTION ASSOCIATION.

NOTE: PROVIDE A MINIMUM OF THREE OVERLAPPING CORRUGATIONS (TRIPLE OVERLAP) AT SIDELAPS.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

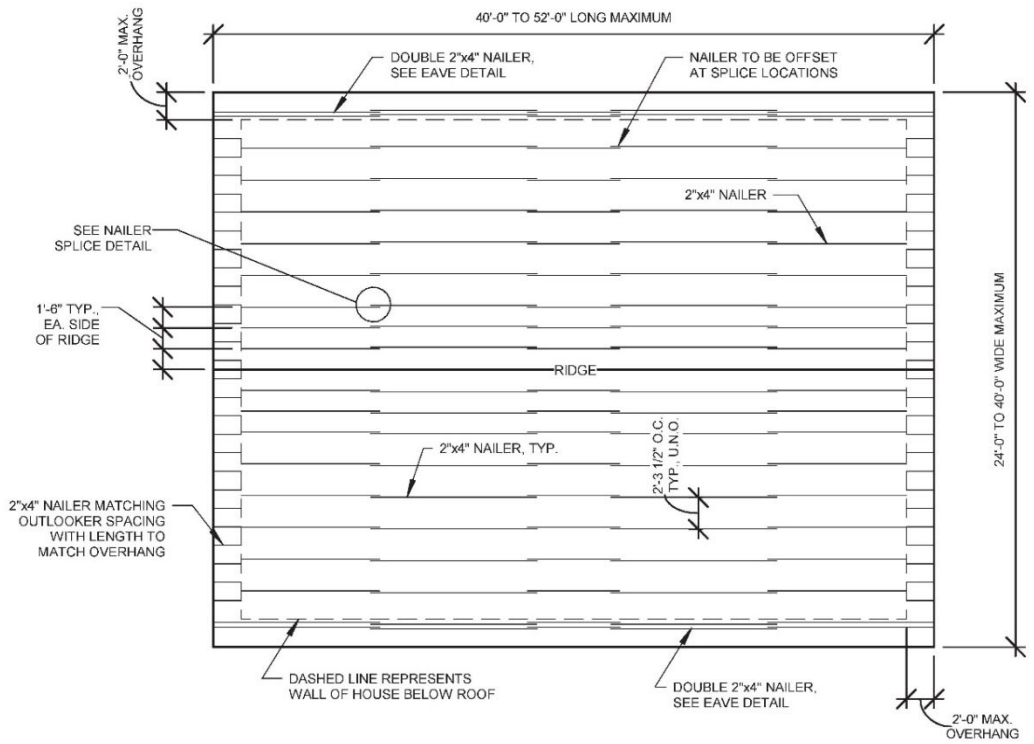
DRAWING TITLE: CORRUGATED ROOF DETAIL

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

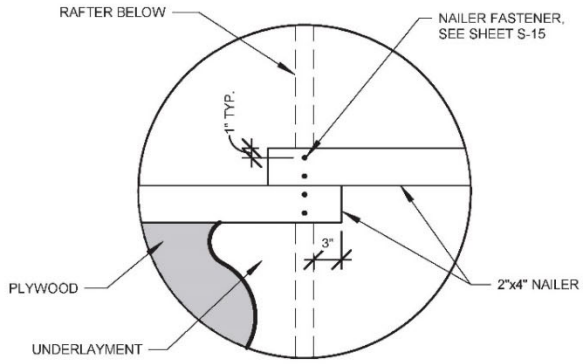
S-16

Sheet Number 16 of 63



NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.

ROOF NAILER LAYOUT-GABLE



NAILER SPLICE DETAIL

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

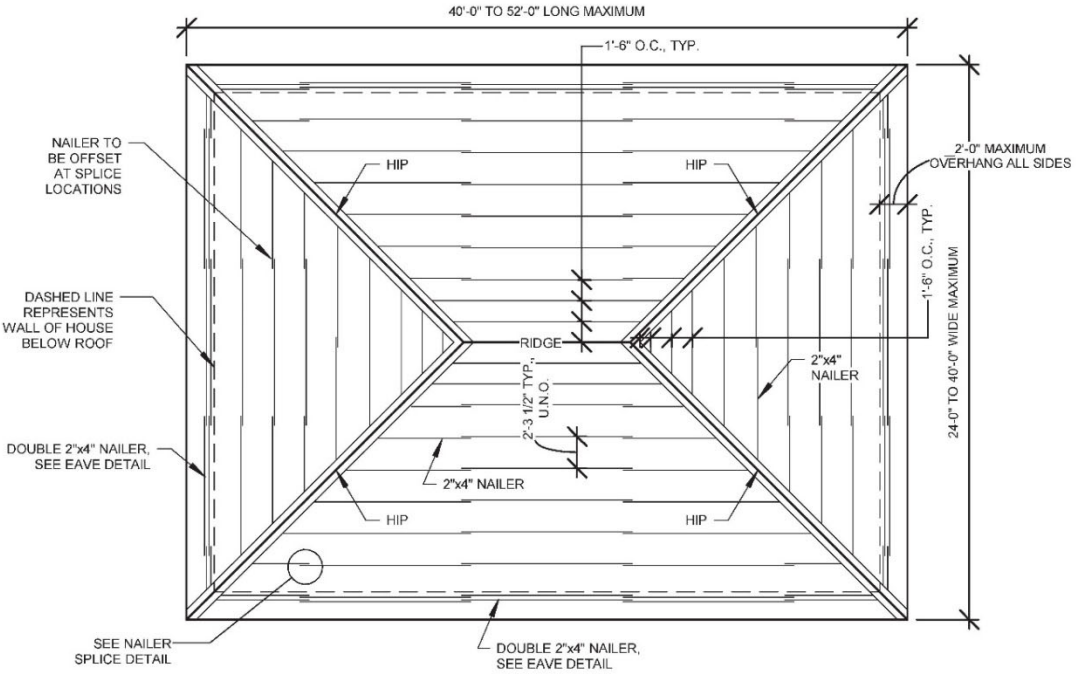
DRAWING TITLE: ROOF NAILER LAYOUT-GABLE

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

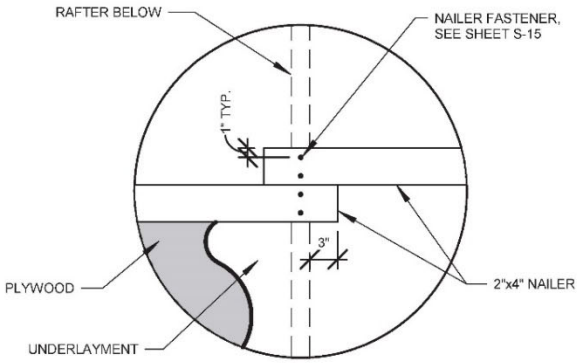
S-17

Sheet Number 17 of 63



NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.

ROOF NAILER LAYOUT-HIP



NAILER SPLICE DETAIL

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

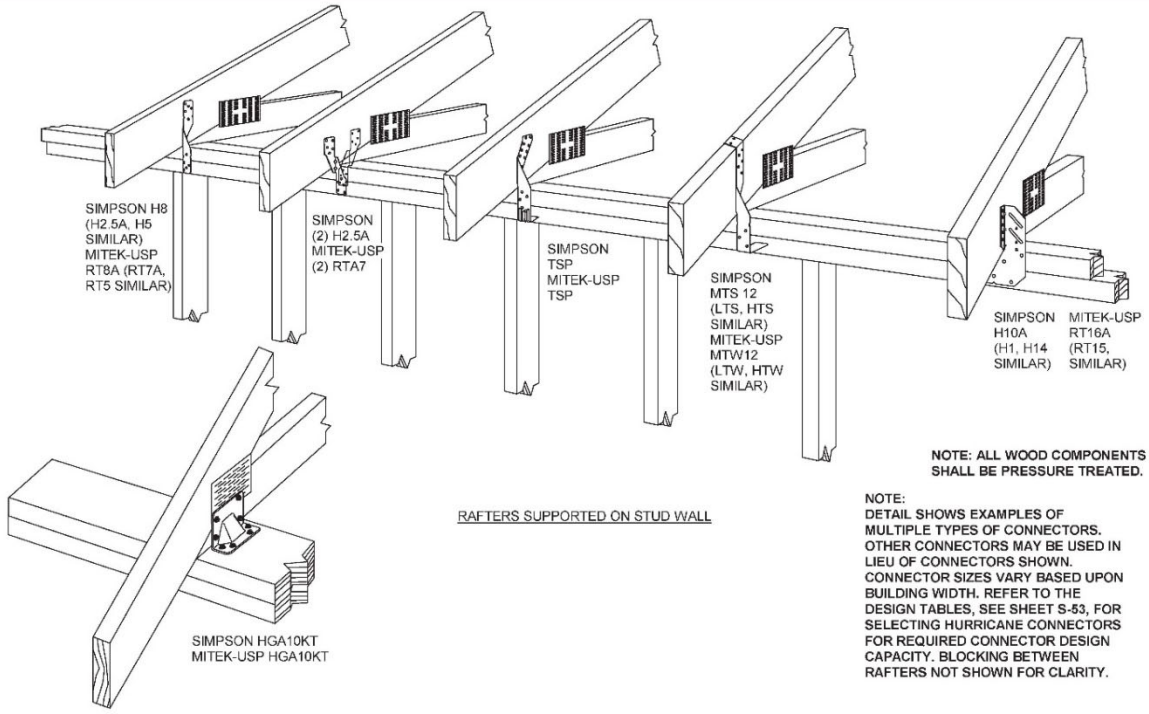
DRAWING TITLE: ROOF NAILER LAYOUT-HIP

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-18

Sheet Number 18 of 63

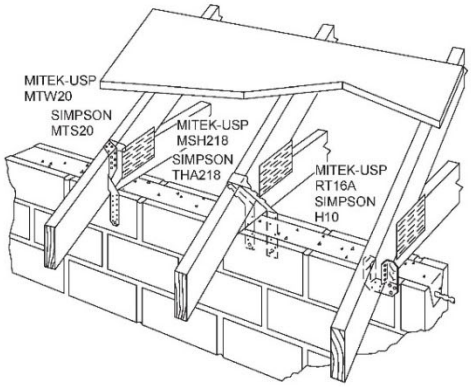


RAFTERS SUPPORTED ON STUD WALL

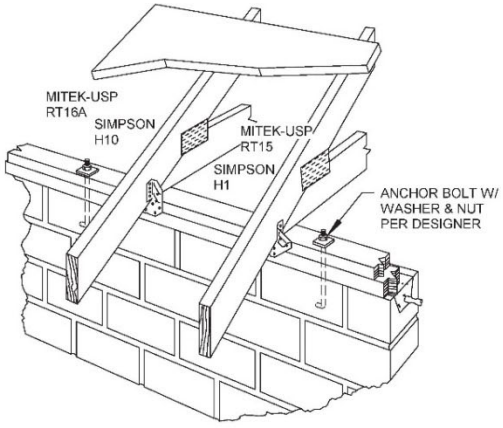
NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.

NOTE:
DETAIL SHOWS EXAMPLES OF MULTIPLE TYPES OF CONNECTORS. OTHER CONNECTORS MAY BE USED IN LIEU OF CONNECTORS SHOWN. CONNECTOR SIZES VARY BASED UPON BUILDING WIDTH. REFER TO THE DESIGN TABLES, SEE SHEET S-53, FOR SELECTING HURRICANE CONNECTORS FOR REQUIRED CONNECTOR DESIGN CAPACITY. BLOCKING BETWEEN RAFTERS NOT SHOWN FOR CLARITY.

DETAILS COURTESY OF THE SIMPSON STRONG-TIE COMPANY



RAFTERS SUPPORTED ON CMU WALL W/O TOP PLATES



RAFTERS SUPPORTED ON CMU WALL W/ TOP PLATES

THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY AND MITEK-USP. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

RECOMMENDED RAFTER CONNECTORS

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

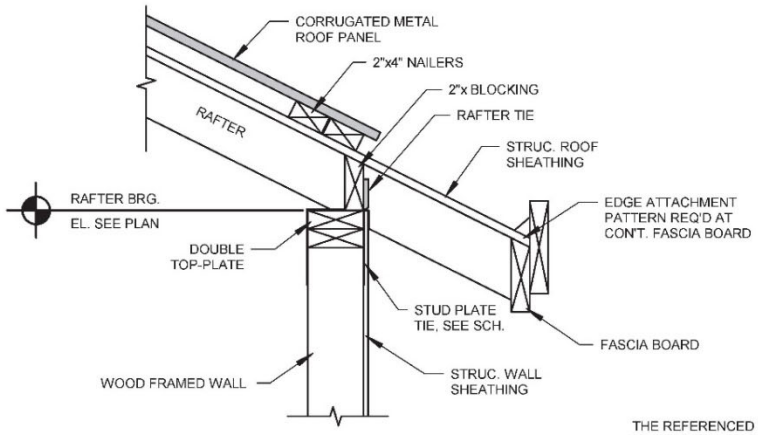
DRAWING TITLE: TRUSS/RAFTER CONNECTORS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-19

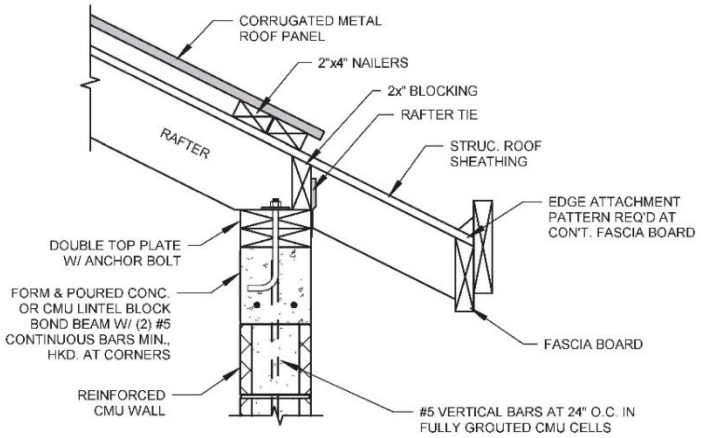
Sheet Number 19 of 63



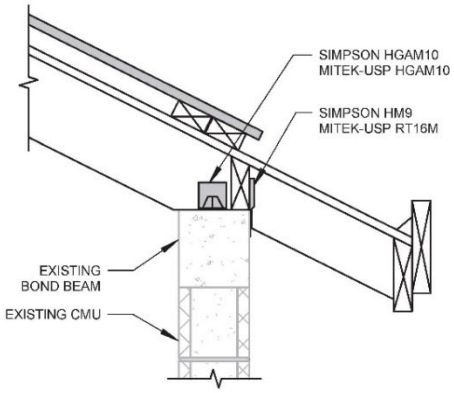
RAFTER BEARING AT WOOD FRAMED WALL

THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY AND MITEK-USP. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.



RAFTER BEARING AT CMU WALL



RETROFIT OF EXISTING BOND BEAM

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

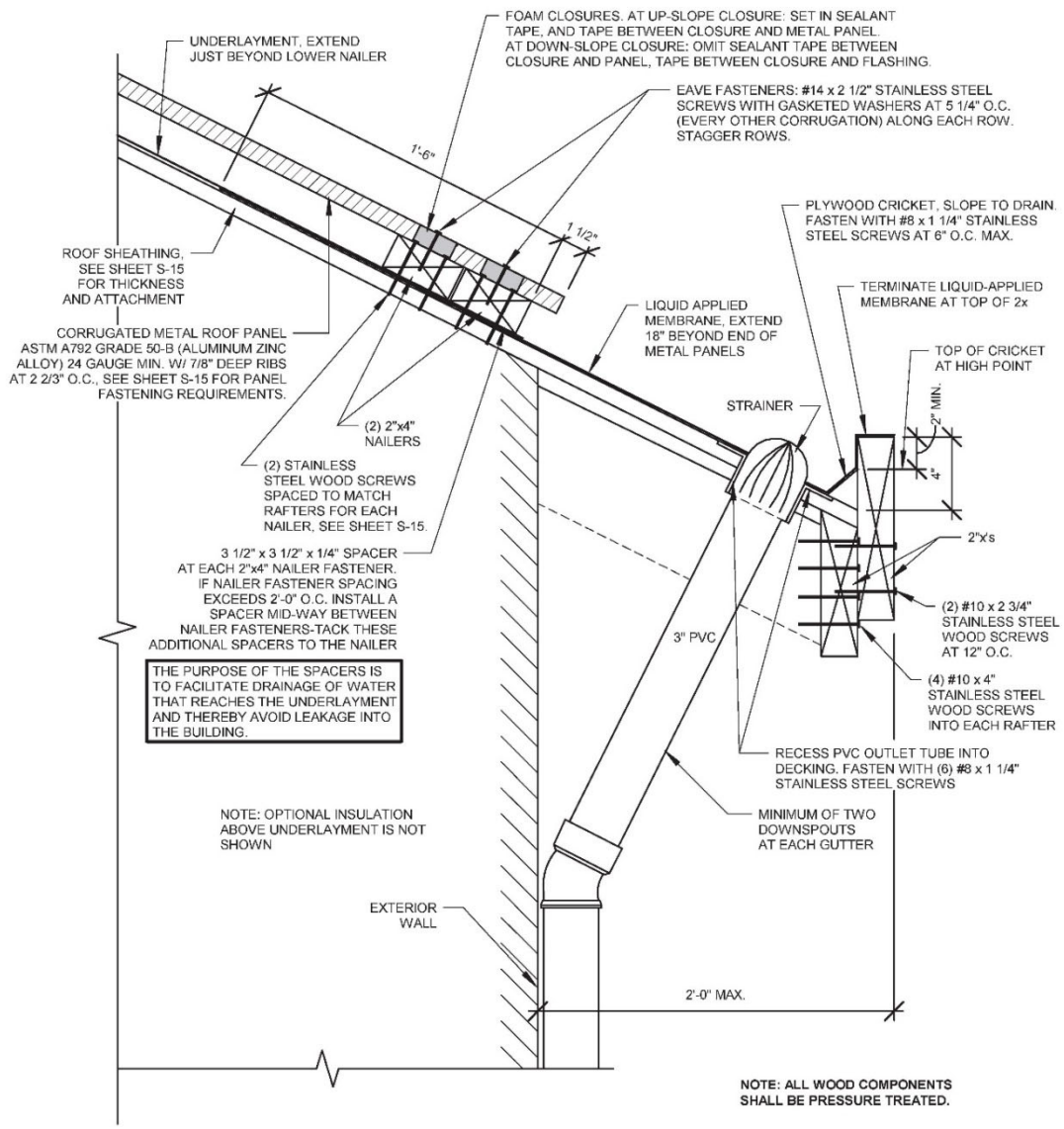
DRAWING TITLE: RAFTER BEARING

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-20

Sheet Number 20 of 63



EAVE DETAIL

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

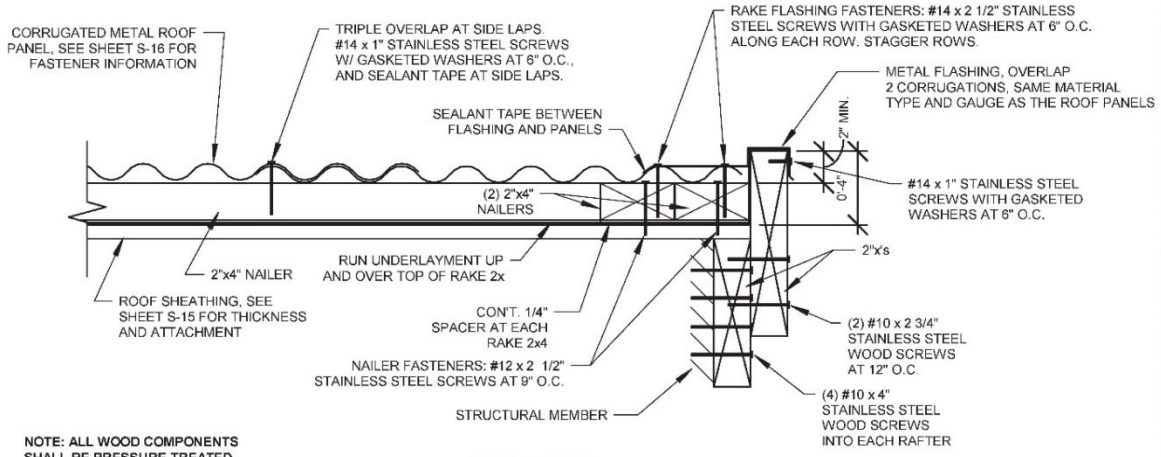
DRAWING TITLE: ROOF GUTTER AT EAVE

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

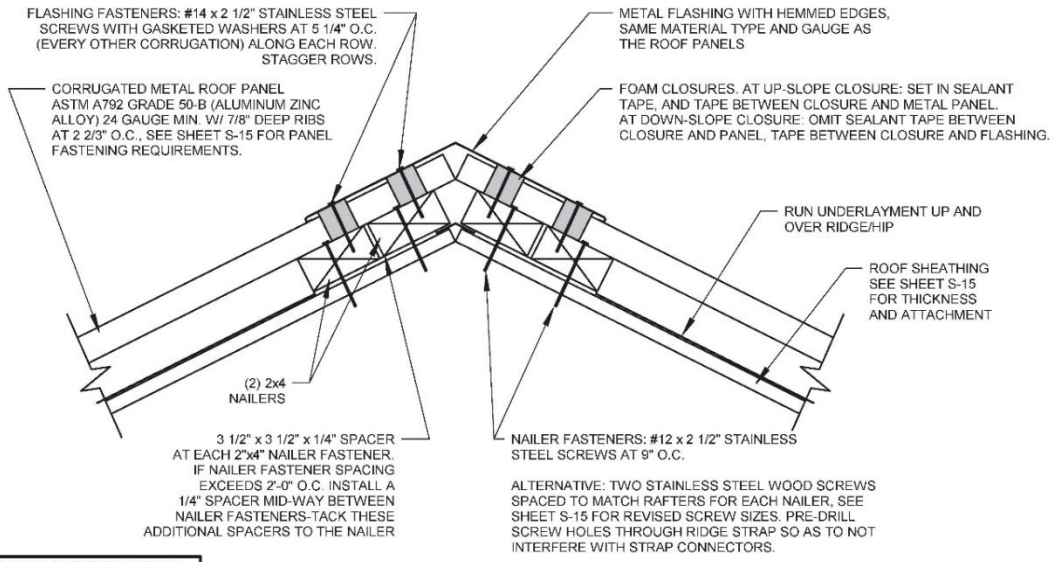
S-21

Sheet Number 21 of 63



NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.

RAKE DETAIL



THE PURPOSE OF THE SPACERS IS TO FACILITATE DRAINAGE OF WATER THAT REACHES THE UNDERLAYMENT AND THEREBY AVOID LEAKAGE INTO THE BUILDING.

RIDGE DETAIL (HIP SIMILAR)

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

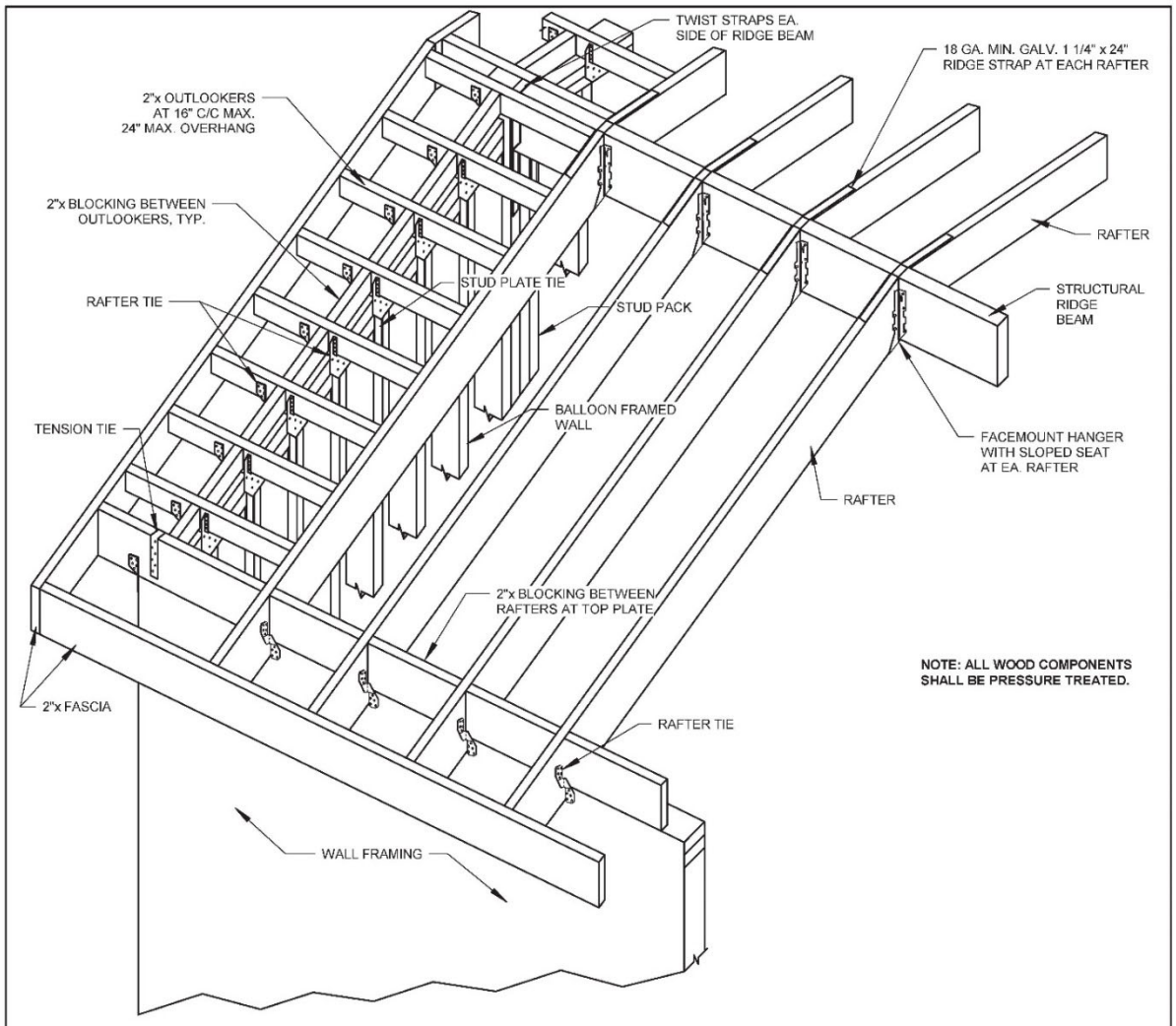
DRAWING TITLE: RAKE AND RIDGE DETAILS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-22

Sheet Number 22 of 63



GABLE END FRAMING DETAIL

NOTES:

1. FOR GABLE END WALL CONSTRUCTED OF MASONRY, PROVIDE SLOPED BOND BEAM WITH SIMILAR OUTLOOKER FRAMING.
2. FOR BALLOON FRAMED WALLS WHICH EXCEED 14'-3" IN HEIGHT, PROVIDE ANGLED KNEEBRACES, REFERENCE SHEET S-24.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

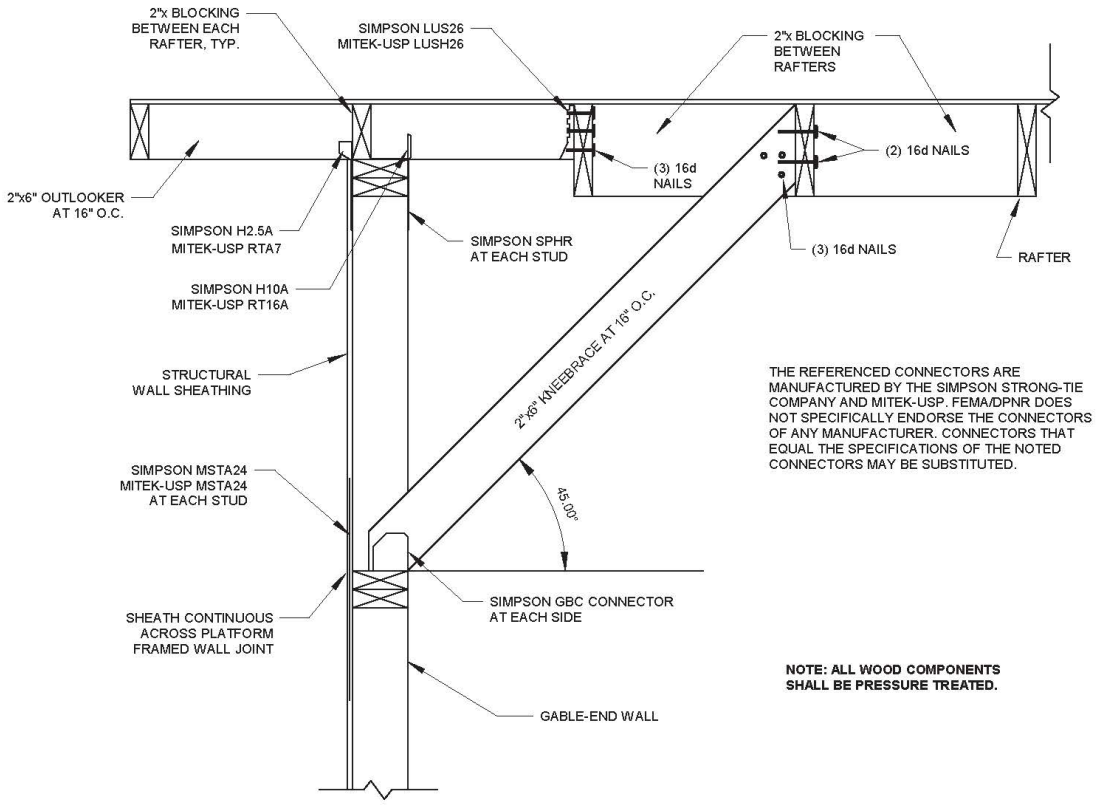
DRAWING TITLE: GABLE END FRAMING DETAIL

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-23

Sheet Number 23 of 63



KNEEBRACE DETAIL

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

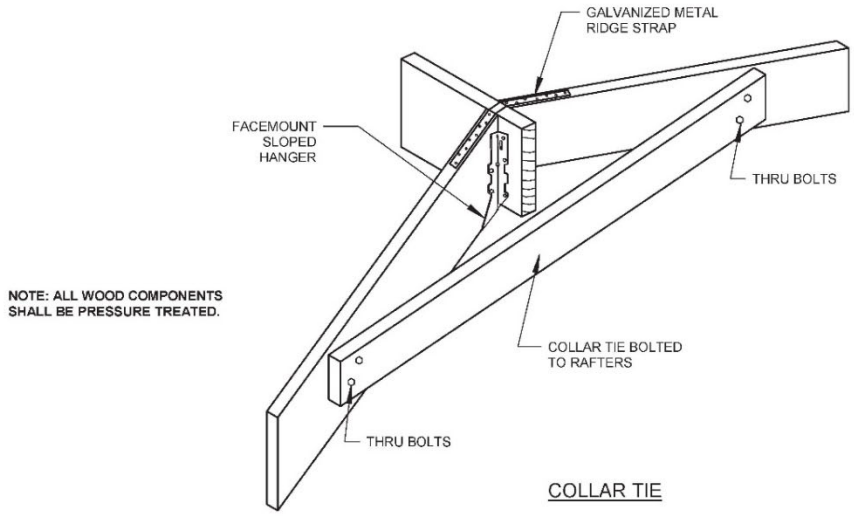
DRAWING TITLE: GABLE END BRACING WITH KNEEBRACE

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

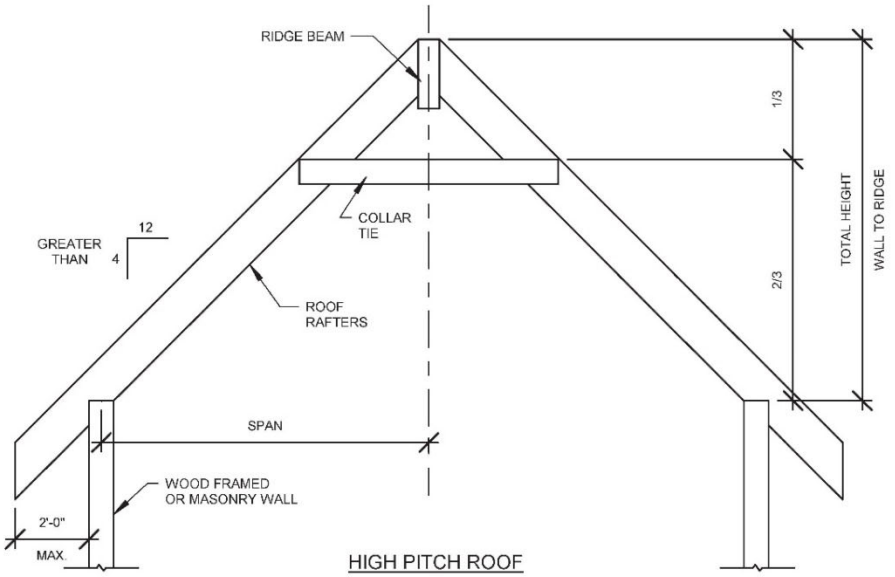
Sheet Number:

S-24

Sheet Number 24 of 63



COLLAR TIE



HIGH PITCH ROOF

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

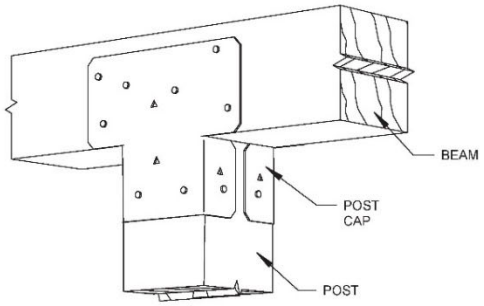
DRAWING TITLE: COLLAR TIE TO RAFTERS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

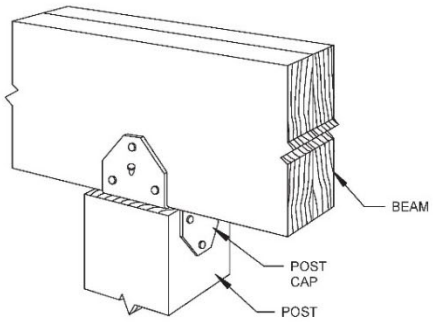
Sheet Number:

S-25

Sheet Number 25 of 63



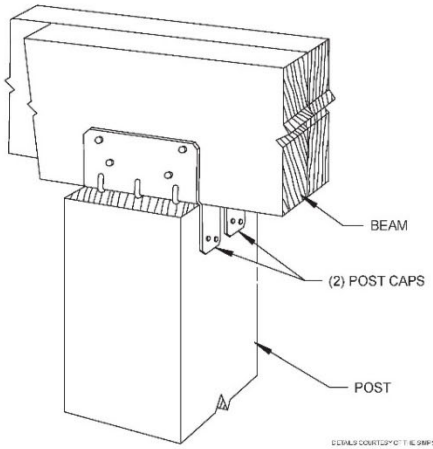
SIMPSON AC
MITEK PBS



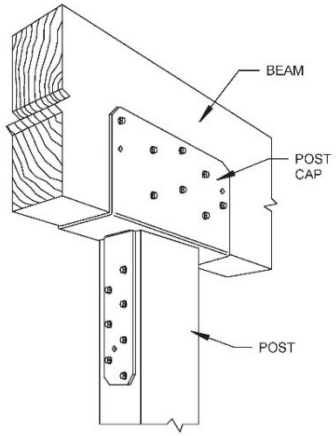
SIMPSON BC/BCS
MITEK BC/C

NOTE:
DETAIL SHOWS EXAMPLES OF MULTIPLE TYPES OF CONNECTORS. OTHER CONNECTORS MAY BE USED IN LIEU OF CONNECTORS SHOWN. REFER TO THE DESIGN TABLES FOR SELECTING HURRICANE CONNECTORS FOR REQUIRED CONNECTOR DESIGN CAPACITY.

NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.



SIMPSON LPC
MITEK PB



SIMPSON CCQ
MITEK KCCQ

THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY AND MITEK-USP. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

RECOMMENDED POST CAP ANCHORAGE

DETAILS ARE FOR INFORMATIVE PURPOSES ONLY AND NOT RELATED TO A SPECIFIC DESIGN.

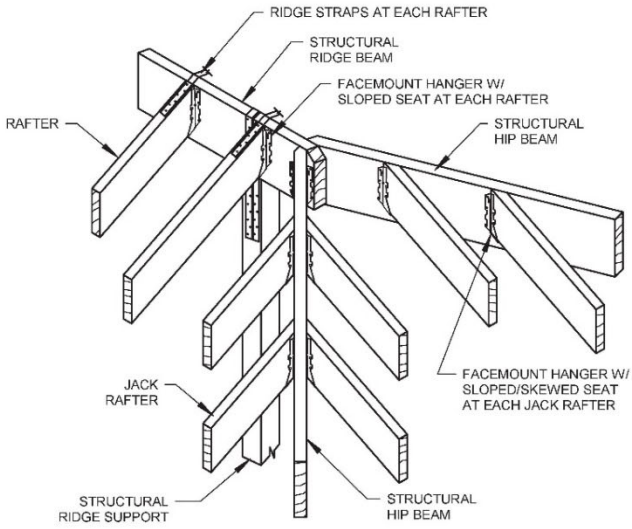
DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: POST CAP CONNECTIONS

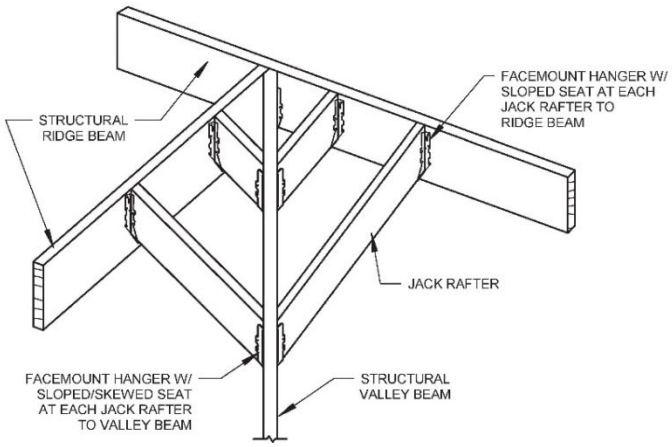
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:
S-26
Sheet Number 26 of 63



NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.

HIP RAFTER ROOF FRAMING



VALLEY RAFTER ROOF FRAMING

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: TYPICAL HIP ROOF FRAMING

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-27

Sheet Number 27 of 63

WALLS

CONSTRUCT THE HOUSE WALLS TO RESIST ALL APPROPRIATE HAZARD LOADS, INCLUDING BUT NOT LIMITED TO WIND, FLOOD, AND SEISMIC LOADS. THE EXTERIOR WALLS AND IN SOME CASES THE INTERIOR WALLS, ARE DESIGNED TO TRANSFER WEIGHT AND LOADING TO THE FOUNDATION. ADEQUATE WALL TO FLOOR TO FOUNDATION CONNECTORS ARE ESSENTIAL TO TIE THE HOUSE TOGETHER.

IN WOOD HOMES USE PROPERLY ATTACHED METAL CONNECTORS TO TIE ROOF TO WALL AND THE WALL TO THE FLOOR STRUCTURE AND FOUNDATION. EMPLOY PROPERLY SIZED AND SPACED ANCHOR BOLTS TO SECURE THE MUDSILL TO THE CONCRETE OR BLOCK FOUNDATION WALL.

MASONRY HOME WALLS REQUIRE PROPERLY SIZED AND SPACED VERTICAL AND HORIZONTAL STEEL REINFORCEMENT AND IN CEMENT BLOCK CONSTRUCTION, ADEQUATE CONCRETING OF BOND BEAMS AND VERTICAL BLOCK CELLS.

IN LIEU OF A SITE SPECIFIC DESIGN FOR SHUTTERS, WINDOWS, AND EXTERIOR DOORS, THIS DOCUMENT INCLUDES WIND DESIGNS FOR BUILDINGS LOCATED IN EXPOSURE B WITHOUT WIND SPEED-UP EFFECTS, AND EXPOSURE D WITHOUT WIND SPEED-UP EFFECTS, AND EXPOSURE B THAT ARE SUBJECTED TO WIND SPEED-UP EFFECTS*:

IT IS RECOMMENDED SHUTTERS RESIST AN ALLOWABLE DESIGN WIND PRESSURE OF +72/-72 PSF OR GREATER IN ACCORDANCE WITH ASTM E1886 AND ASTM E1996 USING MISSILE D.

WINDOWS WITHOUT SHUTTER PROTECTION MUST USE IMPACT RESISTANT GLAZING. THE IMPACT RESISTANT GLAZING IS RECOMMENDED TO RESIST AN ALLOWABLE DESIGN WIND PRESSURE OF +72/-72 PSF OR GREATER IN ACCORDANCE WITH ASTM E1886 AND ASTM E1996 USING MISSILE D. WINDOWS TO BE TESTED IN ACCORDANCE WITH ASTM E330 TO RESIST AN ALLOWABLE DESIGN WIND PRESSURE OF +72/-72 OR GREATER. METAL JALOUSIE WINDOWS AND OTHER WINDOWS, IF PROTECTED BY A SHUTTER, NEED ONLY BE TESTED IN ACCORDANCE WITH ASTM E330 TO RESIST AN ALLOWABLE DESIGN WIND PRESSURE OF +72/-72 PSF OR GREATER.

EXTERIOR DOORS TO BE TESTED IN ACCORDANCE WITH ASTM E330 TO RESIST AN ALLOWABLE DESIGN WIND PRESSURE OF +72/-72 PSF OR GREATER. THE IMPACT RESISTANT GLAZING OF EXTERIOR DOORS IS REQUIRED TO RESIST AN ALLOWABLE DESIGN WIND PRESSURE OF +72/-72 PSF OR GREATER IN ACCORDANCE WITH ASTM E1886 USING MISSILE D.

*BUILDINGS LOCATED IN EXPOSURE C WITH WIND SPEED-UP EFFECTS, AND IN EXPOSURE D WITH WIND SPEED-UP EFFECTS REQUIRE A SITE SPECIFIC DESIGN.

ALL CONSTRUCTION MUST COMPLY WITH THE LATEST U.S.V.I. BUILDING CODE. YOU ARE REQUIRED TO OBTAIN THE NECESSARY BUILDING PERMITS FROM THE DEPARTMENT OF PLANNING AND NATURAL RESOURCES.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

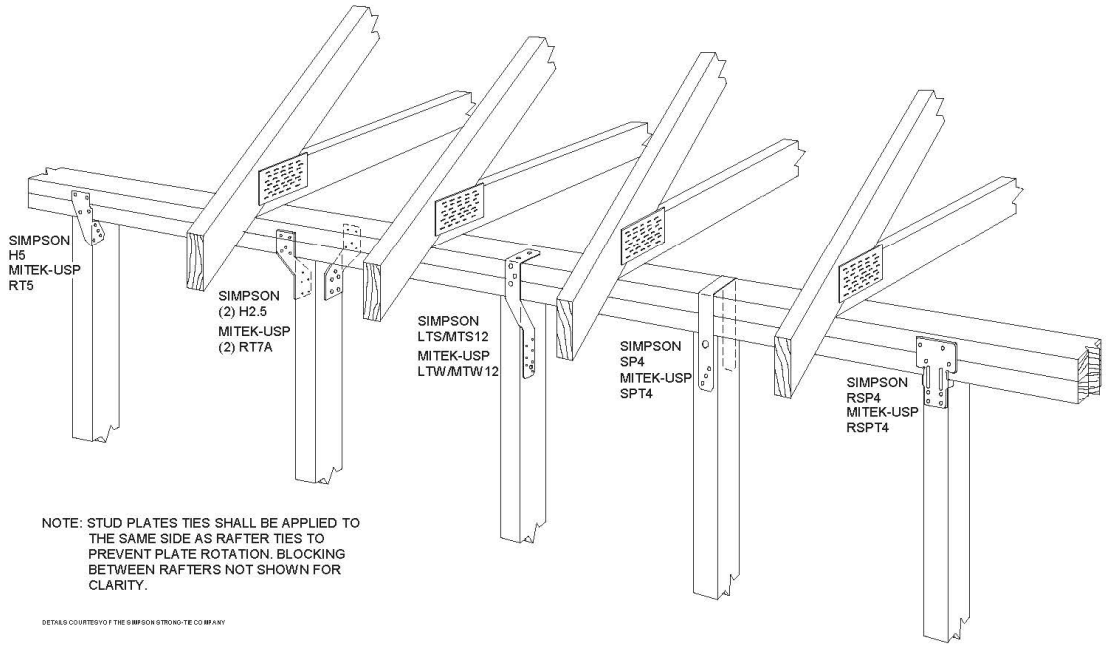
DRAWING TITLE: WALLS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-28

Sheet Number 28 of 63



NOTE: STUD PLATES TIES SHALL BE APPLIED TO THE SAME SIDE AS RAFTER TIES TO PREVENT PLATE ROTATION. BLOCKING BETWEEN RAFTERS NOT SHOWN FOR CLARITY.

DETAILS COURTESY OF THE SIMPSON STRONG-TIE COMPANY

RECOMMENDED TOP PLATE TO STUD CONNECTORS

NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.

THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY AND MITEK-USP. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

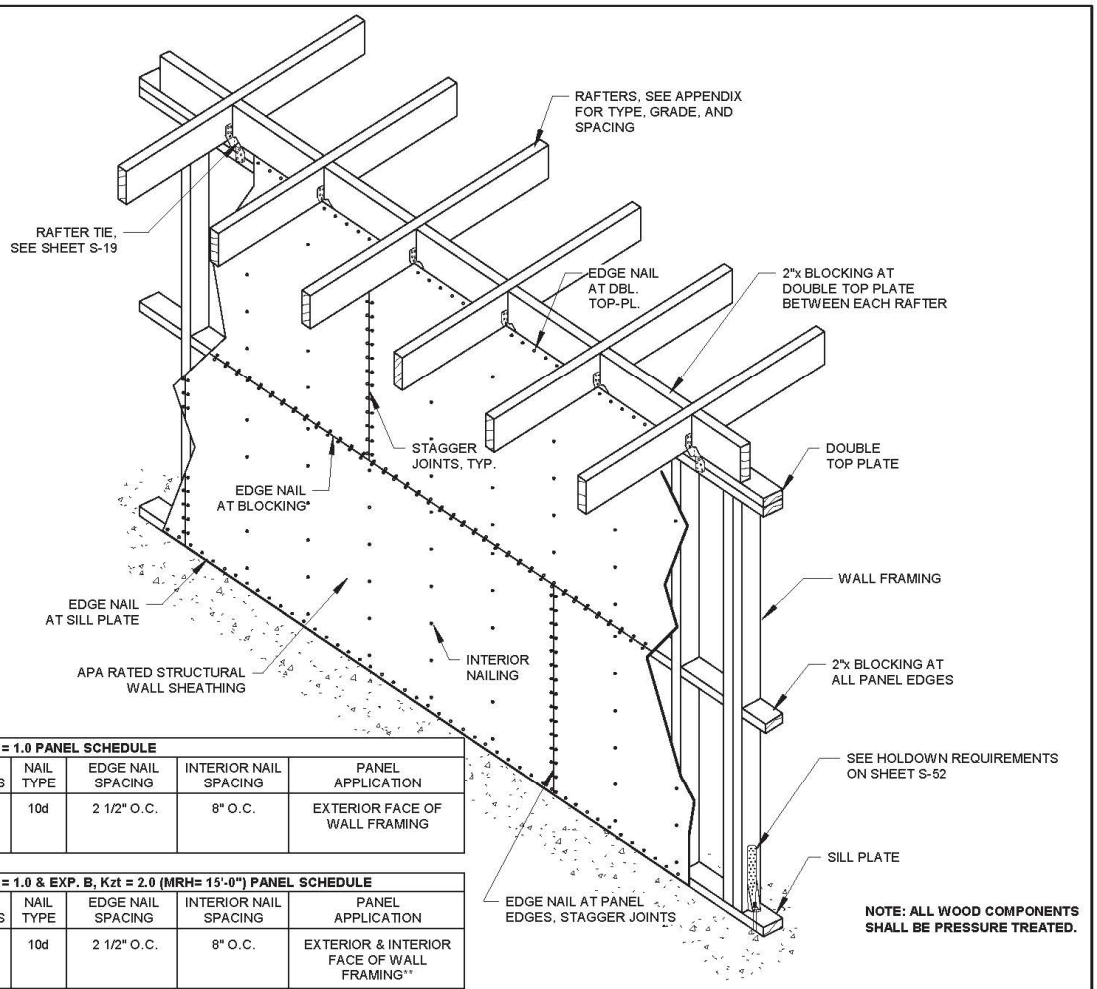
DRAWING TITLE: TOP PLATE TO STUD CONNECTORS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-29

Sheet Number 29 of 63



EXP. B, Kzt = 1.0 PANEL SCHEDULE				
PANEL THICKNESS	NAIL TYPE	EDGE NAIL SPACING	INTERIOR NAIL SPACING	PANEL APPLICATION
15/32"	10d	2 1/2" O.C.	8" O.C.	EXTERIOR FACE OF WALL FRAMING

EXP. D, Kzt = 1.0 & EXP. B, Kzt = 2.0 (MRH= 15'-0") PANEL SCHEDULE				
PANEL THICKNESS	NAIL TYPE	EDGE NAIL SPACING	INTERIOR NAIL SPACING	PANEL APPLICATION
15/32"	10d	2 1/2" O.C.	8" O.C.	EXTERIOR & INTERIOR FACE OF WALL FRAMING**

** INTERIOR SHEATHING ONLY REQUIRED AT FIRST FLOOR LEVEL.

STRUCTURAL WALL SHEATHING

NOTES

1. WALL PANEL BASIS OF DESIGN:
   A. MEAN ROOF HEIGHT (MRH) = 30'-0" MAX., U.N.O.
   B. MAX. WALL HEIGHTS FOR 2-STORY STRUCTURE = 9'-6"
   C. MAX. ROOF PITCH = 12/12 (ROOF ANGLE = 45 DEGRESS).
   D. MAX. BUILDING LENGTH = 52'-0"
   E. MIN. USEABLE SHEAR WALL LENGTH (WALL LENGTH-WALL OPENINGS) PER SIDE = 24'-0".
   F. MAX. USEABLE SHEAR WALL ASPECT RATIOS (h/b) SHALL BE 3.5:1, (HEIGHT: WIDTH).
   G. WALL FRAMING (WALL STUDS AND PLATES) SHALL BE SOUTHERN PINE OR DOUGLAS-FIR-LARCH WITH MIN. NOMINAL THICKNESS OF 2 INCHES.

2. INTERIOR SHEAR WALLS ARE NOT CONSIDERED IN THE DESIGN, IF APPLICABLE, CONTACT ENGINEEER LICENSED IN THE U.S. VIRGIN ISLANDS FOR FURTHER ANALYSIS.

3. FOR TWO-STORY STRUCTURES LOCATED IN EXPOSURE B Kzt = 2.0, PROVIDE REINFORCED MASONRY WALL CONSTRUCTION.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

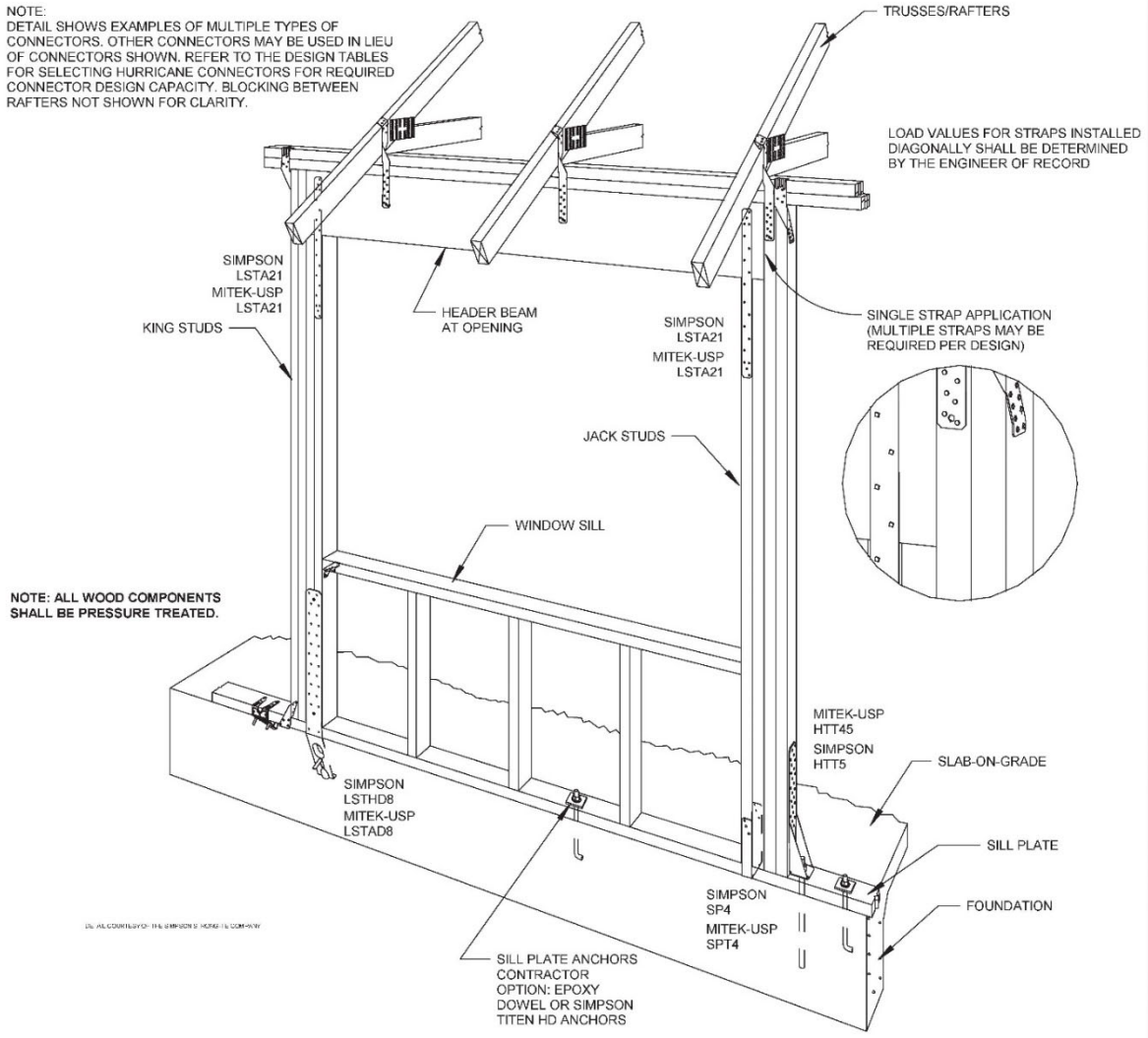
DRAWING TITLE: STRUCTURAL WALL SHEATHING

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-30

Sheet Number 30 of 63



RECOMMENDED WALL OPENING ANCHORAGE

THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY AND MITEK-USP. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

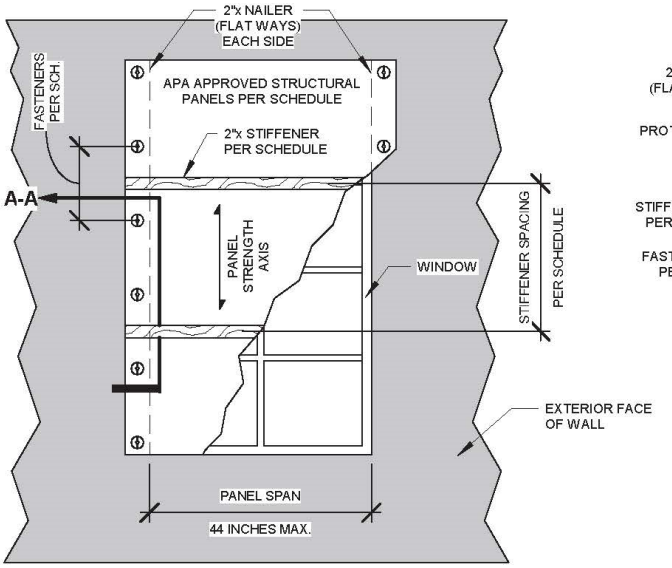
DRAWING TITLE: WOOD WALL OPENING

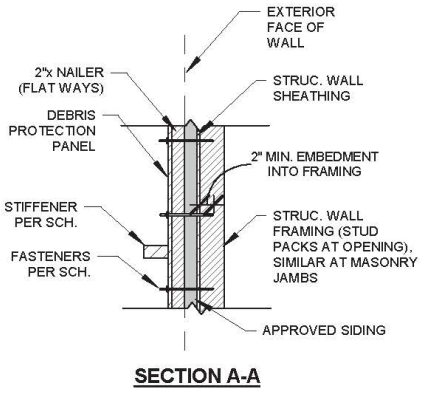
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-31

Sheet Number 31 of 63





SECTION A-A

WIND-BORNE DEBRIS PROTECTION FOR GLAZED AND JALOUSIE WINDOW OPENINGS

NOTES:

1. THE DETAIL'S INTENDED USE IS TO PROVIDE PROTECTION FROM WIND-BORNE DEBRIS. THE PREFERRED METHOD OF PROTECTION IS APPROVED IMPACT RESISTANT GLAZING OR APPROVED IMPACT RESISTANT COVERINGS (i.e. SHUTTER SYSTEM).
2. THE WOOD PANEL OPTION ONLY APPLIES TO OPENINGS WHICH DO NOT EXCEED 44 INCHES IN WIDTH. OPENINGS GREATER THAN 44 INCHES WIDE SHALL BE PROTECTED BY ONE OF THE PREFERRED METHODS MENTIONED IN THE ABOVE NOTE (NOTE #1).
3. DETAILS ARE ONLY APPLICABLE FOR ONE & TWO STORY BUILDINGS WITH A MEAN ROOF HEIGHT OF 30 FEET OR LESS.
4. ALL FASTENERS AND HARDWARE SHALL BE PERMANENTLY INSTALLED AND SHALL BE STAINLESS STEEL.
5. MIN. 3/4" DIAM. WASHER REQUIRED AT EXTERIOR PANEL ATTACHMENT.
6. MIN. 2" EMBEDMENT OF SCREW THREADS INTO WOOD WALL FRAMING.
7. STRUCTURAL PANELS SHALL BE APA RATED CDX PLYWOOD.
8. PANELS SHALL BE PRE-CUT AND PRE-DRILLED FOR INSTALLATION EFFICIENCY.
9. THE HOMEOWNER SHALL BE RESPONSIBLE FOR ROUTINE INSPECTION AND MAINTENANCE OF THE SYSTEM TO ENSURE FUNCTIONALITY FOR THE INTENDED PURPOSE DURING A STORM EVENT.
10. PANELS ATTACHED TO MASONRY SHALL BE ATTACHED USING VIBRATION-RESISTANT ANCHORS HAVING AN ULTIMATE WITHDRAWAL CAPACITY OF NOT LESS THAN 1,500 POUNDS.
11. MASONRY ANCHORS SHALL BE A MINIMUM OF 2.5 INCHES AWAY FROM WINDOW AND DOOR EDGES.
12. FASTENERS SHALL BE LOCATED NOT LESS THAN 1 INCH FROM THE EDGE OF THE PANEL.

DEBRIS PROTECTION-STRUCTURAL PANEL SCHEDULE REQUIREMENTS

STRUCTURAL COMPONENT		PANEL SPAN MAX. STRUCTURAL PANEL SPAN = 44 INCHES
WOOD FRAMED	PANEL	5/8" APA RATED PRESSURE TREATED PLYWOOD
	FASTENER	1/4" DIAMETER LAG SCREWS AT 12" O.C.
	STIFFENER	2"x4" SYP No.2 PRESSURE TREATED AT 16" O.C.
MASONRY	PANEL	5/8" APA RATED PRESSURE TREATED PLYWOOD
	FASTENER	1/4" DIAMETER MASONRY SCREWS AT 12" O.C.
	STIFFENER	2"x4" SYP No.2 PRESSURE TREATED AT 16" O.C.

NOTES:

1. PANEL REQUIREMENTS SHOWN IN TABLE ABOVE ALSO CAN BE APPLIED AT DOOR OPENINGS WHICH DO NOT EXCEED 44 INCHES IN WIDTH.
2. FOR VENTED OPENINGS NOT EXCEEDING 2'-0" x 2'-0", PROVIDE PANEL WITH FASTENERS AS INDICATED IN TABLE ABOVE, STIFFENERS ARE NOT REQUIRED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: WIND BORNE DEBRIS PROTECTION AT OPENINGS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

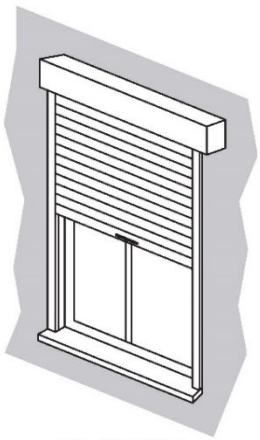
Sheet Number:

S-32

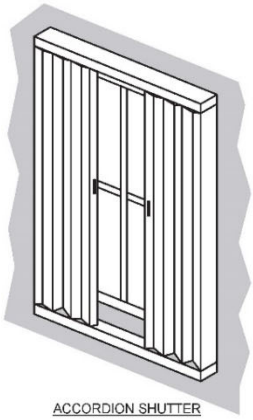
Sheet Number 32 of 63

COLONIAL SHUTTERS

BAHAMA SHUTTER



ROLL-UP SHUTTER



ACCORDION SHUTTER

RECOMMENDED SHUTTER STYLES

A VARIETY OF SHUTTER STYLES ARE AVAILABLE FROM THE MOTOR DRIVEN TO THE ROLL-UP STYLE SHUTTER SYSTEM. FOR HOMES WITH NON-STANDARD SHAPED WINDOWS WHICH COULD REQUIRE CUSTOM SHUTTERS, AS AN ALTERNATIVE DUE TO CUSTOM SHUTTER COST, SUCH WINDOWS MAY BE FABRICATED WITH LAMINATED IMPACT-RESISTANT GLASS.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

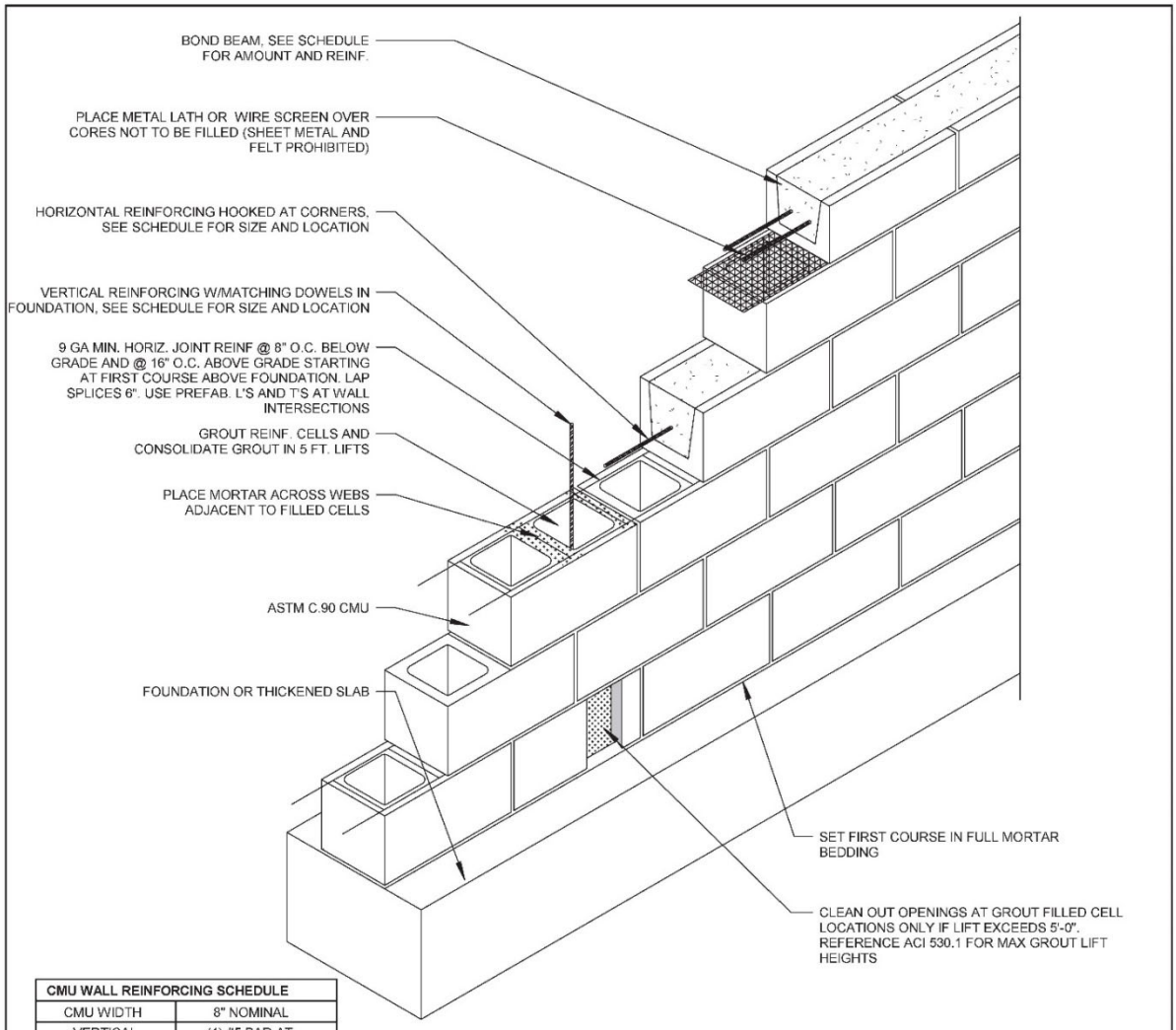
DRAWING TITLE: SHUTTER STYLES

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-33

Sheet Number 33 of 63



CMU WALL REINFORCING SCHEDULE	
CMU WIDTH	8" NOMINAL
VERTICAL REINFORCEMENT	(1) #5 BAR AT 24" O.C.
HORIZONTAL REINFORCEMENT	(1) #4 BAR AT 48" O.C.
BOND BEAM REINFORCEMENT	(2) #5 BARS CONTINUOUS
HORIZ. JOINT REINFORCEMENT	#9 GAUGE AT 8" O.C. BELOW GRADE AND 16" O.C. ABOVE GRADE

TYPICAL MASONRY WALL CONSTRUCTION

NOTES:

1. MAXIMUM UNBRACED WALL HEIGHT SHALL NOT EXCEED 11'-6".
2. FULLY GROUT REINFORCED CELLS.
3. HOOK CONTINUOUS HORIZONTAL REINFORCEMENT AT CORNERS.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

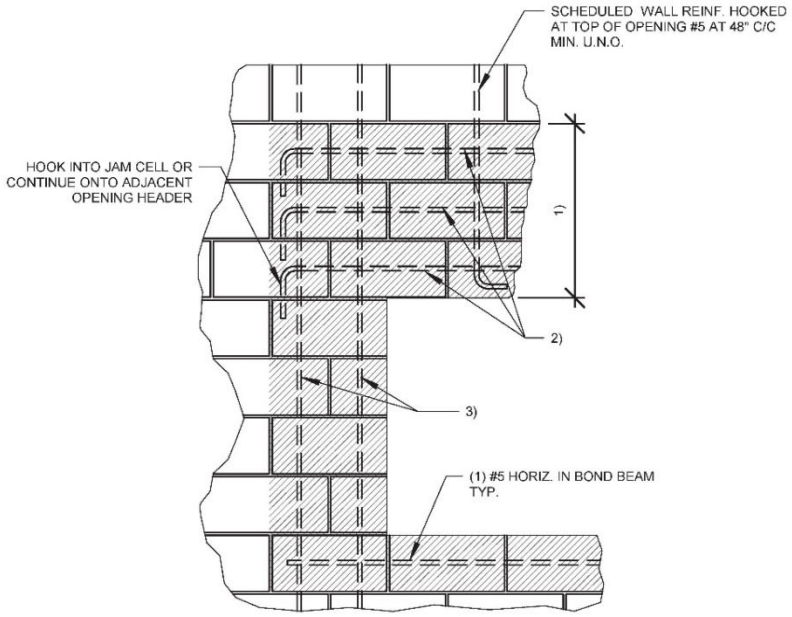
DRAWING TITLE: CMU WALL CONSTRUCTION

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-34

Sheet Number 34 of 63



CMU PILASTER

CMU LINTEL/JAMB SCHEDULE				
MAX OPENING SPAN	CMU WIDTH	1) MIN. DEPTH OF FULL GROUTED CELLS	2) HORIZONTAL BOTT. REINF. U.N.O. (1 HORIZ.) PER COURSE	3) MIN. ADJACENT FULLY GROUTED CELLS AND REINF. (1 VERT.) PER CELL U.N.O.
≤ 4'-4"	8"	8"	(1) #5 BOTT.	8" #5
4'-0" < OPNG. ≤ 6'-0"	8"	16"	(1) #5 BOTT.	16" (2) #5
6'-0" < OPNG. ≤ 8'-0"	8"	24"	(1) #5 BOTT.	16" (2) #6
8'-0" < OPNG. ≤ 10'-0"	8"	32"	(2) #5 BOTT.	16" (2) #6

NOTES:

1. #6 VERT. SHALL START ABOVE FOOTING WITH A MINIMUM LAP LENGTH OF 30".
2. VERIFY ALL CMU OPENINGS W/ ARCHITECT DWG'S.
3. ALL CMU LINTEL BEAMS ABOVE BOTTOM COURSE SHALL BE CONSTRUCTED OF OPEN BOTTOM LINTEL UNITS, OR STRETCHER COURSES WITH 1/2 WEB CUT OUT.
4. COORDINATE W/ SECTIONS, DETAILS, & GENERAL NOTES.
5. PRE-CAST CONCRETE LINTEL MAY BE USED IN LIEU OF LINTEL BLOCK.
6. REFER TO PLANS FOR FULLY GROUTED AREAS.

CMU LINTEL/JAMB DETAIL

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

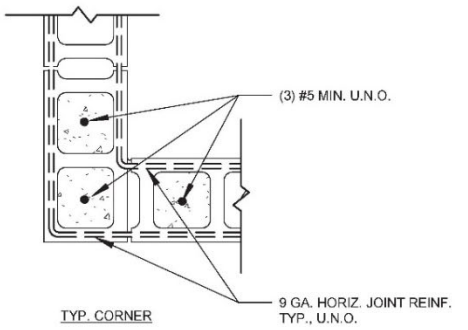
DRAWING TITLE: CMU WALL OPENING

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

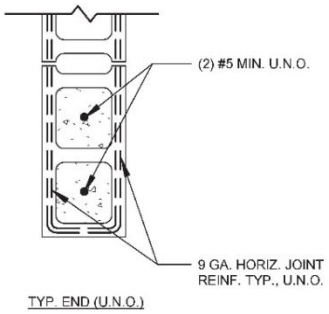
Sheet Number:

S-35

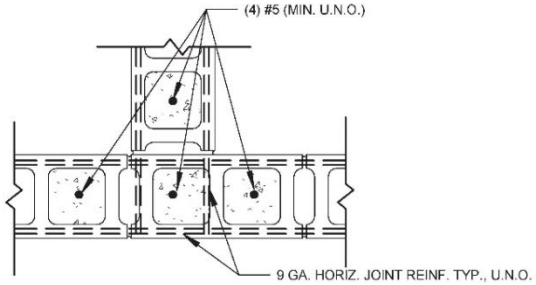
Sheet Number 35 of 63



TYP. CORNER



TYP. END (U.N.O.)



INTERSECTION

NOTE:

MINIMUM REINFORCING SHOWN APPLIES UNLESS SHOWN OTHERWISE ON PLANS OR SECTIONS.

USE BAR POSITIONERS.

DO NOT INTERLOCK LOAD BEARING AND NON-LOAD BEARING WALLS.

TYPICAL CMU DETAILS

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: TYPICAL CMU DETAILS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-36

Sheet Number 36 of 63

FLOORS

MOST WOOD FLOOR SYSTEMS CONSIST PRIMARILY OF JOISTS SUPPORTED BY INTERNAL BEAMS AND PERIMETER CONCRETE OR BLOCK WALLS. PLYWOOD SHEATHING FASTENED TO THE JOISTS PROVIDES THE SUBFLOOR. CONCRETE SLAB FLOORS THICKENED AND REINFORCED AT BEARING POINTS AND WALLS ARE A CONSTRUCTION ALTERNATIVE.

WOOD FLOORS SHOULD BE A MINIMUM OF EIGHTEEN INCHES (18") ABOVE THE SOIL. THERE SHOULD BE ADEQUATE VENTILATION UNDER THE HOUSE, A VAPOR BARRIER OVER THE SOIL AND ENOUGH SPACE FOR MAINTENANCE WORK TO BE PERFORMED. ALL LUMBER USED IN FLOOR CONSTRUCTION SHOULD BE PRESSURE TREATED, STRUCTURAL GRADE MATERIAL.

WIND AND OR FLOOD WATER CAN SEPARATE THE FLOOR FROM THE FOUNDATION IF THE CONNECTIONS BETWEEN THE TWO ARE INADEQUATE. ALL COMPONENTS OF THE FLOOR SYSTEM MUST BE STRUCTURALLY ADEQUATE AND PROPERLY SIZED.

ALL CONSTRUCTION MUST COMPLY WITH THE LATEST U.S.V.I. BUILDING CODE. YOU ARE REQUIRED TO OBTAIN THE NECESSARY BUILDING PERMITS FROM THE DEPARTMENT OF PLANNING AND NATURAL RESOURCES.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

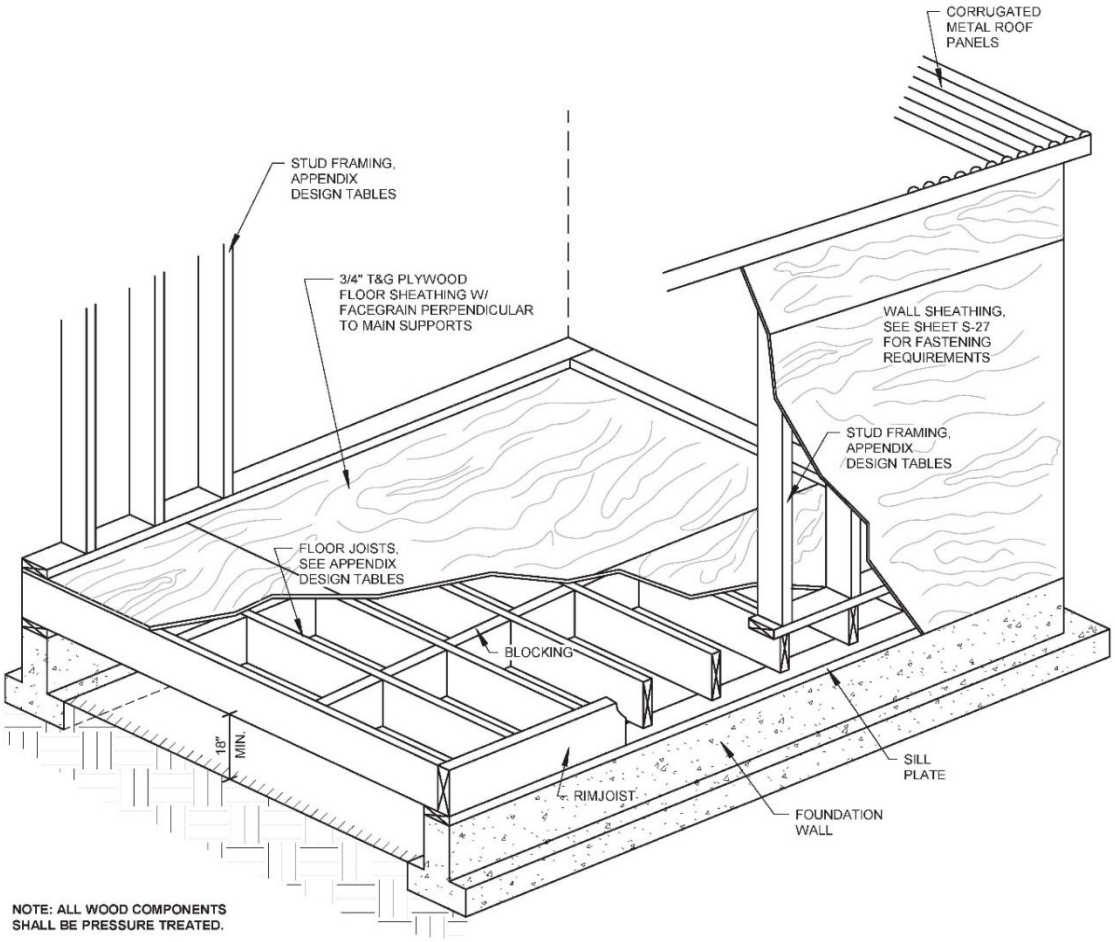
DRAWING TITLE: FLOORS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-37

Sheet Number 37 of 63



FLOOR FRAMING

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

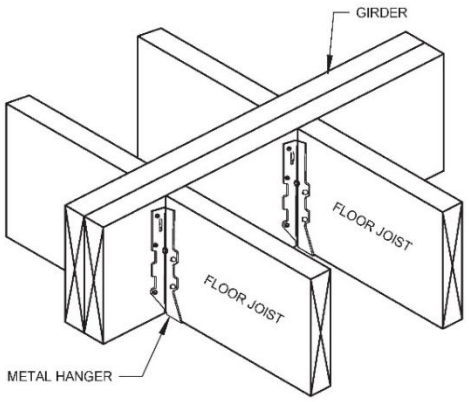
DRAWING TITLE: FLOOR FRAMING

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

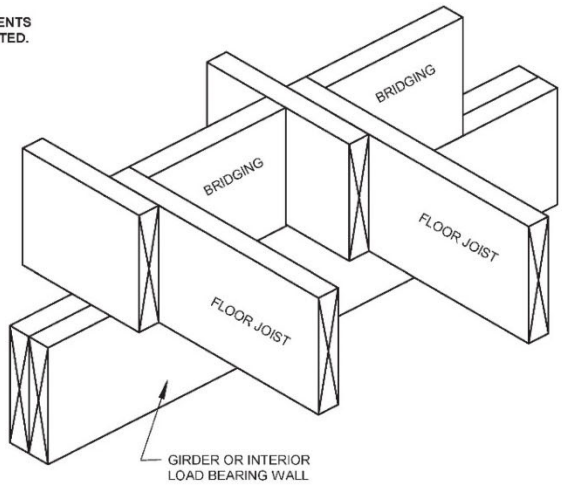
S-38

Sheet Number 38 of 63



JOISTS SUPPORTED BY FACE MOUNT HANGERS

NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.



JOISTS BEARING ON GIRDER OR INTERIOR LOAD BRG. WALL

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

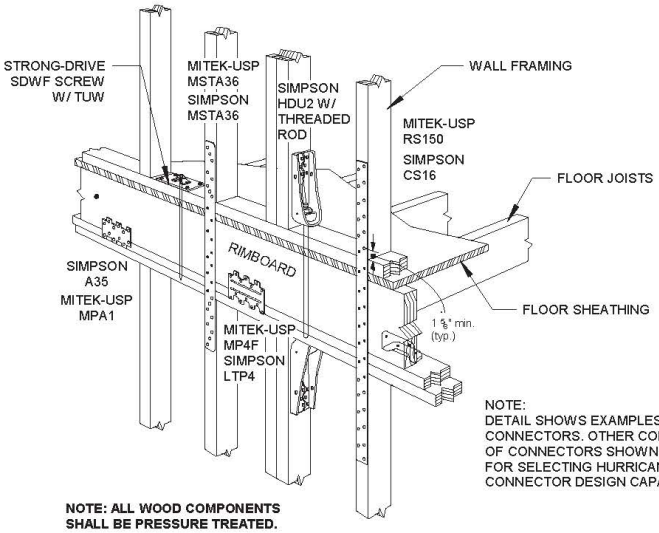
DRAWING TITLE: FLOOR JOIST FRAMING

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-39

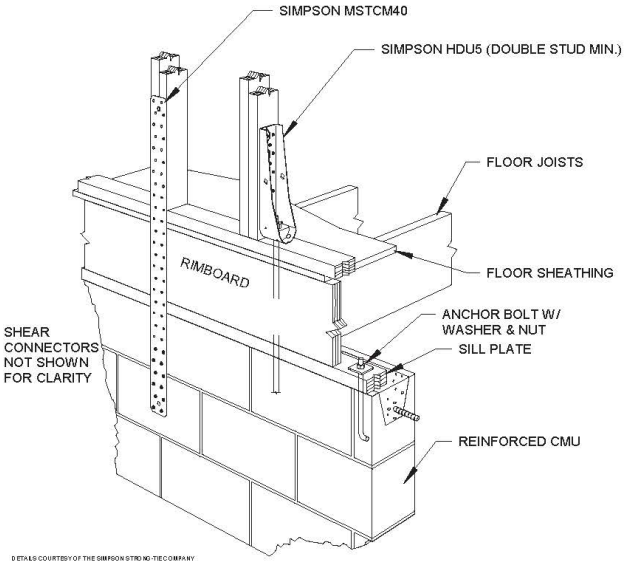
Sheet Number 39 of 63



NOTE:
DETAIL SHOWS EXAMPLES OF MULTIPLE TYPES OF CONNECTORS. OTHER CONNECTORS MAY BE USED IN LIEU OF CONNECTORS SHOWN. REFER TO THE DESIGN TABLES FOR SELECTING HURRICANE CONNECTORS FOR REQUIRED CONNECTOR DESIGN CAPACITY.

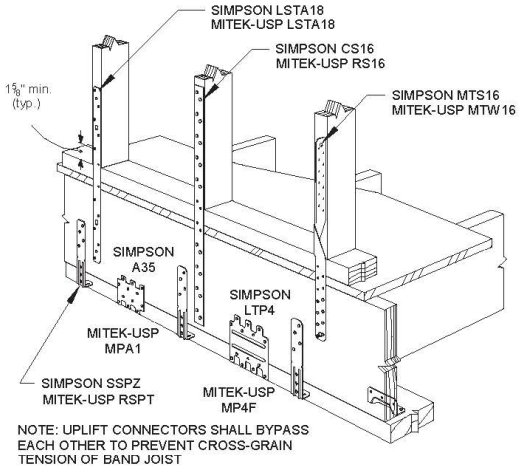
NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.

RECOMMENDED FLOOR -TO-FLOOR CONNECTORS



RECOMMENDED FLOOR -TO-CMU CONNECTORS

THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY AND MITEK USP. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.



NOTE: UPLIFT CONNECTORS SHALL BYPASS EACH OTHER TO PREVENT CROSS-GRAIN TENSION OF BAND JOIST

RECOMMENDED STUD-TO-RIMBOARD CONNECTORS

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

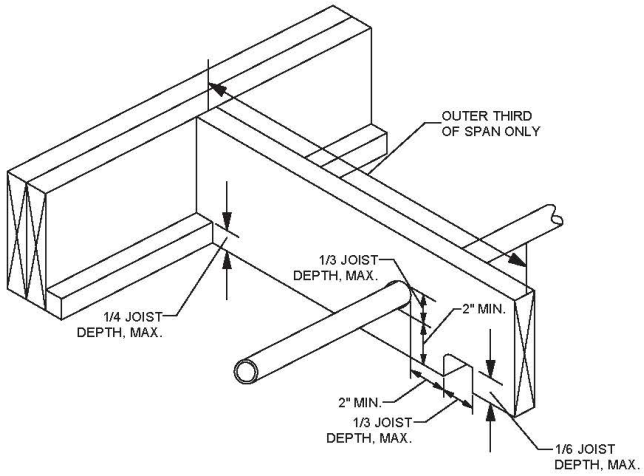
DRAWING TITLE: FLOOR FRAMING CONNECTIONS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

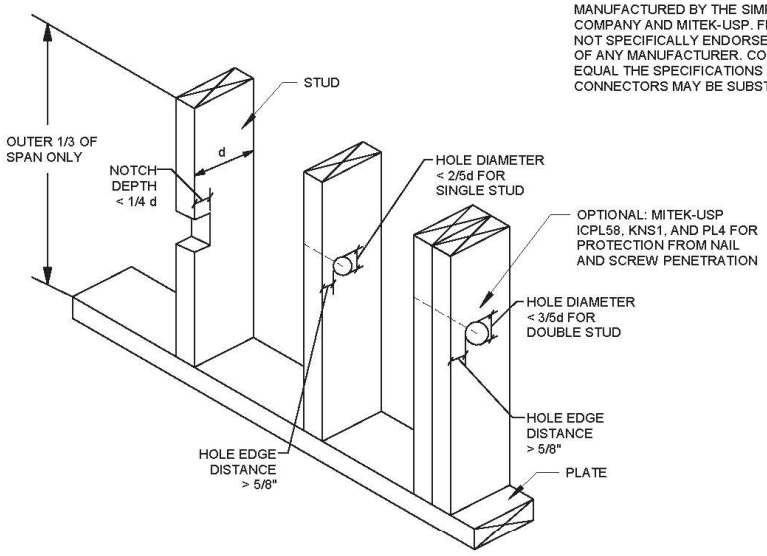
S-40

Sheet Number 40 of 63



SOLID SAWN JOIST AND RAFTER NOTCHING AND BORING LIMITS

THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY AND MITEK-USP. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.



STUD NOTCHING AND BORING LIMITS

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: WOOD NOTCHING AND BORING LIMITS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-41

Sheet Number 41 of 63

FOUNDATIONS

THE FOUNDATION ANCHORS THE HOUSE AND TRANSFERS THE WEIGHT AND LOADING OF THE STRUCTURE TO THE GROUND. LOCATE THE FOOTINGS ON SOLID, UNDISTURBED SOIL OR ENGINEERED FILL AT THE REQUIRED DEPTH. ANTICIPATE SOIL EROSION WHEN DETERMINING EXCAVATION DEPTH. CLAY AND ROCKY SOILS ARE APPROPRIATE FOR THE USE OF CONTINUOUS FOUNDATIONS, AND INDIVIDUAL FOOTINGS. UNSTABLE AND UNCOMPACTED SOILS ARE UNSUITABLE FOR FOUNDATIONS. QUESTIONABLE SOIL CONDITIONS REQUIRE ANALYSIS BY REGISTERED GEOTECHNICAL ENGINEER.

USE ELEVATED FOUNDATIONS/FLOOR SYSTEMS TO ELEVATE THE FLOOR ABOVE THE BASE FLOOD ELEVATION (BFE) PLUS 1 FOOT OR DESIGN FLOOD ELEVATION (DFE), WHICHEVER IS HIGHER OR WHEN THERE IS UNEVEN GROUND. THE FLOOD INSURANCE RATE MAPS (FIRM) INDICATE REGULATED SPECIAL FLOOD HAZARD AREAS (SFHA). IT'S IMPORTANT TO NOTE, AREAS OUTSIDE OF THE SFHA MAY STILL BE SUSCEPTIBLE TO FLOODING.

WOOD POSTS MUST BE PRESSURE TREATED, STRUCTURALLY ADEQUATE AND PROPERLY SIZED.

CONCRETE BLOCK COLUMNS REQUIRE ADEQUATE STEEL REINFORCMENT.

INSTALL REINFORCED CONCRETE COLUMNS ON FOOTINGS A MINIMUM OF 30" DEEP.

WOOD POSTS, CONCRETE AND CONCRETE BLOCK COLUMNS MUST BE DESIGNED TO COMPLY WITH THE WIND AND SEISMIC REQUIREMENTS OF THE BUILDING CODE. CONSULT A LICENSED ENGINEER OR ARCHITECT FOR DESIGN AND SPECIFICATIONS.

ALL CONSTRUCTION MUST COMPLY WITH THE LATEST U.S.V.I. BUILDING CODE. YOU ARE REQUIRED TO OBTAIN THE NECESSARY BUILDING PERMITS FROM THE DEPARTMENT OF PLANNING AND NATURAL RESOURCES.

HOUSES BUILT ON THE SIDES OF STEEP SLOPES REQUIRE SPECIAL DESIGN GUIDANCE. THESE HOMES ARE OFTEN SET ON EXPOSED POSTS OR COLUMNS. WALLS, POSTS, AND COLUMNS SHALL BE PROPERLY BRACED TO PREVENT COLLAPSE DURING AN EARTHQUAKE. FOUNDATIONS SHALL BE PROPERLY EMBEDDED IN CONSIDERATION OF ALL DESIGN FORCES AND POTENTIAL IMPACTS OF EROSION. CONSULT A U.S.V.I. LICENSED PROFESSIONAL ARCHITECT OR ENGINEER FOR DESIGN GUIDANCE IN SUPPORTING A HOME ON A STEEP SLOPE. IT IS RECOMMENDED TO PROVIDE ADDITIONAL ANCHORAGE FOR EACH FLOOR SYSTEM TO THE UPHILL FOUNDATION AND SUPPLEMENTAL ANCHORAGE, STRAPPING, AND BRACING OF CRIPPLE WALLS.

SLOPE STABILITY ANALYSIS SHALL BE PERFORMED ON STEEP SLOPES AND ADDITIONAL STABILIZING DESIGN OF KNEEWALLS OR WIDER GRADE BEAMS MAY BE REQUIRED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

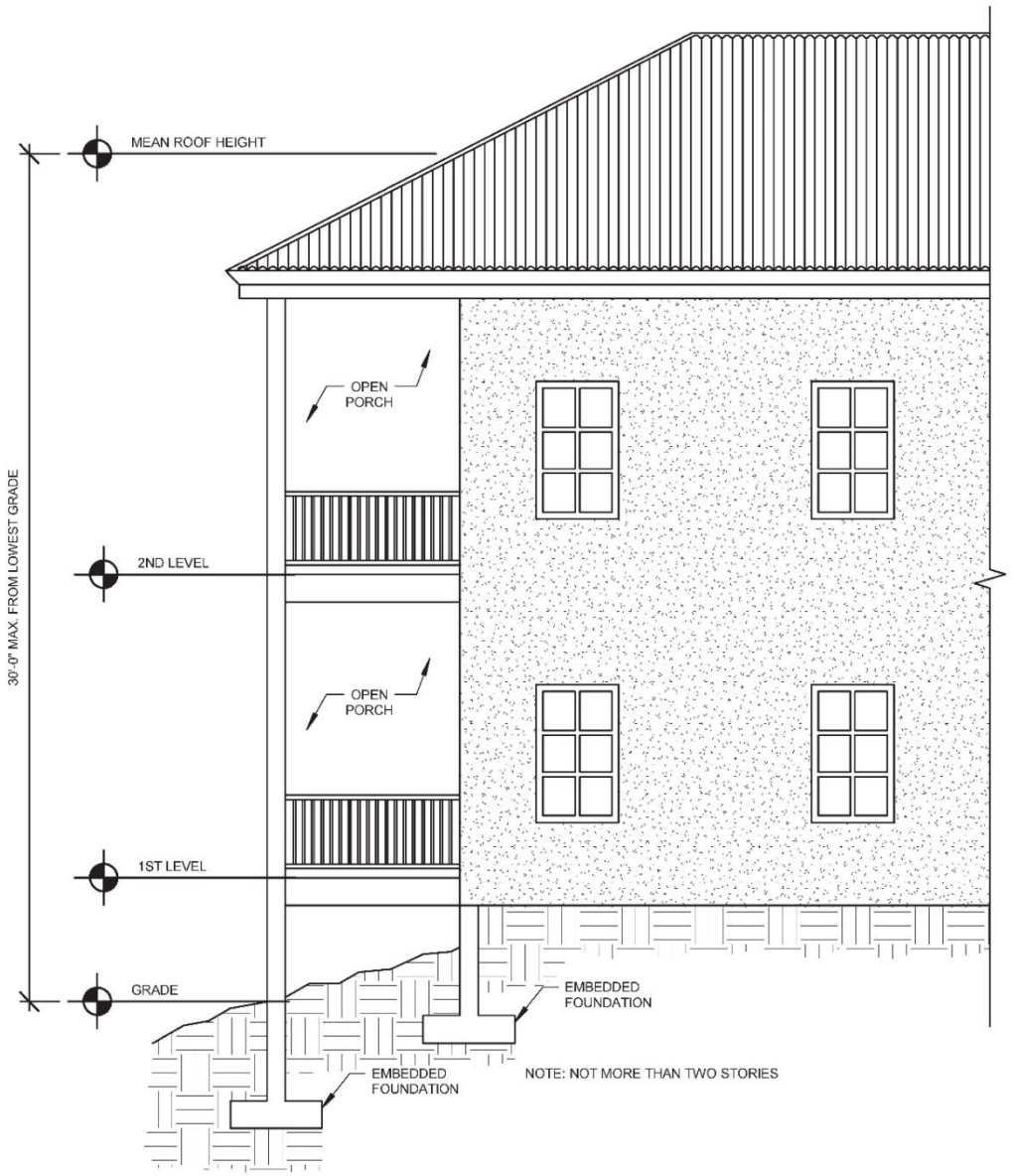
DRAWING TITLE: FOUNDATIONS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-42

Sheet Number 42 of 63



DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

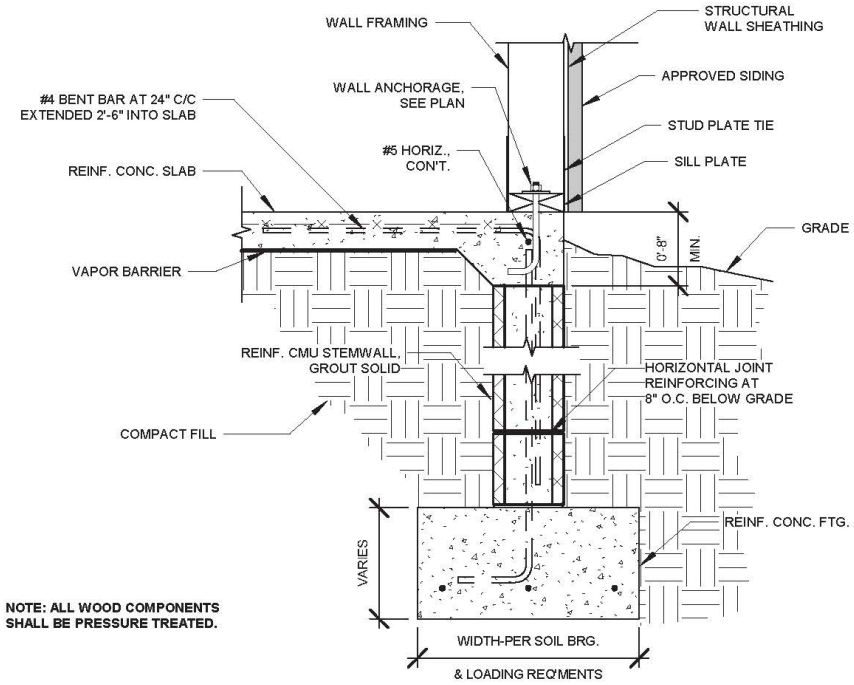
DRAWING TITLE: HEIGHT DEFINITIONS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

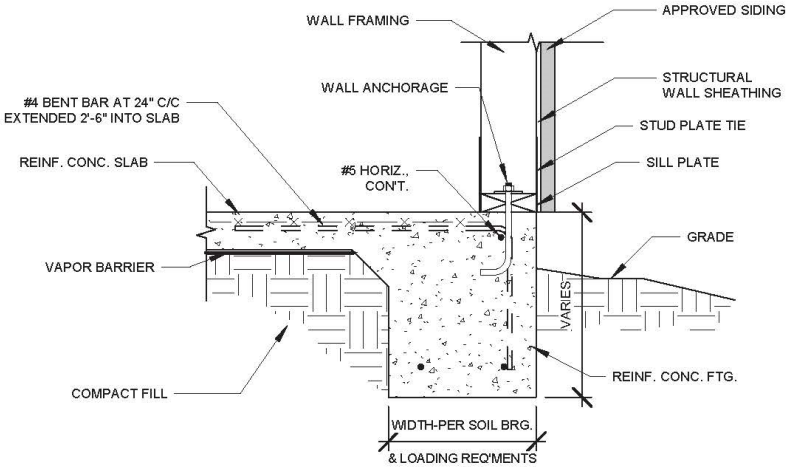
Sheet Number:

S-43

Sheet Number 43 of 63



TYPICAL CMU STEMWALL FOUNDATION



TYPICAL MONOLITHIC FOUNDATION

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

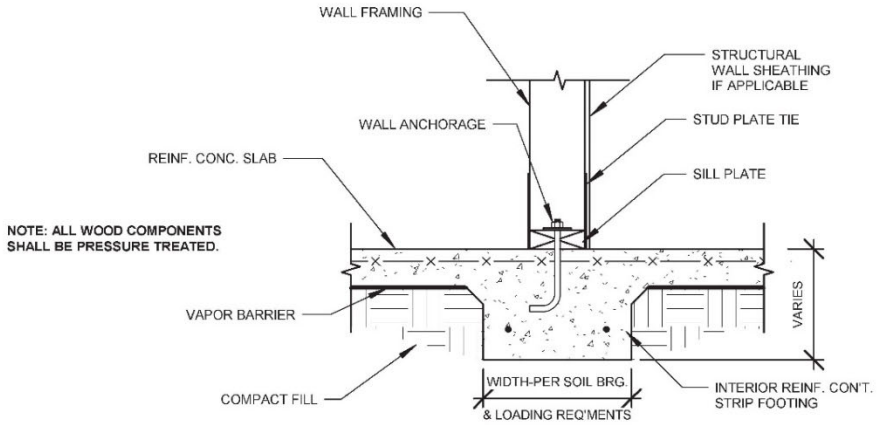
DRAWING TITLE: WOOD FRAMING FOUNDATIONS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

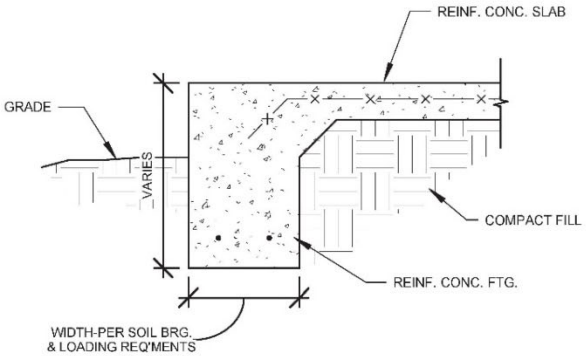
Sheet Number:

S-44

Sheet Number 44 of 63



TYPICAL INTERIOR STRIP FOOTING



SLAB EDGE AT PORCH

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

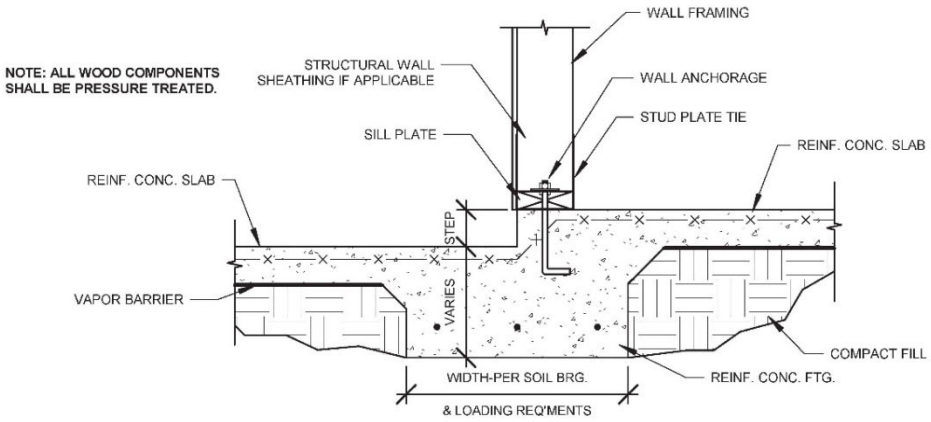
DRAWING TITLE: TYPICAL FOUNDATION DETAILS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

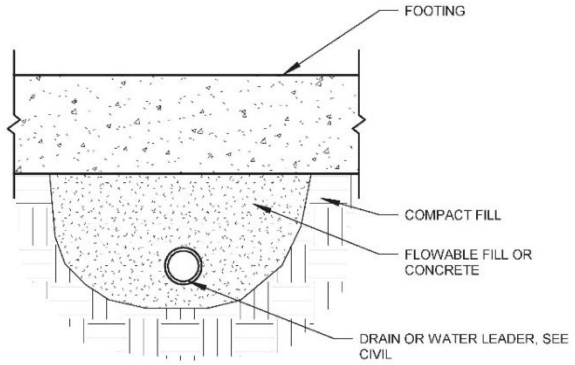
Sheet Number:

S-45

Sheet Number 45 of 63



FOUNDATION STEP DOWN



DRAIN UNDER FOOTING

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

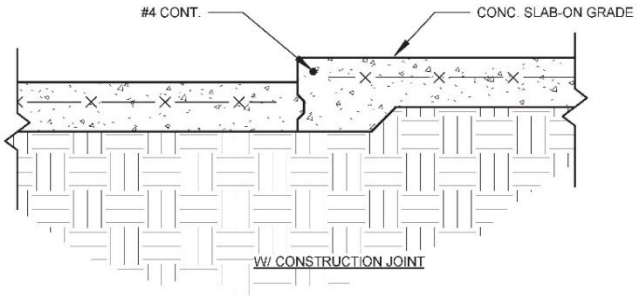
DRAWING TITLE: TYPICAL FOUNDATION DETAILS

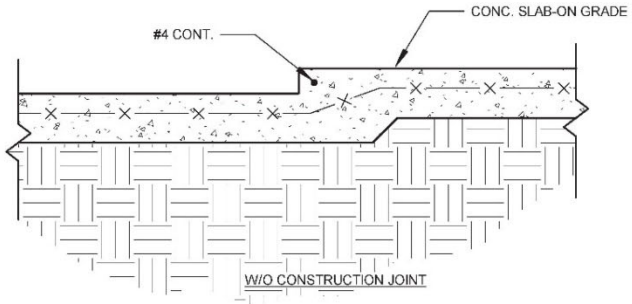
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

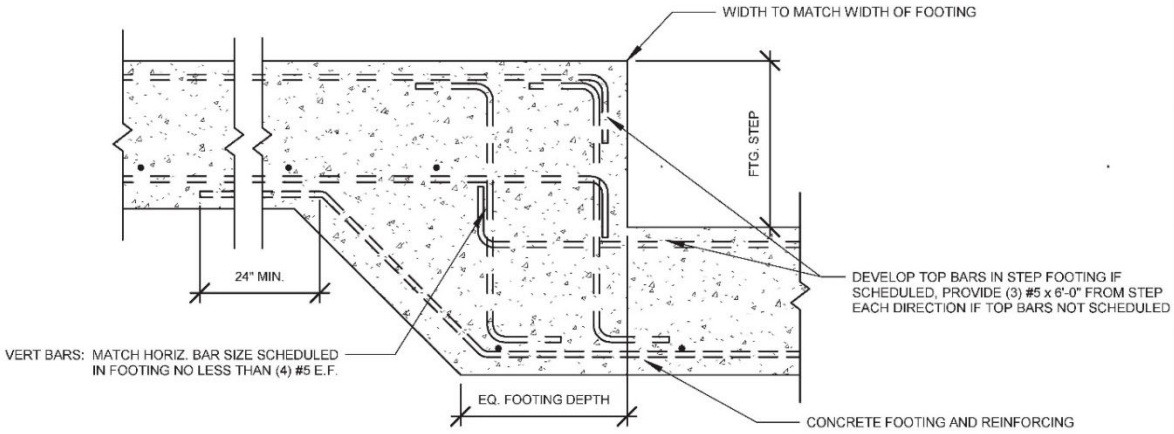
S-46

Sheet Number 46 of 63





TYPICAL SLAB RECESS DETAILS



TYPICAL STEPPED FOOTING

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: TYPICAL FOUNDATION DETAILS

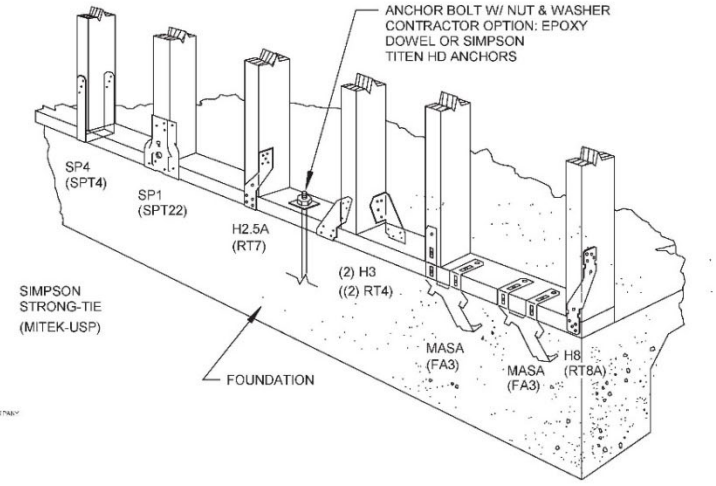
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-47

Sheet Number 47 of 63

NOTE:
DETAIL SHOWS EXAMPLES OF MULTIPLE TYPES OF CONNECTORS. OTHER CONNECTORS MAY BE USED IN LIEU OF CONNECTORS SHOWN. REFER TO THE DESIGN TABLES FOR SELECTING HURRICANE CONNECTORS FOR REQUIRED CONNECTOR DESIGN CAPACITY.



DETAIL COURTESY OF THE SIMPSON STRONG-TIE COMPANY

NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.

THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY AND MITEK-USP. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

RECOMMENDED SILL PLATE ANCHORAGE

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

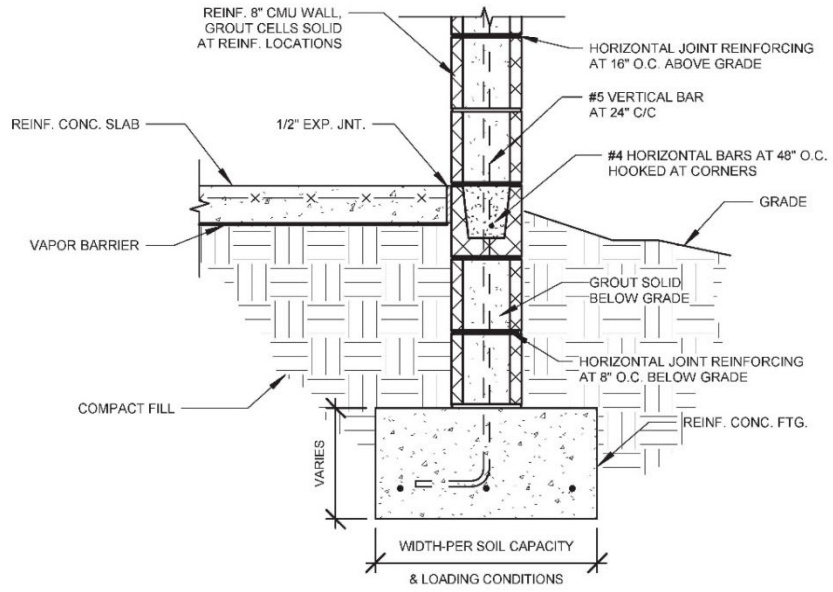
DRAWING TITLE: SILL PLATE ANCHORAGE

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

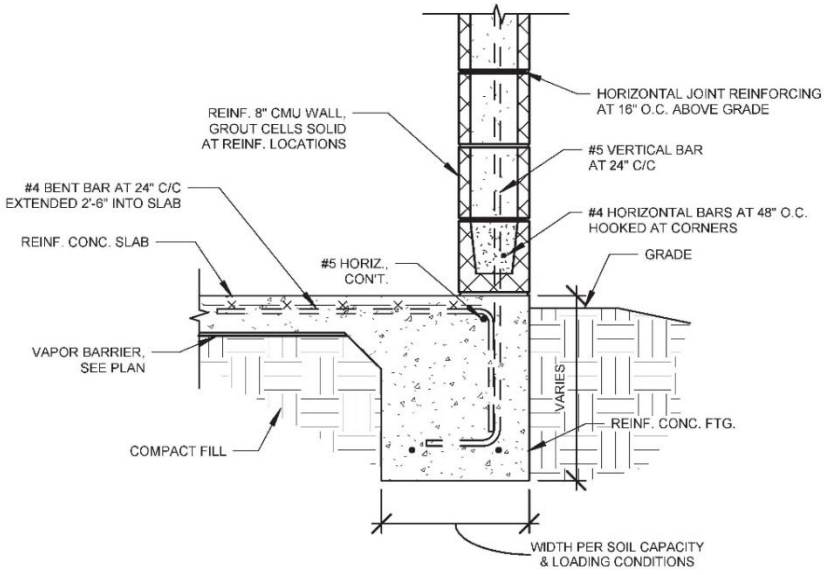
Sheet Number:

S-48

Sheet Number 48 of 63



TYPICAL CMU WALL W/ STRIP FOOTING



TYPICAL CMU WALL W/ MONOLITHIC FTG.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

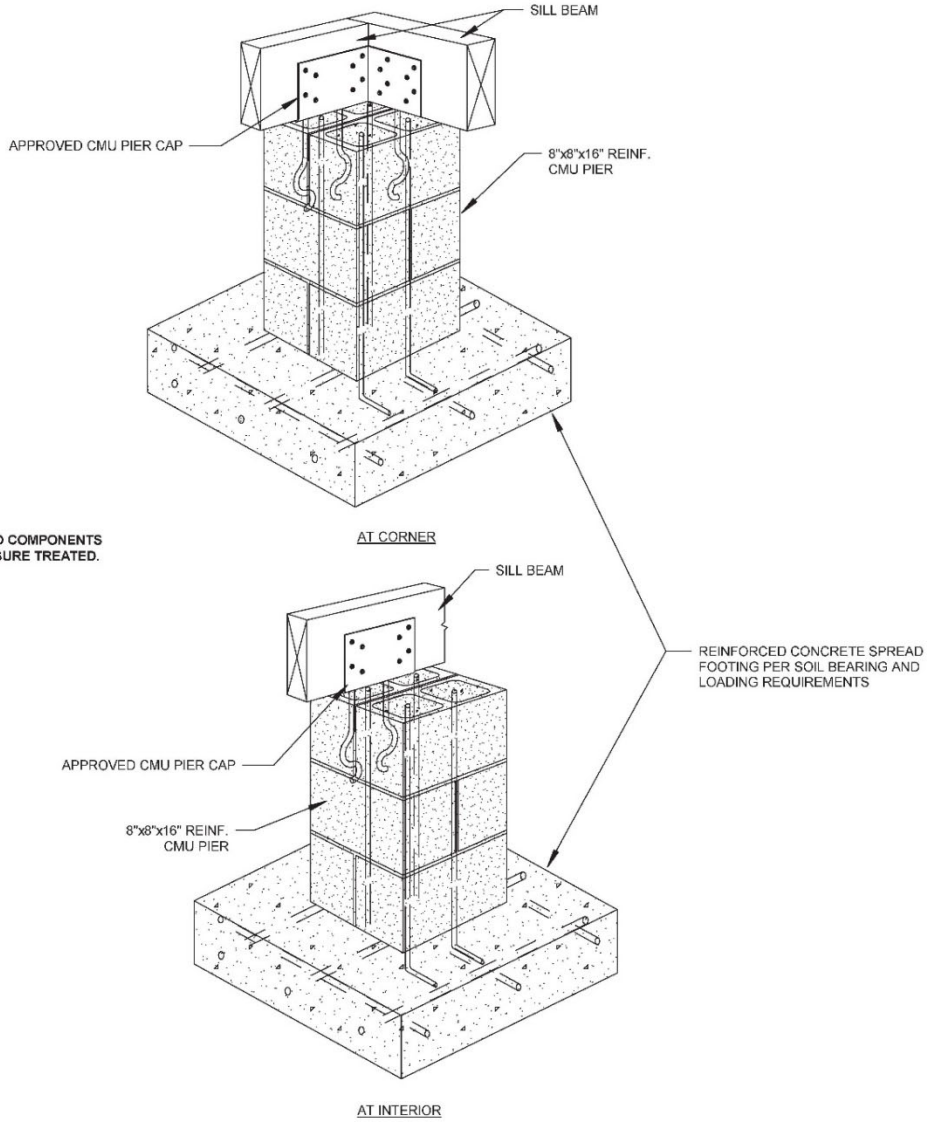
DRAWING TITLE: CMU WALL FOUNDATIONS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-49

Sheet Number 49 of 63



CMU PIER FOUNDATIONS

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

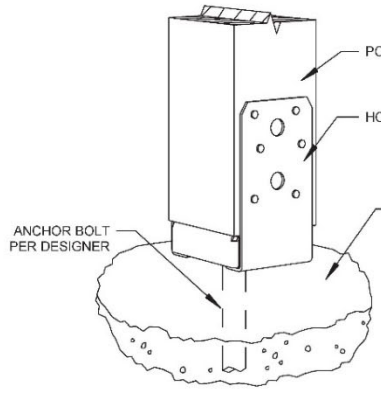
DRAWING TITLE: CMU PIER FOUNDATION

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-50

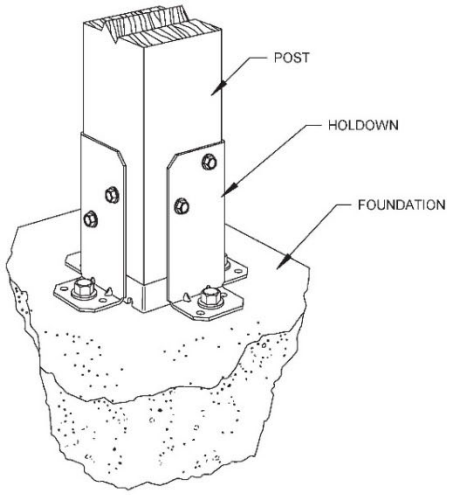
Sheet Number 50 of 63



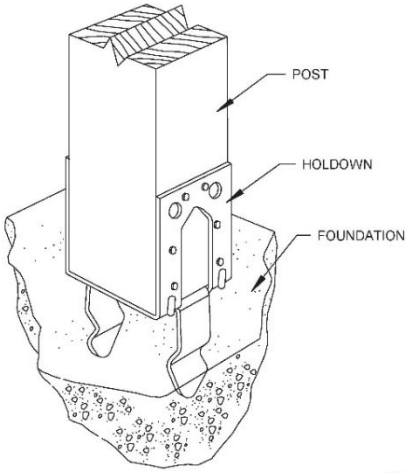
SIMPSON ABU
MITEK-USP PAU

NOTE:
DETAIL SHOWS EXAMPLES OF MULTIPLE TYPES OF CONNECTORS. OTHER CONNECTORS MAY BE USED IN LIEU OF CONNECTORS SHOWN. REFER TO THE DESIGN TABLES FOR SELECTING HURRICANE CONNECTORS FOR REQUIRED CONNECTOR DESIGN CAPACITY.

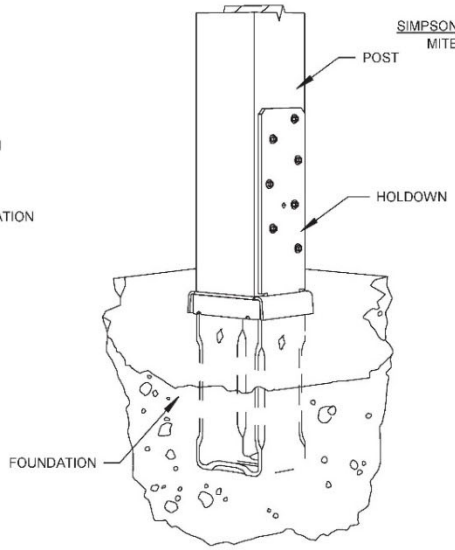
NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.



SIMPSON RPBZ (RETROFIT)
MITEK-USP RPB



SIMPSON PB
MITEK-USP WE



SIMPSON CBSQ
MITEK-USP CBSQ

THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY AND MITEK-USP. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

RECOMMENDED POST BASE HOLDOWNS

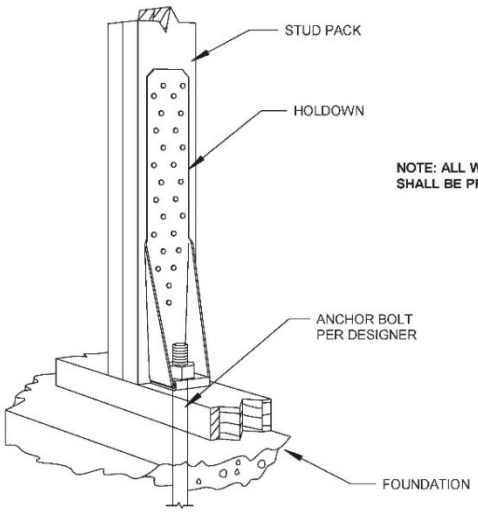
DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: POST ANCHORAGE

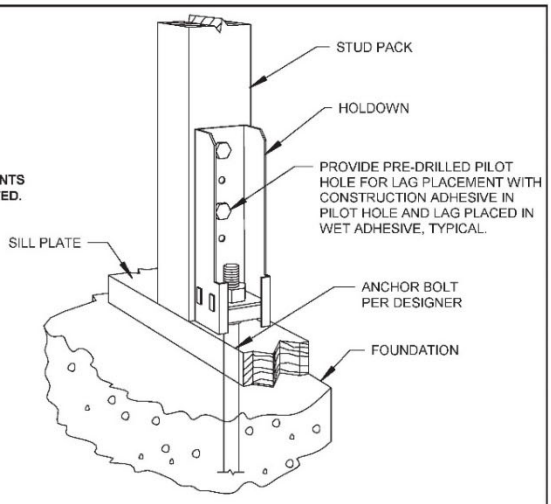
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:
S-51
Sheet Number 51 of 63



SIMPSON HTT TENSION TIE
MITEK-USP HTT

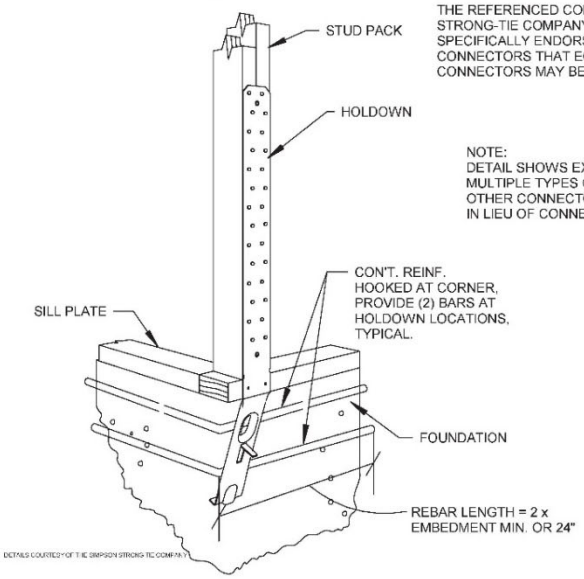
NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.



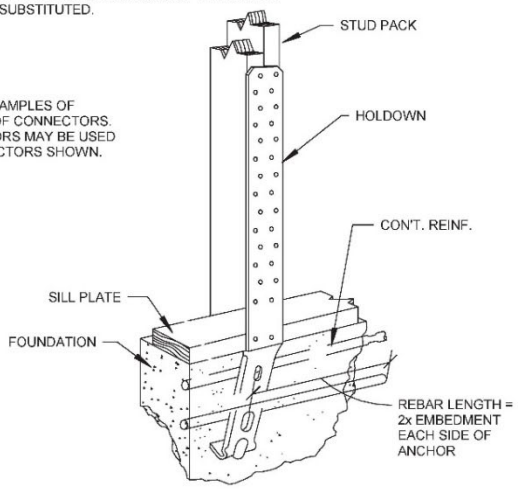
SIMPSON HD HOLDOWN
MITEK-USP TD

THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY AND MITEK-USP. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

NOTE:
DETAIL SHOWS EXAMPLES OF MULTIPLE TYPES OF CONNECTORS. OTHER CONNECTORS MAY BE USED IN LIEU OF CONNECTORS SHOWN.



SIMPSON LSTHD/STHD STRAP-TIE HOLDOWN (CORNER INSTALLATION)
MITEK-USP LSTAD/STAD STRAP-TIE HOLDOWN (CORNER INSTALLATION)



SIMPSON LSTHD/STHD STRAP-TIE HOLDOWN (EDGE INSTALLATION)
MITEK-USP LSTAD/STAD STRAP-TIE HOLDOWN (EDGE INSTALLATION)

FOUNDATION HOLDOWNS

NOTES:

1. RECOMMENDED HOLDOWN: SIMPSON HD12 OR EQUIVALENT WITH 1 1/8" DIAMETER HEADED ANCHOR BOLT (16" MIN. EMBEDMENT), 7-1/4 INCH MIN. WOOD MAIN MEMBER THICKNESS AND 4 INCH MIN. EDGE DISTANCE. PROVIDE ANCHORS AT THE END OF ALL WALL SEGMENTS AND AT EACH CORNER.
2. CONSULT ENGINEER REGISTERED IN U.S.V.I. FOR FURTHER ANALYSIS BASED ON STRUCTURE GEOMETRY FOR OPTIONAL HOLDOWNS TYPES AND PLACEMENT.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: FOUNDATION HOLDOWNS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:
S-52
Sheet Number 52 of 63

DESIGN TABLES
FOR
SELECTING HURRICANE CONNECTORS

THE FOLLOWING WOOD FRAME CONNECTOR TABLES REFERENCE CONNECTORS MANUFACTURED BY SIMPSON STRONG-TIE COMPANY, MITEK-USP, AND TAMLYN. CONNECTOR REFERNCES ARE BASED UPON MANUFACTURER SUPPLIED INFORMATION AS OF MARCH, 2018 AND ARE SUBJECT TO CHANGE BY THE MANUFACTUER. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED. ALL CONNECTORS SHALL BE MINIMUM HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A653, ASTM A123, OR HIGHER STANDARDS. STAINLESS STEEL CONNECTORS MAY ALSO BE USED IN LIEU OF HOT-DIPPED GALVANIZED CONNECTORS.

ALL CONSTRUCTION MUST COMPLY WITH THE LATEST ADOPTED BUILDING CODE IN THE U.S.V.I. YOU ARE REQUIRED TO OBTAIN THE NECESSARY BUILDING PERMITS FROM THE DEPARTMENT OF PLANNING AND NATURAL RESOURCES.

ALL CONNECTOR DESIGNS ARE BASED UPON SPECIFIC DESIGN PARAMETERS AS SHOWN BELOW. THE FOLLOWING BOUNDARY CONDITIONS SHALL BE MET IN ORDER TO USE THESE CONNECTOR TABLES. THESE CONNECTOR TABLES ARE NOT VALID IF THE PROJECT PARAMETERS ARE OUTSIDE OF THESE BOUNDARY CONDITIONS.

NOTES

1. CONNECTION BASIS OF DESIGN:

WIND SPEED.....165 MPH (ULTIMATE)	RISK CATEGORY.....II
EXPOSURE CATEGORY.....B	BUILDING CLASSIFICATION.....PARTIALLY OPEN/ENCLOSED
TOPOGRAPHIC FACTOR (Kzt).....2.0	INTERNAL PRESSURE.....+/-0.18
ROOF ANGLE.....2/12 (9.5 DEGREES) (CONTROLS)	WALL PLATE HEIGHT.....11'-6"
MEAN ROOF HEIGHT (MRH).....30'-0"	

2. UPLIFT AND LATERAL LOADS SHOWN IN TABLES ARE BASED ON MAIN WIND FORCE RESISTING SYSTEM (MWFRS) NOMINAL WIND LOADS.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: CONNECTOR DESIGN TABLES

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-53

Sheet Number 53 of 63

FRAMING PRODUCT CONNECTOR CROSS REFERENCE TABLES

TAMLYN	SIMPSON	USP
AAE44L	ABU44	PAU44
AAE66L	ABU66	PAU66
AAE88L	ABU88	PAU88
AD15	HD15	TD15
AD12	HD12	TD12
AD9	HD9	TD9
AD7	HD7	TD7
AD5	HD5	TD5
AP45	A35	MPA1
BC44	CC44	KCC44
BC66	CC66	KCC66
DJ410	LUS210-2	JUS210-2
DJ46	LUS26-2	JUS26-2
DJ48	LUS28-2	JUS28-2
EPB4	ACE4	PBES44
ETAH20	HETA20	HTA20
ETAM12	META12	HTA16-18
ETAM16	META16	HTA16-18
ETAM18	META18	HTA20-18
ETAM20	META20	HTA20-18
FA3	A34	MP34
FA36	A35	MPA1
GTH2	HGT2	HUGT2
GTH3	HGT3	HUGT3
GTH4	HGT4	HUGT4
GTL2	LGT2	LUGT2
HA44	CB44	KCB44
HA66	CB66	KCB66
HA88	CB88	KCB88
HDTP210	HUS210	HUS210
HDTP26	HUS26	HUS26
HDTP28	HUS28	HUS28
HT10-2	H10-2	RT16-2
HT12	LTS12	LTW12
HT4	H4	RT3
HT5	H5	HDCP
HT6	H6	LFTA6
HT7	H7	RT20
HT8	H8	

TAMLYN	SIMPSON	USP
HTF210	HU210TF	HDO210
HTF212	HU212TF	HDO212
HTF214	HU214TF	HDO214
HTF24	HU24TF	HDO24
HTF26	HU26TF	HDO26
HTF28	HU28TF	HDO28
HTW16	HTS16	HTW16
HTW20	HTS20	HTW20
HTW24	HTS24	HTW24
HTW28	HTS28	HTW28
HTW30	HTS30	HTW30
LSS210	LSSU210	LSSH210
LSS26	LSSU26	LSSH26
LSS28	LSSU28	LSSH28
MTS27	MST27	KST227
MTS37	MST37	KST237
MTS48	MST48	KST248
MTS60	MST60	KST260
MTW16	MTS16	MTW16
MTW18	MTS18	MTW18
MTW20	MTS20	MTW20
MTW30	MTS30	MTW30
MTW48	MTS48	MTW48
PAM44	LCB44	CBE44
PAM66	LCB66	CBE66
PB4	AC4	PBS44
PB6	AC6	PBS66
PC44	BC4	C44
PC66	BC6	C66
PC88	BC8	C88
PTC4	LPC4	PB44-6
PTC6	LPC6	PB66-6
RT1	H3	RT12
RT15	H1	RT15
RT16	H10	RT16
RT2A	H2.5A	RT7A
RT2LR	H2.5	RT7
S210	U210	SUH210
S210-2	U210-2	SUH210-2

TAMLYN	SIMPSON	USP
S210-3	U210-3	SUH210-3
S24	U24	SUH24
S24-2	U24-2	SUH24-2
S26	U26	SUH26
S26-2	U26-2	SUH26-2
SJQ210	LU210	JL210
SJQ24	LU24	JL24
SJQ26	LU26	JL26
SJQ28	LU28	JL28
SPT4	SP4	SPT4
SPT6	SP6	SPT6
SS12	LSTA12	LSTA12
SS18	LSTA18	LSTA18
SS24	LSTA24	LSTA24
SS30	LSTA30	LSTA30
SS36	LSTA36	LSTA36
SSAD10	STHD10	STAD14
SSAD14	STHD14	STAD14
TSA12	MSTA12	MSTA12
TSA15	MSTA15	MSTA15
TSA18	MSTA18	MSTA18
TSA21	MSTA21	MSTA21
TSA24	MSTA24	MSTA24
TSA30	MSTA30	MSTA30
TSA36	MSTA36	MSTA36
TSTP210	LUS210	JUS210
TSTP24	LUS24	JUS24
TSTP26	LUS26	JUS26
TSTP28	LUS28	JUS28

NOTES

1. ALL FRAMING CONNECTORS/HARDWARE SHALL BE MITEK-USP, SIMPSON STRONG-TIE,TAMLYN, OR APPROVED EQUAL.
2. SUBSTITUTIONS MUST BE SUBMITTED FOR REVIEW. REQUESTS FOR ALTERNATE BRANDS MUST BE SUBMITTED IN WRITING WITH COPIES OF THE MANUFACTURER'S PRODUCT INFORMATION WHICH INLCUDES ESR'S/CODE APPROVALS.
3. THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY, MITEK-USP, AND TAMLYN. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: FRAMING CONNECTOR CONVERSION CHART

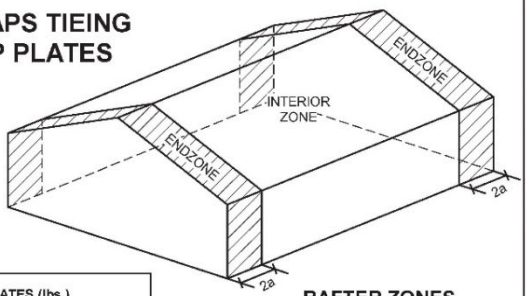
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-54

Sheet Number 54 of 63

TABLES FOR SIZING ENDZONE HURRICANE STRAPS TIEING RAFTERS TO WOOD FRAMED WALL DOUBLE TOP PLATES



RAFTER ZONES

ENDZONE WIND FORCES ON RAFTER HURRICANE TIES AT WALL DOUBLE TOP PLATES (lbs.)					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL
12	398/248	441/248	484/248	528/248	572/248
16	532/330	588/330	646/330	704/330	762/330
19.2	638/396	706/396	775/396	845/396	915/396
24	798/495	882/495	969/495	1056/495	1143/495

RECOMMENDED HURRICANE TIE CONNECTORS-ENDZONE 2X RAFTERS AT WALL DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT
16	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT
19.2	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT
24	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT

RECOMMENDED HURRICANE TIE CONNECTORS-ENDZONE 3X RAFTERS AT WALL DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	H11Z	H11Z	H11Z	H11Z	H11Z
16	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT
19.2	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT
24	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT

RECOMMENDED HURRICANE TIE CONNECTORS-ENDZONE 4X RAFTERS AT WALL DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT
16	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT
19.2	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT
24	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT

NOTES

1. RAFTER CONNECTION BASIS OF DESIGN:
   - WIND SPEED.....165 MPH (ULTIMATE)
   - EXPOSURE CATEGORY.....B
   - TOPOGRAPHIC FACTOR (Kzt).....2.0
   - ROOF ANGLE.....2/12 (9.5 DEGREES) (CONTROLS)
   - MEAN ROOF HEIGHT (MRH).....30'-0"
   - RISK CATEGORY.....II
   - BUILDING CLASSIFICATION....PARTIALLY OPEN/ENCLOSED
   - INTERNAL PRESSURE.....+/-0.18
   - WALL PLATE HEIGHT.....11'-6"
2. UPLIFT AND LATERAL LOADS SHOWN IN TABLE ABOVE ARE BASED ON MAIN WIND FORCE RESISTING SYSTEM NOMINAL WIND LOADS.
3. THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: WOOD WALL-ENDZONE RAFTER TIE DESIGN TABLE

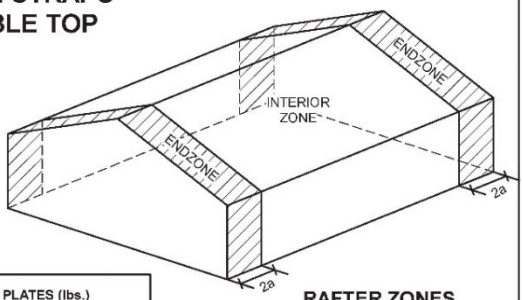
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-55

Sheet Number 55 of 63

TABLES FOR SIZING INTERIOR ZONE HURRICANE STRAPS TIEING RAFTERS TO WOOD FRAMED WALL DOUBLE TOP PLATES



RAFTER ZONES

INTERIOR ZONE WIND FORCES ON RAFTER HURRICANE TIES AT WALL DOUBLE TOP PLATES (lbs.)					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL
12	263/179	287/179	311/179	336/179	361/179
16	350/238	382/238	415/238	448/238	482/238
19.2	420/286	459/286	498/286	538/286	578/286
24	525/357	573/357	622/357	672/357	722/357

RECOMMENDED HURRICANE TIE CONNECTORS-INTERIOR ZONE 2X RAFTERS AT WALL DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	H10A	H10A	H10A	H10A	H10A
16	H10A + H2.5A	H10A + H2.5A	H10A + H2.5A	H10A + H2.5A	H10A + H2.5A
19.2	H10A + H2.5A	H10A + H2.5A	H10A + H2.5A	H10A + H2.5A	H10A + H2.5A
24	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT

RECOMMENDED HURRICANE TIE CONNECTORS-INTERIOR ZONE 3X RAFTERS AT WALL DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	H11Z	H11Z	H11Z	H11Z	H11Z
16	H11Z	H11Z	H11Z	H11Z	H11Z
19.2	H11Z	H11Z	H11Z	H11Z	H11Z
24	H11Z + H2.5A	H11Z + H2.5A	H11Z + H2.5A	H11Z + H2.5A	H11Z + H2.5A

RECOMMENDED HURRICANE TIE CONNECTORS-INTERIOR ZONE 4X RAFTERS AT WALL DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	HGA10KT	HGA10KT	HGA10KT	HGA10KT	HGA10KT
16	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT
19.2	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT
24	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT	MTS16 + HGA10KT

NOTES

1. RAFTER CONNECTION BASIS OF DESIGN:
   - WIND SPEED.....165 MPH (ULTIMATE)
   - EXPOSURE CATEGORY.....B
   - TOPOGRAPHIC FACTOR (Kzt).....2.0
   - ROOF ANGLE.....2/12 (9.5 DEGREES) (CONTROLS)
   - MEAN ROOF HEIGHT (MRH).....30'-0"
   - RISK CATEGORY.....II
   - BUILDING CLASSIFICATION.....PARTIALLY OPEN/ENCLOSED
   - INTERNAL PRESSURE.....+/-0.18
   - WALL PLATE HEIGHT.....11'-6"
2. UPLIFT AND LATERAL LOADS SHOWN IN TABLE ABOVE ARE BASED ON MAIN WIND FORCE RESISTING SYSTEM NOMINAL WIND LOADS.
3. THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: WOOD WALL-INTERIOR ZONE RAFTER TIE DESIGN TABLE

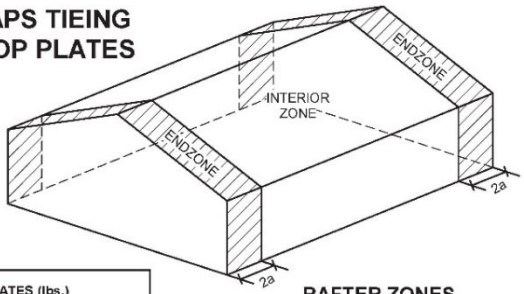
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-56

Sheet Number 56 of 63

TABLES FOR SIZING ENDZONE HURRICANE STRAPS TIEING RAFTERS TO CMU WALL WITH WOOD DOUBLE TOP PLATES



RAFTER ZONES

ENDZONE WIND FORCES ON RAFTER HURRICANE TIES AT WALL DOUBLE TOP PLATES (lbs.)					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL
12	398/248	441/248	484/248	528/248	572/248
16	532/330	588/330	646/330	704/330	762/330
19.2	638/396	706/396	775/396	845/396	915/396
24	798/495	882/495	969/495	1056/495	1143/495

RECOMMENDED HURRICANE TIE CONNECTORS-ENDZONE 2X RAFTERS AT WALL DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT
16	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT
19.2	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT
24	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT

RECOMMENDED HURRICANE TIE CONNECTORS-ENDZONE 3X RAFTERS AT WALL DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	H11Z	H11Z	H11Z	H11Z	H11Z
16	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT
19.2	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT
24	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT	H11Z + HGA10KT

RECOMMENDED HURRICANE TIE CONNECTORS-ENDZONE 4X RAFTERS AT WALL DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	HGA10KT	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT
16	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT
19.2	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT
24	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT

NOTES

1. RAFTER CONNECTION BASIS OF DESIGN:
   - WIND SPEED.....165 MPH (ULTIMATE)
   - EXPOSURE CATEGORY.....B
   - TOPOGRAPHIC FACTOR (Kzt).....2.0
   - ROOF ANGLE.....2/12 (9.5 DEGREES) (CONTROLS)
   - MEAN ROOF HEIGHT (MRH).....30'-0"
   - RISK CATEGORY.....II
   - BUILDING CLASSIFICATION.....PARTIALLY OPEN/ENCLOSED
   - INTERNAL PRESSURE.....+/-0.18
   - WALL PLATE HEIGHT.....11'-6"
2. UPLIFT AND LATERAL LOADS SHOWN IN TABLE ABOVE ARE BASED ON MAIN WIND FORCE RESISTING SYSTEM NOMINAL WIND LOADS.
3. THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: CMU WALL-ENDZONE RAFTER TIE DESIGN TABLE A

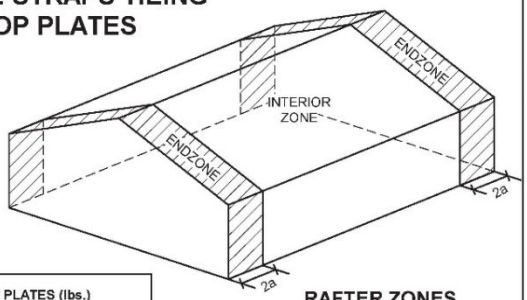
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-57

Sheet Number 57 of 63

TABLES FOR SIZING INTERIOR ZONE HURRICANE STRAPS TIEING RAFTERS TO CMU WALL WITH WOOD DOUBLE TOP PLATES



RAFTER ZONES

INTERIOR ZONE WIND FORCES ON RAFTER HURRICANE TIES AT WALL DOUBLE TOP PLATES (lbs.)					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL
12	263/179	287/179	311/179	336/179	361/179
16	350/238	382/238	415/238	448/238	482/238
19.2	420/286	459/286	498/286	538/286	578/286
24	525/357	573/357	622/357	672/357	722/357

RECOMMENDED HURRICANE TIE CONNECTORS-INTERIOR ZONE 2X RAFTERS AT WALL DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	H10A	H10A	H10A	H10A	H10A
16	H10A + H2.5A	H10A + H2.5A	H10A + H2.5A	H10A + H2.5A	H10A + H2.5A
19.2	H10A + H2.5A	H10A + H2.5A	H10A + H2.5A	H10A + H2.5A	H10A + H2.5A
24	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT	H10A + HGA10KT

RECOMMENDED HURRICANE TIE CONNECTORS-INTERIOR ZONE 3X RAFTERS AT WALL DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	H11Z	H11Z	H11Z	H11Z	H11Z
16	H11Z	H11Z	H11Z	H11Z	H11Z
19.2	H11Z	H11Z	H11Z	H11Z	H11Z
24	H11Z + H2.5A	H11Z + H2.5A	H11Z + H2.5A	H11Z + H2.5A	H11Z + H2.5A

RECOMMENDED HURRICANE TIE CONNECTORS-INTERIOR ZONE 4X RAFTERS AT WALL DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	HGA10KT	HGA10KT	HGA10KT	HGA10KT	HGA10KT
16	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT
19.2	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT
24	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT	(2) HGA10KT

NOTES

1. RAFTER CONNECTION BASIS OF DESIGN:
   - WIND SPEED.....165 MPH (ULTIMATE)
   - EXPOSURE CATEGORY.....B
   - TOPOGRAPHIC FACTOR (Kzt).....2.0
   - ROOF ANGLE.....2/12 (9.5 DEGREES) (CONTROLS)
   - MEAN ROOF HEIGHT (MRH).....30'-0"
   - RISK CATEGORY.....II
   - BUILDING CLASSIFICATION.....PARTIALLY OPEN/ENCLOSED
   - INTERNAL PRESSURE.....+/-0.18
   - WALL PLATE HEIGHT.....11'-6"
2. UPLIFT AND LATERAL LOADS SHOWN IN TABLE ABOVE ARE BASED ON MAIN WIND FORCE RESISTING SYSTEM NOMINAL WIND LOADS.
3. THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: CMU WALL-INTERIOR ZONE RAFTER TIE DESIGN TABLE B

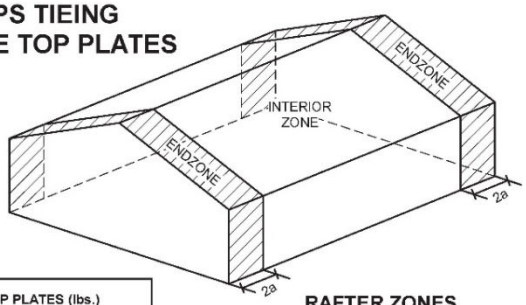
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-58

Sheet Number 58 of 63

TABLES FOR SIZING ENDZONE HURRICANE STRAPS TIEING RAFTERS TO CMU WALL WITHOUT WOOD DOUBLE TOP PLATES



RAFTER ZONES

ENDZONE WIND FORCES ON RAFTER HURRICANE TIES AT WALL WITHOUT DOUBLE TOP PLATES (lbs.)					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL
12	398/248	441/248	484/248	528/248	572/248
16	532/330	588/330	646/330	704/330	762/330
19.2	638/396	706/396	775/396	845/396	915/396
24	798/495	882/495	969/495	1056/495	1143/495

RECOMMENDED HURRICANE TIE CONNECTORS-ENDZONE 2X RAFTERS AT WALL WITHOUT DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	LTA2	LTA2	LTA2	LTA2	LTA2
16	LTA2	LTA2	LTA2	LTA2	LTA2
19.2	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA
24	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA

RECOMMENDED HURRICANE TIE CONNECTORS-ENDZONE 3X RAFTERS AT WALL WITHOUT DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	LTA2	LTA2	LTA2	LTA2	LTA2
16	LTA2	LTA2	LTA2	LTA2	LTA2
19.2	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA
24	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA

RECOMMENDED HURRICANE TIE CONNECTORS-ENDZONE 4X RAFTERS AT WALL WITHOUT DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	LTA2	LTA2	LTA2	LTA2	LTA2
16	LTA2	LTA2	LTA2	LTA2	LTA2
19.2	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA
24	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA	LTA2+HGAM10KTA

NOTES

1. RAFTER CONNECTION BASIS OF DESIGN:
   - WIND SPEED.....165 MPH (ULTIMATE)
   - EXPOSURE CATEGORY.....B
   - TOPOGRAPHIC FACTOR (Kzt).....2.0
   - ROOF ANGLE.....2/12 (9.5 DEGREES) (CONTROLS)
   - MEAN ROOF HEIGHT (MRH).....30'-0"
   - RISK CATEGORY.....II
   - BUILDING CLASSIFICATION.....PARTIALLY OPEN/ENCLOSED
   - INTERNAL PRESSURE.....+/-0.18
   - WALL PLATE HEIGHT.....11'-6"
2. UPLIFT AND LATERAL LOADS SHOWN IN TABLE ABOVE ARE BASED ON MAIN WIND FORCE RESISTING SYSTEM NOMINAL WIND LOADS.
3. THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: CMU WALL-ENDZONE RAFTER TIE DESIGN TABLE C

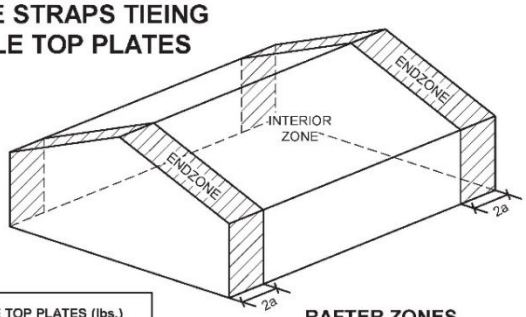
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-59

Sheet Number 59 of 63

TABLES FOR SIZING INTERIOR ZONE HURRICANE STRAPS TIEING RAFTERS TO CMU WALL WITHOUT WOOD DOUBLE TOP PLATES



RAFTER ZONES

INTERIOR ZONE WIND FORCES ON RAFTER HURRICANE TIES AT WALL WITHOUT DOUBLE TOP PLATES (lbs.)					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL	UPLIFT/LATERAL
12	263/179	287/179	311/179	336/179	361/179
16	350/238	382/238	415/238	448/238	482/238
19.2	420/286	459/286	498/286	538/286	578/286
24	525/357	573/357	622/357	672/357	722/357

RECOMMENDED HURRICANE TIE CONNECTORS-INT. ZONE 2X RAFTERS AT WALL WITHOUT DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	LTA2	LTA2	LTA2	LTA2	LTA2
16	LTA2	LTA2	LTA2	LTA2	LTA2
19.2	LTA2	LTA2	LTA2	LTA2	LTA2
24	LTA2	LTA2	LTA2	LTA2	LTA2

RECOMMENDED HURRICANE TIE CONNECTORS-INT. ZONE 3X RAFTERS AT WALL WITHOUT DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	LTA2	LTA2	LTA2	LTA2	LTA2
16	LTA2	LTA2	LTA2	LTA2	LTA2
19.2	LTA2	LTA2	LTA2	LTA2	LTA2
24	LTA2	LTA2	LTA2	LTA2	LTA2

RECOMMENDED HURRICANE TIE CONNECTORS-INT. ZONE 4X RAFTERS AT WALL WITHOUT DOUBLE TOP PLATES					
RAFTER SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	LTA2	LTA2	LTA2	LTA2	LTA2
16	LTA2	LTA2	LTA2	LTA2	LTA2
19.2	LTA2	LTA2	LTA2	LTA2	LTA2
24	LTA2	LTA2	LTA2	LTA2	LTA2

NOTES

1. RAFTER CONNECTION BASIS OF DESIGN:
   - WIND SPEED.....165 MPH (ULTIMATE)
   - EXPOSURE CATEGORY.....B
   - TOPOGRAPHIC FACTOR (Kzt).....2.0
   - ROOF ANGLE.....2/12 (9.5 DEGREES) (CONTROLS)
   - MEAN ROOF HEIGHT (MRH).....30'-0"
   - RISK CATEGORY.....II
   - BUILDING CLASSIFICATION.....PARTIALLY OPEN/ENCLOSED
   - INTERNAL PRESSURE.....+/-0.18
   - WALL PLATE HEIGHT.....11'-6"
2. UPLIFT AND LATERAL LOADS SHOWN IN TABLE ABOVE ARE BASED ON MAIN WIND FORCE RESISTING SYSTEM NOMINAL WIND LOADS.
3. THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: CMU WALL-INTERIOR ZONE RAFTER TIE DESIGN TABLE D

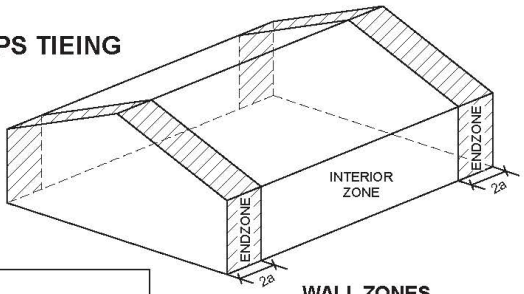
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-60

Sheet Number 60 of 63

TABLES FOR SIZING ENDZONE HURRICANE STRAPS TIEING WALL STUDS TO TOP PLATES AND SILL PLATES



WALL ZONES

ENDZONE WIND UPLIFT FORCES ON PLATE TIES AT WALL FRAMING (lbs.)					
STUD SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	UPLIFT	UPLIFT	UPLIFT	UPLIFT	UPLIFT
12	398	441	484	528	572
16	532	588	646	704	762
19.2	638	706	775	845	915
24	798	882	969	1056	1143

RECOMMENDED CONNECTORS-ENDZONE 2X4 DOUBLE TOP PLATES AND SILL PLATES W/ 2X STUDS					
STUD SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	SP2	SP2	SP2	SP2	SP2
16	SP2	SP2	SP2	SP2	SP2
19.2	SP2	SP2	SP2	SP2	SP2
24	SP2	SP2	SP2	SP2 + H3	SP2 + H3

RECOMMENDED CONNECTORS-ENDZONE 2X6 DOUBLE TOP PLATES AND SILL PLATES W/ 2X,3X, & 4X STUDS					
STUD SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	H2.5A	H2.5A	H2.5A	H2.5A	H2.5A
16	H2.5A	H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A
19.2	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A
24	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A

RECOMMENDED CONNECTORS-ENDZONE 2X8 DOUBLE TOP PLATES AND SILL PLATES W/ 2X,3X, & 4X STUDS					
STUD SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	H2.5A	H2.5A	H2.5A	H2.5A	H2.5A
16	H2.5A	H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A
19.2	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A
24	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A

NOTES

1. STUD CONNECTION BASIS OF DESIGN:
   - WIND SPEED.....165 MPH (ULTIMATE)
   - EXPOSURE CATEGORY.....B
   - TOPOGRAPHIC FACTOR (Kzt).....2.0
   - ROOF ANGLE.....2/12 (9.5 DEGREES) (CONTROLS)
   - MEAN ROOF HEIGHT (MRH).....30'-0"
   - RISK CATEGORY.....II
   - BUILDING CLASSIFICATION.....PARTIALLY OPEN/ENCLOSED
   - INTERNAL PRESSURE.....+/-0.18
   - WALL PLATE HEIGHT.....11'-6"
2. UPLIFT LOADS SHOWN IN TABLE ABOVE ARE BASED ON MAIN WIND FORCE RESISTING SYSTEM NOMINAL WIND LOADS.
3. FOR INSTANCES WHERE TWO CONNECTORS ARE SPECIFIED, CONNECTORS SHALL BE INSTALLED DIAGONALLY FROM EACH OTHER ON OPPOSITE FACES OF THE WALL FRAMING.
4. THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: ENDZONE WALL FRAMING UPLIFT DESIGN TABLES

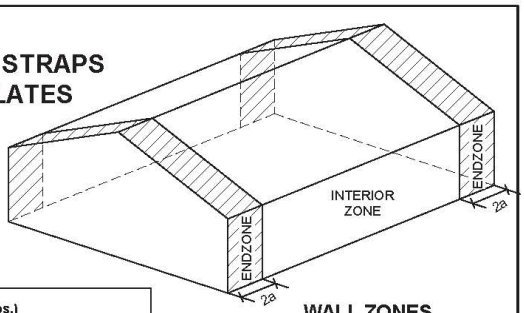
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-61

Sheet Number 61 of 63

TABLES FOR SIZING INTERIOR ZONE HURRICANE STRAPS TIEING WALL STUDS TO TOP PLATES AND SILL PLATES



WALL ZONES

INTERIOR ZONE WIND UPLIFT FORCES ON PLATE TIES AT WALL FRAMING (lbs.)					
STUD SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	UPLIFT	UPLIFT	UPLIFT	UPLIFT	UPLIFT
12	263	287	311	336	361
16	350	382	415	448	482
19.2	420	459	498	538	578
24	525	573	622	672	722

RECOMMENDED CONNECTORS-INTERIOR ZONE 2X4 DOUBLE TOP PLATES AND SILL PLATES W/ 2X STUDS					
STUD SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	SP4	SP4	SP4	SP4	SP4
16	SP4	SP4	SP4	SP2	SP2
19.2	SP2	SP2	SP2	SP2	SP2
24	SP2	SP2	SP2	SP2	SP2

RECOMMENDED CONNECTORS-INTERIOR ZONE 2X6 DOUBLE TOP PLATES AND SILL PLATES W/ 2X,3X, & 4X STUDS					
STUD SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	SP6	SP6	SP6	SP6	SP6
16	SP6	SP6	SP6	(2) H2.5A	(2) H2.5A
19.2	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A
24	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A

RECOMMENDED CONNECTORS-INTERIOR ZONE 2X8 DOUBLE TOP PLATES AND SILL PLATES W/ 2X,3X, & 4X STUDS					
STUD SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	SP8	SP8	SP8	SP8	SP8
16	SP8	SP8	SP8	(2) H2.5A	(2) H2.5A
19.2	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A
24	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A	(2) H2.5A

NOTES

1. STUD CONNECTION BASIS OF DESIGN:
   - WIND SPEED.....165 MPH (ULTIMATE)
   - EXPOSURE CATEGORY.....B
   - TOPOGRAPHIC FACTOR (Kzt).....2.0
   - ROOF ANGLE.....2/12 (9.5 DEGREES) (CONTROLS)
   - MEAN ROOF HEIGHT (MRH).....30'-0"
   - RISK CATEGORY.....II
   - BUILDING CLASSIFICATION.....PARTIALLY OPEN/ENCLOSED
   - INTERNAL PRESSURE.....+/-0.18
   - WALL PLATE HEIGHT.....11'-6"
2. UPLIFT LOADS SHOWN IN TABLE ABOVE ARE BASED ON MAIN WIND FORCE RESISTING SYSTEM NOMINAL WIND LOADS.
3. FOR INSTANCES WHERE TWO CONNECTORS ARE SPECIFIED, CONNECTORS SHALL BE INSTALLED DIAGONALLY FROM EACH OTHER ON OPPOSITE FACES OF THE WALL FRAMING.
4. THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: INTERIOR ZONE WALL FRAMING UPLIFT DESIGN TABLES

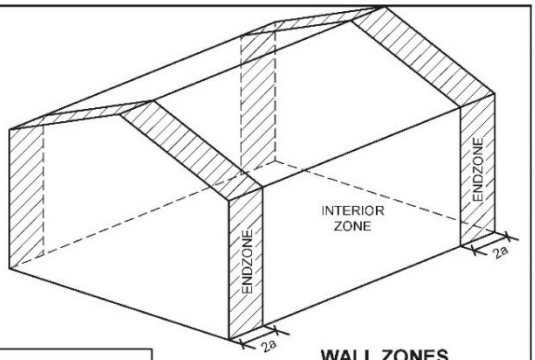
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

S-62

Sheet Number 62 of 63

TABLES FOR SIZING HURRICANE STRAPS TIEING WALL STUDS TO BAND JOISTS



WALL ZONES

ENDZONE WIND UPLIFT FORCES ON PLATE TIES AT WALL FRAMING (lbs.)					
STUD SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	UPLIFT	UPLIFT	UPLIFT	UPLIFT	UPLIFT
12	398	441	484	528	572
16	532	588	646	704	762
19.2	638	706	775	845	915
24	798	882	969	1056	1143

INTERIOR ZONE WIND UPLIFT FORCES ON PLATE TIES AT WALL FRAMING (lbs.)					
STUD SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	UPLIFT	UPLIFT	UPLIFT	UPLIFT	UPLIFT
12	263	287	311	336	361
16	350	382	415	448	482
19.2	420	459	498	538	578
24	525	573	622	672	722

RECOMMENDED CONNECTORS-ENDZONE STUDS TO BANDJOISTS					
STUD SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	MSTA36	MSTA36	MSTA36	MSTA36	MSTA36
16	MSTA36	MSTA36	MSTA36	MSTA36	MSTA36
19.2	MSTA36	MSTA36	MSTA36	MSTA36	MSTA36
24	MSTA36	MSTA36	MSTA36	MSTA36	MSTA36

RECOMMENDED CONNECTORS-INTERIOR ZONE STUDS TO BANDJOISTS					
STUD SPACING (INCHES O.C.)	TOTAL BUILDING WIDTH (INCLUDING OVERHANGS, ft)				
	24, 2a = 6'-0"	28, 2a = 6'-0"	32, 2a = 6'-6"	36, 2a = 7'-3"	40, 2a = 8'-0"
	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS	CONNECTORS
12	MSTA36	MSTA36	MSTA36	MSTA36	MSTA36
16	MSTA36	MSTA36	MSTA36	MSTA36	MSTA36
19.2	MSTA36	MSTA36	MSTA36	MSTA36	MSTA36
24	MSTA36	MSTA36	MSTA36	MSTA36	MSTA36

NOTES

1. STUD CONNECTION BASIS OF DESIGN:
   - WIND SPEED.....165 MPH (ULTIMATE)
   - EXPOSURE CATEGORY.....B
   - TOPOGRAPHIC FACTOR (Kzt).....2.0
   - ROOF ANGLE.....2/12 (9.5 DEGREES) (CONTROLS)
   - MEAN ROOF HEIGHT (MRH).....30'-0"
   - RISK CATEGORY.....II
   - BUILDING CLASSIFICATION.....PARTIALLY OPEN/ENCLOSED
   - INTERNAL PRESSURE.....+/-0.18
   - WALL PLATE HEIGHT.....11'-6"
2. UPLIFT LOADS SHOWN IN TABLE ABOVE ARE BASED ON MAIN WIND FORCE RESISTING SYSTEM NOMINAL WIND LOADS.
3. THE REFERENCED CONNECTORS ARE MANUFACTURED BY THE SIMPSON STRONG-TIE COMPANY. FEMA/DPNR DOES NOT SPECIFICALLY ENDORSE THE CONNECTORS OF ANY MANUFACTURER. CONNECTORS THAT EQUAL THE SPECIFICATIONS OF THE NOTED CONNECTORS MAY BE SUBSTITUTED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: WOOD WALL-BAND JOIST UPLIFT DESIGN TABLES

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

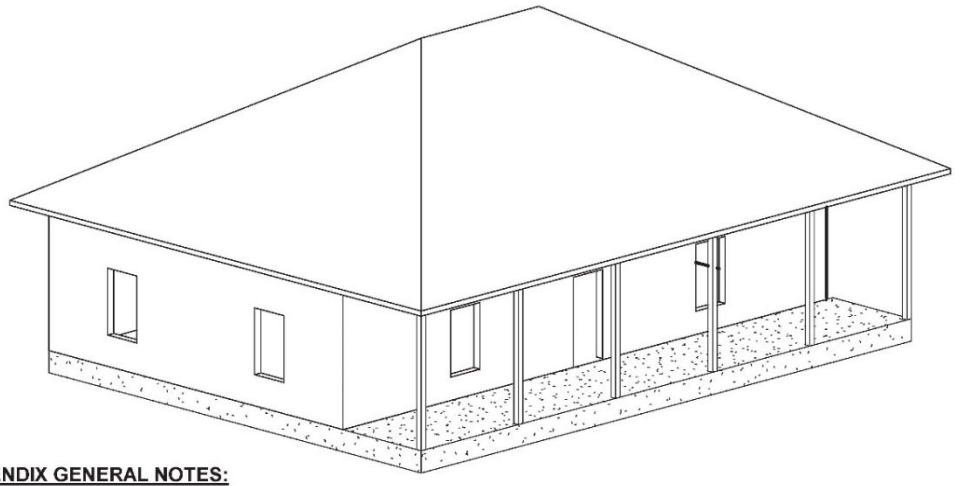
Sheet Number:

S-63

Sheet Number 63 of 63

CONSTRUCTION INFORMATION
for a
STRONGER HOME

APPENDIX
TO THE
4th EDITION APRIL 2018
INCLUDING SPAN TABLES
REPLACES ALL PREVIOUS EDITIONS



APPENDIX GENERAL NOTES:

THIS IS A GUIDANCE DOCUMENT ONLY. REFERENCED BY THE U.S.V.I. BUILDING CODE.

ALL CONSTRUCTION MUST COMPLY WITH THE U.S.V.I. BUILDING CODE.

YOU ARE REQUIRED TO OBTAIN THE NECESSARY BUILDING PERMITS FROM THE DEPARTMENT OF PLANNING AND NATURAL RESOURCES.

SIGNED AND SEALED DRAWINGS FOR PERMIT MUST BE SUBMITTED TO THE DEPARTMENT OF PLANNING AND NATURAL RESOURCES (DPNR) DIVISION OF PERMITS.

STRUCTURES LOCATED IN SPECIAL FLOOD HAZARD AREAS SHALL BE DESIGNED BY A U.S.V.I. REGISTERED DESIGN PROFESSIONAL AND CERTIFIED TO COMPLY WITH ASCE 24-14 FLOOD RESISTANT DESIGN AND CONSTRUCTION.

ALL NOTES AND REQUIREMENTS FOUND IN THE MAIN BODY OF THE CONSTRUCTION INFORMATION FOR A STRONGER HOME, 4TH EDITION STILL APPLY. SEE PREFACE FOR ADDITIONAL LIMITATIONS AND ASSUMPTIONS ASSOCIATED WITH THE APPENDIX.

NOTE: ALL WOOD COMPONENTS SHALL BE PRESSURE TREATED.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: TITLE SHEET

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:
A-01
Sheet Number 1 of 45

1 Background

This Appendix to the USVI Stronger Homes guidelines, presents the limiting spans for studs, roof rafters, floor beams, floor joists, hip and valley beams for structural lumber sizes in the USVI. For each lumber size, the limiting spans determined are the longest spans possible while satisfying the requirements of IRC 2018. The design values for the different species of lumber are based on the design values in 2018 National Design Specification (NDS) for Wood Construction and its Supplement.

2 Member Sizing

The timber member shown in the span tables are designated based on their actual sizes but expressed as nominal sizes. The actual dressed member sizes vary from the nominal sizes. Table below shows the nominal dimension and corresponding dressed actual dimensions.

Thickness (in)		Width (in)	
Nominal	Actual Size	Nominal	Actual Size
2	1.5	4	3.50
3	2.5	6	5.50
4	3.5	8	7.25
		10	9.25
		12	11.25
		14	13.25

The sections with a nominal thickness of 2 inches, 3 inches and 4 inches are designated in this guide as 2x, 3x and 4x sections respectively.

3 Structure Risk Category and Classification

The homes have a structural risk category of II (as defined in Table 1.5-1 of ASCE 7-16). The building enclosure type is taken as Enclosed or Partially Open.

4 Structure and Roof geometry:

The guidance is provided only for regular shaped structures with plan aspect ratios (Width:Length) from 1:1 to 1:2. Structures with unusual geometrical irregularities in its spatial form are not covered by this document and must be professionally designed. The mean roof height is assumed to be less than 30 feet and is assumed to have simple diaphragm

DEPARTMENT OF PLANNING AND NATURAL RESOURCES
BY COMMISSIONER: DAWN L. HENRY
DRAWING TITLE: PREFACE

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:
A-02
Sheet Number 2 of 45

construction. The building foot print for design covered by this guidance shall be between 24 feet to 40 feet wide (in increments of four feet such as 24, 28, 32, 36 and 40 feet) and between 40 feet to 52 feet long (in increments such as 40, 44, 48 and 52 feet). Interior bearing walls are required at the center of the home. The support walls shall be constructed out of CMU (Concrete Masonry Units), Concrete or Wood Frames.

The provisions shown here are applicable only for Hip and Gable roofs. The roof overhang is limited to 2 feet maximum.

5 Design Loads

Unless stated otherwise, all calculations are based on LRFD (Load Resistance Factor Design) methods using the loads from ASCE 7-16.

5.1 Dead Loads:

The uniform area dead loads used for the various structural elements are noted in the respective span tables.

5.2 Live Loads:

The uniform area live loads used for the various structural elements are also noted in the respective span tables.

5.3 Wind Loads:

Wind forces are calculated with wind loads acting perpendicular to wall and roof surfaces. Lateral loads flow into roof and floor diaphragms and are transferred to the foundation via shear walls. Roof uplift forces are transferred to the foundation by direct tension through the wall framing and tension straps or wall sheathing. Shear wall overturning forces are resisted by the structure's dead load and by supplemental hold down connections. It is assumed that the home is a simple structure that is roughly rectangular in shape, has relatively uniform distribution of shear resistance throughout the structure, and has no significant structural discontinuities.

The wind loads are determined in accordance with the envelope procedure which has been presented in ASCE 7-16. The Basic Wind Speed is 165 mph (based on Figure 26.5-1B of ASCE 7-16 for Virgin Islands) and is used to determine the provisions of this guidance. The wind Directionality Factor K_d is taken as 0.85 (as per Table 26.6-1 of ASCE 7-16). The ground

DEPARTMENT OF PLANNING AND NATURAL RESOURCES
BY COMMISSIONER: DAWN L. HENRY
DRAWING TITLE: PREFACE CONTINUED

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:
A-03
Sheet Number 3 of 45

elevation factor K_e is taken as 1.0. The gust effect factor is taken as 0.85 (based on Section 26.11.1 for rigid building).

6 Design Parameters

The design parameters for Floor, Wall and Roof systems are as follows:

6.1 Floor System

6.1.1 Floor Beams

- Dead load of 15 PSF and live load of 40 PSF is used and combined as per ASCE 7-16
- The widths of tributary areas are 8', 10', 12', 14', 16' and 18'.
- Single beams and ganged beams are presented.
- Ganged beams must be stagger bolted at a spacing of 2 feet to ensure composite action.
- Spans satisfy both strength and serviceability requirements.
- Live load deflection is limited to L/360 and the total load deflection is limited to L/240

6.1.2 Floor Joists

- Dead load of 15 PSF and live load of 40 PSF is used and combined as per ASCE 7-16
- The joists are spaced at 12", 16", 19.2" and 24"
- Spans satisfy both strength and serviceability requirements.
- Live load deflection is limited to L/360.

6.2 Wall System

6.2.1 Wall Studs

- Axial loads from the roof and/or upper floors and lateral wind forces are analyzed.
- Three exposure categories B (with K_{zt} = 1.0, 2.0) and D (with K_{zt} = 1.0) are analyzed.
- Envelope method specified in ASCE 7-16 is used to determine wind loads.
- Spans are checked for MWFRS (Main Wind Force Resisting System) wind loads and Components & Cladding (C&C) wind loads.
- 2X, 3X and 4X sections spaced at 12", 16", 19.2" and 24" are analyzed.
- The deflection is limited to L/180.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: PREFACE CONTINUED

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-04

Sheet Number 4 of 45

6.3 Roof System

6.3.1 Rafters

- Dead load of 10 PSF and no live load is used.
- The spans are determined for the interior and edge roof zones.
- C&C (Components and Cladding) wind loads are used for analysis.
- Roof slopes vary from 2:12 to 12:12.
- 2X, 3X and 4X sections spaced at 12", 16", 19.2" and 24" are analyzed.
- Deflection is limited to L/180.

6.3.2 Roof Beams

- Dead load of 10 PSF and no live load is used.
- The widths (horizontal projection) of tributary areas are 10', 12', 14', 16', 18' and 20'.
- Three exposure categories B (with K_{zt} = 1.0, 2.0) and D (with K_{zt} = 1.0) are analyzed.
- Envelope method specified in ASCE 7-16 is used to determine wind loads.
- The edge zone load is used to determine limiting span.
- Deflection is limited to L/240.

6.3.3 Hip and Valley Beams

- Dead load of 10 PSF and no live load is used.
- Three exposure categories B (with K_{zt} = 1.0, 2.0) and D (with K_{zt}= 1.0) are analyzed.
- Envelope method specified in ASCE 7-16 is used to determine wind loads.
- The wind load is assumed to vary linearly from the highest value at the hip to a value of zero at the valley.
- Deflection is limited to L/240.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: PREFACE CONTINUED

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-05

Sheet Number 5 of 45

DRAWING INDEX

SHEET NUMBER	SHEET NAME
A-01	TITLE SHEET
A-02	PREFACE
A-03	PREFACE CONTINUED
A-04	PREFACE CONTINUED
A-05	PREFACE CONTINUED
A-06	DRAWING INDEX
A-07	APPROVED METHODS OF ROOF SUPPORT
A-08	HIP ROOF LAYOUT RECOMMENDATIONS
A-09	FLOOR BEAM DESIGN TABLE A
A-10	FLOOR BEAM DESIGN TABLE B
A-11	FLOOR BEAM DESIGN TABLE C
A-12	FLOOR BEAM DESIGN TABLE D
A-13	FLOOR JOIST DESIGN TABLE
A-14	WALL STUD DESIGN TABLE
A-15	ROOF BEAM DESIGN TABLE A
A-16	ROOF BEAM DESIGN TABLE B
A-17	ROOF BEAM DESIGN TABLE C
A-18	ROOF BEAM DESIGN TABLE D
A-19	ROOF BEAM DESIGN TABLE E
A-20	ROOF BEAM DESIGN TABLE F
A-21	HIP & VALLEY ROOF BEAM DESIGN TABLE
A-22	RAFTER DESIGN TABLE A-EXP. B, Kzt = 1.0
A-23	RAFTER DESIGN TABLE B-EXP. B, Kzt = 1.0
A-24	RAFTER DESIGN TABLE C-EXP. B, Kzt = 1.0
A-25	RAFTER DESIGN TABLE D-EXP. B Kzt = 1.0
A-26	RAFTER DESIGN TABLE E-EXP. B, Kzt = 1.0
A-27	RAFTER DESIGN TABLE F-EXP. B, Kzt = 1.0
A-28	RAFTER DESIGN TABLE G-EXP. B, Kzt =1.0
A-29	RAFTER DESIGN TABLE H-EXP. B, Kzt = 1.0
A-30	RAFTER DESIGN TABLE A-EXP. B, Kzt = 2.0
A-31	RAFTER DESIGN TABLE B-EXP. B, Kzt = 2.0
A-32	RAFTER DESIGN TABLE C-EXP. B, Kzt = 2.0
A-33	RAFTER DESIGN TABLE D-EXP. B, Kzt = 2.0
A-34	RAFTER DESIGN TABLE E-EXP. B, Kzt = 2.0
A-35	RAFTER DESIGN TABLE F-EXP. B, Kzt = 2.0
A-36	RAFTER DESIGN TABLE G-EXP. B, Kzt = 2.0
A-37	RAFTER DESIGN TABLE H-EXP. B, Kzt = 2.0
A-38	RAFTER DESIGN TABLE A-EXP. D, Kzt = 1.0
A-39	RAFTER DESIGN TABLE B-EXP. D, Kzt = 1.0
A-40	RAFTER DESIGN TABLE C-EXP. D, Kzt =1.0
A-41	RAFTER DESIGN TABLE D-EXP. D, Kzt = 1.0
A-42	RAFTER DESIGN TABLE E-EXP. D, Kzt = 1.0
A-43	RAFTER DESIGN TABLE F-EXP. D, Kzt = 1.0
A-44	RAFTER DESIGN TABLE G-EXP. D, Kzt = 1.0
A-45	RAFTER DESIGN TABLE H-EXP. D, Kzt = 1.0

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: DRAWING INDEX

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

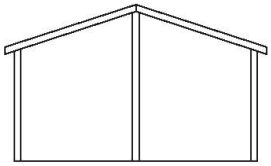
Sheet Number:

A-06

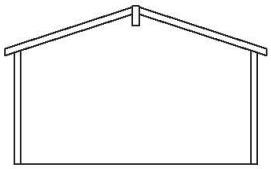
Sheet Number 6 of 45

APPROVED METHODS OF ROOF RAFTER AND HIP BEAM SUPPORT

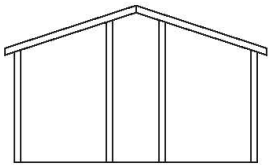
THIS ROOF HAS A CATHEDRAL CEILING WITHOUT INTERIOR BEARING WALLS OR STRUCTURAL RIDGE BEAMS. THIS CONDITION IS NOT ALLOWED. PRE-ENGINEERED TRUSSES MAY BE USED IF DESIGN IS SIGNED AND SEALED BY ENGINEER REGISTERED IN THE U.S. VIRGIN ISLANDS AND MANUFACTURING IS PERFORMED BY A CERTIFIED TRUSS MANUFACTURING FACILITY PER THE TRUSS PLATE INSTITUTE, "NATIONAL DESIGN STANDARD FOR METAL-PLATE CONNECTED WOOD TRUSS CONSTRUCTION" (ANSI/TPI 1-2014).



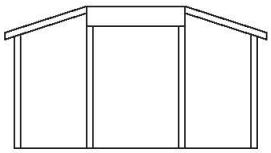
THIS ROOF IS SUPPORTED BY AN INTERIOR BEARING WALL DIRECTLY BELOW THE RIDGE. IF THE FLOOR PLAN ALLOWS A CENTER WALL, THIS IS THE MOST ECONOMICAL METHOD OF SUPPORTING THE ROOF AT THE RIDGE.



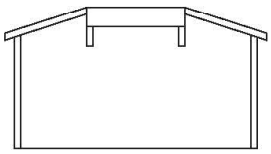
THIS ROOF IS ADEQUATELY SUPPORTED BY A STRUCTURAL ROOF BEAM AT THE RIDGE. THIS BEAM MUST BE VERTICALLY SUPPORTED BY COLUMNS, EXTERIOR WALLS, INTERIOR WALLS, OTHER BEAMS, OR A COMBINATION OF THESE METHODS. THIS BEAM MUST BE PROPERLY SELECTED FOR SIZE, SPACING, AND UNSUPPORTED SPAN.



THIS ROOF SECTION IS SUPPORTED BY INTERIOR WALLS OFFSET NOT MORE THAN 2 FEET FROM THE CENTER OF THE RIDGE BEING SUPPORTED. THIS METHOD OF SUPPORT MAY ONLY BE USED IF THERE ARE SUPPORTING WALLS ON BOTH SIDES OF THE RIDGE AND NOT OFFSET GREATER THAN 2 FEET FROM CENTERLINE OF THE WALL TO THE CENTERLINE OF THE RIDGE. THE MAXIMUM WIDTH OF A HALLWAY IS 4 FEET UNLESS ADDITIONAL BEAMS OR HEADERS ARE UTILIZED. COMBINATIONS OF THE SUPPORT METHODS SET FORTH ABOVE MAY BE USED AND IN MOST CASES WILL BE ADVANTAGEOUS BASED UPON FLOOR PLAN LAYOUTS.



IF THE RIDGE IS ADEQUATELY SUPPORTED BY INTERIOR BEARING WALLS, BEAMS, HEADERS, COLUMNS, OR A COMBINATION, THE HIPS ARE ALSO SUPPORTED. THE CENTER RIDGE MAY NOT BE SUPPORTED BY CANTILEVERED SECTIONS OF HIPS PROJECTING BEYOND AN INTERIOR BEARING WALL UNDER THE HIP.



THE HIPS AND VALLEYS MUST BE SPECIFIED AS BEAMS OF ADEQUATE SIZE AND SPACING TO CARRY THE IMPOSED ROOF LOADS. INTERSECTING INTERIOR BEARING WALLS, HEADERS, BEAMS, AND COLUMNS MAY BE USED TO REDUCE UNSUPPORTED SPANS OF THE HIP OR VALLEY.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: APPROVED METHODS OF ROOF SUPPORT

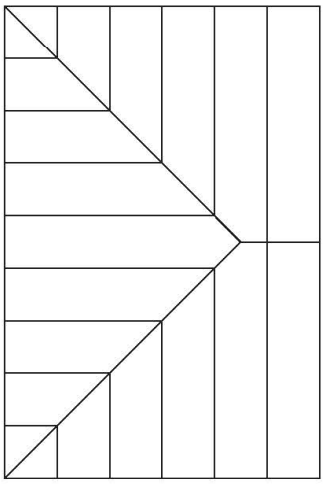
Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

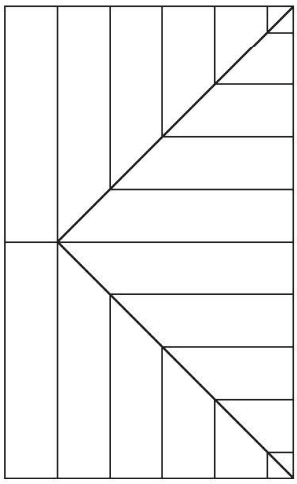
A-07

Sheet Number 7 of 45

HIP ROOF LAYOUT RECOMMENDATIONS



THIS



NOT THIS

THE PREFERED METHOD OF LAYOUT FOR THE INTERSECTION OF THE RIDGE, HIPS, COMMON RAFTERS, AND JACK RAFTERS IS SHOWN IN THE VIEW ON THE LEFT. THE CONNECTION WITH THREE STRUCTURAL MEMBERS IS STRONGER AND EASIER TO TIE CORRECTLY IN THE FIELD THAN THE ONE WITH FIVE MEMBERS BEING JOINED AT ONE POINT AS SHOWN IN THE VIEW ON THE RIGHT. THE CONTRACTOR MUST LAYOUT OUT FRAMING IN A WORKMANLIKE MANNER.

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: HIP ROOF LAYOUT RECOMMENDATIONS

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-08

Sheet Number 8 of 45

FLOOR BEAM BEAM ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 15 PSF
Live Load: 40 PSF
Deflection Limits: Δ_{LL} = L/360, Δ_{TL} = L/240
Limits and Assumption: See Appendix General Notes

Wood Species	Plys - Beam Size (Nominal)	Governing Span (ft-in)					
		8' Tributary Width	10' Tributary Width	12' Tributary Width	14' Tributary Width	16' Tributary Width	18' Tributary Width
DFL1	(1) 2x8	5 - 3	4 - 8	4 - 3	4 - 0	3 - 8	3 - 6
DFL1	(2) 2x8	7 - 4	6 - 7	6 - 1	5 - 7	5 - 3	5 - 0
DFL1	(3) 2x8	9 - 1	8 - 1	7 - 4	6 - 10	6 - 4	6 - 1
DFL1	(4) 2x8	10 - 3	9 - 4	8 - 6	7 - 10	7 - 4	7 - 0
DFL1	(1) 2x10	6 - 4	5 - 8	5 - 2	4 - 10	4 - 6	4 - 3
DFL1	(2) 2x10	9 - 0	8 - 1	7 - 4	6 - 10	6 - 4	6 - 0
DFL1	(3) 2x10	11 - 0	9 - 10	9 - 0	8 - 4	7 - 9	7 - 4
DFL1	(4) 2x10	12 - 8	11 - 4	10 - 4	9 - 8	9 - 0	8 - 6
DFL1	(1) 2x12	7 - 4	6 - 7	6 - 1	5 - 7	5 - 3	5 - 0
DFL1	(2) 2x12	10 - 6	9 - 4	8 - 7	7 - 10	7 - 4	7 - 0
DFL1	(3) 2x12	12 - 9	11 - 6	10 - 6	9 - 8	9 - 1	8 - 7
DFL1	(4) 2x12	14 - 8	13 - 2	12 - 1	11 - 2	10 - 6	9 - 10
DFL1	(1) 3x8	6 - 9	6 - 1	5 - 6	5 - 1	4 - 9	4 - 6
DFL1	(2) 3x8	9 - 6	8 - 6	7 - 9	7 - 2	6 - 9	6 - 4
DFL1	(3) 3x8	11 - 1	10 - 3	9 - 6	8 - 9	8 - 3	7 - 9
DFL1	(4) 3x8	12 - 2	11 - 4	10 - 8	10 - 1	9 - 6	9 - 0
DFL1	(1) 3x10	8 - 3	7 - 4	6 - 9	6 - 3	5 - 10	5 - 6
DFL1	(2) 3x10	11 - 7	10 - 4	9 - 6	8 - 9	8 - 3	7 - 9
DFL1	(3) 3x10	14 - 2	12 - 8	11 - 7	10 - 9	10 - 1	9 - 6
DFL1	(4) 3x10	15 - 7	14 - 6	13 - 4	12 - 4	11 - 7	11 - 0
DFL1	(1) 3x12	9 - 7	8 - 7	7 - 9	7 - 3	6 - 9	6 - 4
DFL1	(2) 3x12	13 - 6	12 - 1	11 - 0	10 - 2	9 - 7	9 - 0
DFL1	(3) 3x12	16 - 4	14 - 8	13 - 6	12 - 6	11 - 8	11 - 0
DFL1	(4) 3x12	18 - 10	16 - 10	15 - 6	14 - 4	13 - 6	12 - 8
DFL1	(1) 4x8	8 - 3	7 - 6	6 - 9	6 - 3	5 - 10	5 - 7
DFL1	(2) 4x8	10 - 10	10 - 1	9 - 6	8 - 10	8 - 3	7 - 10
DFL1	(3) 4x8	12 - 4	11 - 6	10 - 10	10 - 3	9 - 10	9 - 6
DFL1	(4) 4x8	13 - 8	12 - 8	12 - 0	11 - 4	10 - 10	10 - 4
DFL1	(1) 4x10	10 - 2	9 - 1	8 - 3	7 - 8	7 - 2	6 - 9
DFL1	(2) 4x10	13 - 10	12 - 9	11 - 8	10 - 10	10 - 2	9 - 7
DFL1	(3) 4x10	15 - 10	14 - 8	13 - 10	13 - 2	12 - 4	11 - 8
DFL1	(4) 4x10	17 - 6	16 - 2	15 - 2	14 - 6	13 - 10	13 - 3
DFL1	(1) 4x12	11 - 10	10 - 7	9 - 8	9 - 0	8 - 4	7 - 10
DFL1	(2) 4x12	16 - 7	14 - 10	13 - 8	12 - 8	11 - 10	11 - 2
DFL1	(3) 4x12	19 - 3	17 - 10	16 - 7	15 - 4	14 - 6	13 - 8
DFL1	(4) 4x12	21 - 2	19 - 8	18 - 6	17 - 7	16 - 7	15 - 8

DEPARTMENT OF PLANNING AND NATURAL RESOURCES
BY COMMISSIONER: DAWN L. HENRY
DRAWING TITLE: FLOOR BEAM DESIGN TABLE A

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:
A-09
Sheet Number 9 of 45

FLOOR BEAM BEAM ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 15 PSF
Live Load: 40 PSF
Deflection Limits: Δ_{LL} = L/360, Δ_{TL} = L/240
Limits and Assumption: See Appendix General Notes

Wood Species	Plys - Beam Size (Nominal)	Governing Span (ft-in)					
		8' Tributary Width	10' Tributary Width	12' Tributary Width	14' Tributary Width	16' Tributary Width	18' Tributary Width
DFL2	(1) 2x8	5 - 0	4 - 6	4 - 1	3 - 9	3 - 6	3 - 3
DFL2	(2) 2x8	7 - 0	6 - 3	5 - 8	5 - 3	5 - 0	4 - 8
DFL2	(3) 2x8	8 - 7	7 - 8	7 - 0	6 - 6	6 - 1	5 - 8
DFL2	(4) 2x8	9 - 10	8 - 10	8 - 1	7 - 6	7 - 0	6 - 7
DFL2	(1) 2x10	6 - 1	5 - 4	5 - 0	4 - 7	4 - 3	4 - 1
DFL2	(2) 2x10	8 - 7	7 - 8	7 - 0	6 - 6	6 - 1	5 - 8
DFL2	(3) 2x10	10 - 6	9 - 4	8 - 7	7 - 10	7 - 4	7 - 0
DFL2	(4) 2x10	12 - 1	10 - 9	9 - 10	9 - 2	8 - 7	8 - 1
DFL2	(1) 2x12	7 - 0	6 - 3	5 - 9	5 - 3	5 - 0	4 - 8
DFL2	(2) 2x12	9 - 10	8 - 10	8 - 1	7 - 6	7 - 0	6 - 7
DFL2	(3) 2x12	12 - 1	10 - 10	9 - 10	9 - 2	8 - 7	8 - 1
DFL2	(4) 2x12	14 - 0	12 - 6	11 - 6	10 - 7	9 - 10	9 - 4
DFL2	(1) 3x8	6 - 4	5 - 8	5 - 2	4 - 10	4 - 6	4 - 3
DFL2	(2) 3x8	9 - 1	8 - 1	7 - 4	6 - 10	6 - 4	6 - 1
DFL2	(3) 3x8	10 - 10	9 - 10	9 - 1	8 - 4	7 - 10	7 - 4
DFL2	(4) 3x8	12 - 0	11 - 1	10 - 4	9 - 8	9 - 1	8 - 6
DFL2	(1) 3x10	7 - 9	7 - 0	6 - 4	5 - 10	5 - 7	5 - 2
DFL2	(2) 3x10	11 - 0	9 - 10	9 - 0	8 - 4	7 - 9	7 - 4
DFL2	(3) 3x10	13 - 6	12 - 1	11 - 0	10 - 2	9 - 7	9 - 0
DFL2	(4) 3x10	15 - 3	13 - 10	12 - 8	11 - 9	11 - 0	10 - 4
DFL2	(1) 3x12	9 - 1	8 - 1	7 - 4	6 - 10	6 - 4	6 - 1
DFL2	(2) 3x12	12 - 9	11 - 6	10 - 6	9 - 8	9 - 1	8 - 7
DFL2	(3) 3x12	15 - 7	14 - 0	12 - 9	11 - 9	11 - 1	10 - 6
DFL2	(4) 3x12	17 - 10	16 - 1	14 - 8	13 - 7	12 - 9	12 - 1
DFL2	(1) 4x8	7 - 10	7 - 1	6 - 6	6 - 0	5 - 7	5 - 3
DFL2	(2) 4x8	10 - 7	9 - 10	9 - 1	8 - 4	7 - 10	7 - 6
DFL2	(3) 4x8	12 - 2	11 - 3	10 - 7	10 - 1	9 - 8	9 - 1
DFL2	(4) 4x8	13 - 4	12 - 4	11 - 8	11 - 1	10 - 7	10 - 2
DFL2	(1) 4x10	9 - 8	8 - 8	7 - 10	7 - 3	6 - 10	6 - 6
DFL2	(2) 4x10	13 - 7	12 - 2	11 - 1	10 - 3	9 - 8	9 - 1
DFL2	(3) 4x10	15 - 6	14 - 4	13 - 7	12 - 7	11 - 9	11 - 1
DFL2	(4) 4x10	17 - 1	15 - 10	14 - 10	14 - 2	13 - 7	12 - 9
DFL2	(1) 4x12	11 - 2	10 - 1	9 - 2	8 - 6	8 - 0	7 - 6
DFL2	(2) 4x12	15 - 9	14 - 2	13 - 0	12 - 0	11 - 2	10 - 7
DFL2	(3) 4x12	18 - 10	17 - 3	15 - 9	14 - 8	13 - 8	13 - 0
DFL2	(4) 4x12	20 - 9	19 - 3	18 - 2	16 - 10	15 - 9	14 - 10

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: FLOOR BEAM DESIGN TABLE B

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-10

Sheet Number 10 of 45

FLOOR BEAM BEAM ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 15 PSF
Live Load: 40 PSF
Deflection Limits: Δ_{LL} = L/360, Δ_{TL} = L/240
Limits and Assumption: See Appendix General Notes

Wood Species	Plys - Beam Size (Nominal)	Governing Span (ft-in)					
		8' Tributary Width	10' Tributary Width	12' Tributary Width	14' Tributary Width	16' Tributary Width	18' Tributary Width
SP01	(1) 2x8	5 - 4	4 - 9	4 - 4	4 - 1	3 - 9	3 - 7
SP01	(2) 2x8	7 - 7	6 - 9	6 - 2	5 - 8	5 - 4	5 - 1
SP01	(3) 2x8	9 - 2	8 - 3	7 - 7	7 - 0	6 - 7	6 - 2
SP01	(4) 2x8	10 - 1	9 - 4	8 - 8	8 - 1	7 - 7	7 - 1
SP01	(1) 2x10	6 - 3	5 - 7	5 - 1	4 - 8	4 - 4	4 - 2
SP01	(2) 2x10	8 - 9	7 - 10	7 - 2	6 - 8	6 - 3	5 - 10
SP01	(3) 2x10	10 - 9	9 - 8	8 - 9	8 - 2	7 - 8	7 - 2
SP01	(4) 2x10	12 - 4	11 - 1	10 - 2	9 - 4	8 - 9	8 - 3
SP01	(1) 2x12	7 - 4	6 - 7	6 - 1	5 - 7	5 - 3	5 - 0
SP01	(2) 2x12	10 - 6	9 - 4	8 - 7	7 - 10	7 - 4	7 - 0
SP01	(3) 2x12	12 - 9	11 - 6	10 - 6	9 - 8	9 - 1	8 - 7
SP01	(4) 2x12	14 - 8	13 - 2	12 - 1	11 - 2	10 - 6	9 - 10
SP01	(1) 3x8	6 - 10	6 - 2	5 - 7	5 - 2	4 - 10	4 - 7
SP01	(2) 3x8	9 - 6	8 - 8	8 - 0	7 - 4	6 - 10	6 - 6
SP01	(3) 3x8	10 - 10	10 - 1	9 - 6	9 - 0	8 - 4	8 - 0
SP01	(4) 3x8	12 - 0	11 - 1	10 - 6	9 - 10	9 - 6	9 - 1
SP01	(1) 3x10	8 - 1	7 - 2	6 - 7	6 - 1	5 - 8	5 - 4
SP01	(2) 3x10	11 - 4	10 - 2	9 - 3	8 - 7	8 - 1	7 - 7
SP01	(3) 3x10	13 - 10	12 - 4	11 - 4	10 - 6	9 - 10	9 - 3
SP01	(4) 3x10	15 - 3	14 - 2	13 - 1	12 - 1	11 - 4	10 - 8
SP01	(1) 3x12	9 - 7	8 - 7	7 - 9	7 - 2	6 - 9	6 - 4
SP01	(2) 3x12	13 - 6	12 - 1	11 - 0	10 - 2	9 - 7	9 - 0
SP01	(3) 3x12	16 - 4	14 - 8	13 - 6	12 - 6	11 - 8	11 - 0
SP01	(4) 3x12	18 - 7	16 - 10	15 - 6	14 - 4	13 - 6	12 - 8
SP01	(1) 4x8	8 - 4	7 - 8	7 - 0	6 - 6	6 - 1	5 - 8
SP01	(2) 4x8	10 - 7	9 - 10	9 - 3	8 - 9	8 - 4	8 - 1
SP01	(3) 4x8	12 - 2	11 - 3	10 - 7	10 - 1	9 - 8	9 - 3
SP01	(4) 4x8	13 - 4	12 - 4	11 - 8	11 - 1	10 - 7	10 - 2
SP01	(1) 4x10	10 - 0	9 - 0	8 - 2	7 - 7	7 - 1	6 - 8
SP01	(2) 4x10	13 - 7	12 - 7	11 - 6	10 - 8	10 - 0	9 - 4
SP01	(3) 4x10	15 - 6	14 - 4	13 - 7	12 - 10	12 - 2	11 - 6
SP01	(4) 4x10	17 - 1	15 - 10	14 - 10	14 - 2	13 - 7	13 - 1
SP01	(1) 4x12	11 - 9	10 - 7	9 - 8	9 - 0	8 - 4	7 - 10
SP01	(2) 4x12	16 - 6	14 - 10	13 - 7	12 - 8	11 - 9	11 - 2
SP01	(3) 4x12	18 - 10	17 - 6	16 - 6	15 - 4	14 - 6	13 - 7
SP01	(4) 4x12	20 - 9	19 - 3	18 - 2	17 - 3	16 - 6	15 - 8

DEPARTMENT OF PLANNING AND NATURAL RESOURCES
BY COMMISSIONER: DAWN L. HENRY
DRAWING TITLE: FLOOR BEAM DESIGN TABLE C

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:
A-11
Sheet Number 11 of 45

FLOOR BEAM BEAM ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 15 PSF
Live Load: 40 PSF
Deflection Limits: Δ_{LL} = L/360, Δ_{TL} = L/240
Limits and Assumption: See Appendix General Notes

Wood Species	Plys - Beam Size (Nominal)	Governing Span (ft-in)					
		8' Tributary Width	10' Tributary Width	12' Tributary Width	14' Tributary Width	16' Tributary Width	18' Tributary Width
SP02	(1) 2x8	4 - 7	4 - 1	3 - 9	3 - 6	3 - 3	3 - 1
SP02	(2) 2x8	6 - 6	5 - 9	5 - 3	4 - 10	4 - 7	4 - 3
SP02	(3) 2x8	7 - 10	7 - 1	6 - 6	6 - 0	5 - 7	5 - 3
SP02	(4) 2x8	9 - 2	8 - 2	7 - 6	6 - 10	6 - 6	6 - 1
SP02	(1) 2x10	5 - 6	4 - 10	4 - 6	4 - 1	3 - 10	3 - 7
SP02	(2) 2x10	7 - 8	6 - 10	6 - 3	5 - 9	5 - 6	5 - 2
SP02	(3) 2x10	9 - 4	8 - 4	7 - 8	7 - 1	6 - 8	6 - 3
SP02	(4) 2x10	10 - 9	9 - 8	8 - 10	8 - 2	7 - 8	7 - 3
SP02	(1) 2x12	6 - 4	5 - 9	5 - 3	4 - 10	4 - 7	4 - 3
SP02	(2) 2x12	9 - 1	8 - 1	7 - 4	6 - 10	6 - 4	6 - 1
SP02	(3) 2x12	11 - 1	9 - 10	9 - 1	8 - 4	7 - 10	7 - 4
SP02	(4) 2x12	12 - 8	11 - 4	10 - 4	9 - 8	9 - 1	8 - 7
SP02	(1) 3x8	5 - 10	5 - 3	4 - 10	4 - 6	4 - 2	4 - 0
SP02	(2) 3x8	8 - 4	7 - 6	6 - 10	6 - 3	5 - 10	5 - 7
SP02	(3) 3x8	10 - 2	9 - 2	8 - 4	7 - 9	7 - 3	6 - 10
SP02	(4) 3x8	11 - 6	10 - 6	9 - 7	8 - 10	8 - 4	7 - 10
SP02	(1) 3x10	7 - 0	6 - 3	5 - 9	5 - 3	5 - 0	4 - 8
SP02	(2) 3x10	9 - 10	8 - 10	8 - 1	7 - 6	7 - 0	6 - 7
SP02	(3) 3x10	12 - 1	10 - 9	9 - 10	9 - 2	8 - 7	8 - 1
SP02	(4) 3x10	13 - 10	12 - 6	11 - 4	10 - 7	9 - 10	9 - 4
SP02	(1) 3x12	8 - 3	7 - 4	6 - 9	6 - 3	5 - 10	5 - 6
SP02	(2) 3x12	11 - 8	10 - 4	9 - 7	8 - 10	8 - 3	7 - 9
SP02	(3) 3x12	14 - 2	12 - 8	11 - 8	10 - 9	10 - 1	9 - 7
SP02	(4) 3x12	16 - 3	14 - 7	13 - 4	12 - 4	11 - 8	11 - 0
SP02	(1) 4x8	7 - 4	6 - 7	6 - 0	5 - 7	5 - 2	4 - 10
SP02	(2) 4x8	10 - 2	9 - 3	8 - 6	7 - 10	7 - 4	6 - 10
SP02	(3) 4x8	11 - 8	10 - 9	10 - 2	9 - 7	9 - 0	8 - 6
SP02	(4) 4x8	12 - 9	11 - 10	11 - 2	10 - 7	10 - 2	9 - 9
SP02	(1) 4x10	8 - 8	7 - 9	7 - 1	6 - 7	6 - 2	5 - 9
SP02	(2) 4x10	12 - 3	11 - 0	10 - 1	9 - 3	8 - 8	8 - 2
SP02	(3) 4x10	14 - 10	13 - 4	12 - 3	11 - 4	10 - 8	10 - 1
SP02	(4) 4x10	16 - 4	15 - 2	14 - 1	13 - 1	12 - 3	11 - 7
SP02	(1) 4x12	10 - 3	9 - 2	8 - 4	7 - 9	7 - 3	6 - 10
SP02	(2) 4x12	14 - 4	12 - 10	11 - 9	11 - 0	10 - 3	9 - 8
SP02	(3) 4x12	17 - 6	15 - 8	14 - 4	13 - 4	12 - 6	11 - 9
SP02	(4) 4x12	19 - 10	18 - 1	16 - 6	15 - 4	14 - 4	13 - 7

DEPARTMENT OF PLANNING AND NATURAL RESOURCES
BY COMMISSIONER: DAWN L. HENRY
DRAWING TITLE: FLOOR BEAM DESIGN TABLE D

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:
A-12
Sheet Number 12 of 45

FLOOR JOIST ALLOWABLE SPANS
USVI

Date: 3/6/2018	Dead Load: 15 PSF
Governing Code: 2018 IBC/ASCE 7-16	Live Load: 40 PSF
Risk Category: II	Deflection Limits: Δ_{LL} = L/360
Base Wind Speed: 165 MPH	Limits and Assumption: See Appendix General Notes

Governing Span (ft-in)

Nominal Depth (in)	Wood Species	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
		Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
6	DFL1	10 - 11	9 - 11	9 - 4	8 - 8	12 - 11	11 - 9	11 - 1	10 - 3	14 - 6	13 - 2	12 - 4	11 - 6
8	DFL1	14 - 5	13 - 1	12 - 3	11 - 2	17 - 1	15 - 6	14 - 7	13 - 6	19 - 1	17 - 4	16 - 4	15 - 2
10	DFL1	18 - 4	16 - 7	15 - 2	13 - 7	21 - 9	19 - 9	18 - 7	17 - 3	24 - 4	22 - 2	20 - 10	19 - 4
12	DFL1	22 - 0	19 - 2	17 - 7	15 - 9	26 - 0	24 - 1	22 - 6	20 - 2	26 - 0	26 - 0	25 - 4	23 - 6
6	DFL2	10 - 8	9 - 8	9 - 2	8 - 4	12 - 8	11 - 6	10 - 10	10 - 1	14 - 2	12 - 11	12 - 1	11 - 3
8	DFL2	14 - 1	12 - 10	11 - 10	10 - 7	16 - 9	15 - 2	14 - 3	13 - 3	18 - 8	17 - 0	16 - 0	14 - 10
10	DFL2	18 - 0	15 - 9	14 - 5	12 - 11	21 - 4	19 - 5	18 - 3	16 - 7	23 - 10	21 - 8	20 - 5	18 - 11
12	DFL2	20 - 11	18 - 2	16 - 8	14 - 11	26 - 0	23 - 3	21 - 4	19 - 2	26 - 0	26 - 0	24 - 10	23 - 1
6	SP01	10 - 8	9 - 8	9 - 2	8 - 6	12 - 8	11 - 6	10 - 10	10 - 1	14 - 2	12 - 11	12 - 1	11 - 3
8	SP01	14 - 1	12 - 10	12 - 0	11 - 2	16 - 9	15 - 2	14 - 3	13 - 3	18 - 8	17 - 0	16 - 0	14 - 10
10	SP01	18 - 0	16 - 2	14 - 10	13 - 3	21 - 4	19 - 5	18 - 3	16 - 11	23 - 10	21 - 8	20 - 5	18 - 11
12	SP01	21 - 11	19 - 2	17 - 6	15 - 9	26 - 0	23 - 7	22 - 2	20 - 2	26 - 0	26 - 0	24 - 10	23 - 1
6	SP02	10 - 3	9 - 3	8 - 7	7 - 9	12 - 1	11 - 0	10 - 4	9 - 7	13 - 7	12 - 4	11 - 7	10 - 9
8	SP02	13 - 6	11 - 11	10 - 11	9 - 9	16 - 0	14 - 6	13 - 8	12 - 7	17 - 11	16 - 3	15 - 3	14 - 2
10	SP02	16 - 3	14 - 1	12 - 11	11 - 7	20 - 5	18 - 1	16 - 7	14 - 10	22 - 10	20 - 9	19 - 5	17 - 6
12	SP02	19 - 6	16 - 7	15 - 2	13 - 7	24 - 2	21 - 2	19 - 5	17 - 5	26 - 0	24 - 9	22 - 9	20 - 6

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: FLOOR JOIST DESIGN TABLE

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-13

Sheet Number 13 of 45

STUDS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes

Governing Span (ft-in)

Wood Species	Size	Exposure B, Kzt = 1.0				Exposure B, Kzt = 2.0				Exposure D, Kzt = 1.0			
		Spacing				Spacing				Spacing			
		12"	16"	19.2"	24"	12"	16"	19.2"	24"	12"	16"	19.2"	24"
DFL1	2x4	6 - 10	6 - 3	5 - 9	5 - 1	5 - 5	4 - 11	4 - 8	4 - 4	5 - 9	5 - 3	4 - 11	4 - 6
DFL1	2x6	10 - 10	9 - 11	9 - 6	8 - 6	8 - 7	7 - 10	7 - 4	6 - 10	9 - 2	8 - 4	7 - 11	7 - 4
DFL1	2x8	14 - 3	13 - 4	12 - 8	11 - 8	11 - 4	10 - 3	9 - 5	8 - 6	12 - 2	11 - 1	10 - 5	9 - 5
DFL1	3x4	6 - 10	6 - 10	6 - 8	6 - 0	6 - 5	5 - 10	5 - 6	5 - 2	6 - 10	6 - 3	5 - 11	5 - 6
DFL1	3x6	10 - 10	10 - 10	10 - 10	10 - 7	10 - 2	9 - 4	8 - 10	8 - 3	10 - 10	10 - 0	9 - 5	8 - 10
DFL1	3x8	14 - 3	14 - 3	14 - 3	14 - 3	13 - 7	12 - 6	11 - 10	10 - 10	14 - 3	13 - 4	12 - 8	11 - 11
DFL1	4x4	6 - 10	6 - 10	6 - 10	6 - 10	6 - 10	6 - 7	6 - 2	5 - 9	6 - 10	6 - 10	6 - 7	6 - 2
DFL1	4x6	10 - 10	10 - 10	10 - 10	10 - 10	10 - 10	10 - 6	9 - 11	9 - 4	10 - 10	10 - 10	10 - 7	10 - 0
DFL1	4x8	14 - 3	14 - 3	14 - 3	14 - 3	14 - 3	14 - 1	13 - 5	12 - 8	14 - 3	14 - 3	14 - 3	13 - 6
DFL2	2x4	6 - 9	5 - 11	5 - 5	4 - 10	5 - 4	4 - 10	4 - 7	4 - 3	5 - 8	5 - 2	4 - 10	4 - 5
DFL2	2x6	10 - 7	9 - 9	9 - 3	8 - 4	8 - 5	7 - 8	7 - 2	6 - 6	8 - 11	8 - 2	7 - 8	7 - 2
DFL2	2x8	14 - 2	13 - 1	12 - 5	11 - 5	11 - 2	9 - 8	8 - 11	8 - 0	11 - 11	10 - 9	9 - 10	8 - 11
DFL2	3x4	6 - 10	6 - 10	6 - 7	5 - 11	6 - 4	5 - 9	5 - 5	5 - 0	6 - 9	6 - 1	5 - 9	5 - 4
DFL2	3x6	10 - 10	10 - 10	10 - 10	10 - 4	10 - 0	9 - 2	8 - 7	7 - 10	10 - 8	9 - 9	9 - 3	8 - 7
DFL2	3x8	14 - 3	14 - 3	14 - 3	14 - 0	13 - 4	12 - 3	11 - 3	10 - 3	14 - 2	13 - 1	12 - 4	11 - 4
DFL2	4x4	6 - 10	6 - 10	6 - 10	6 - 10	6 - 10	6 - 5	6 - 1	5 - 8	6 - 10	6 - 10	6 - 5	6 - 1
DFL2	4x6	10 - 10	10 - 10	10 - 10	10 - 10	10 - 10	10 - 3	9 - 9	9 - 1	10 - 10	10 - 10	10 - 5	9 - 9
DFL2	4x8	14 - 3	14 - 3	14 - 3	14 - 3	14 - 3	13 - 9	13 - 1	12 - 4	14 - 3	14 - 3	14 - 0	13 - 3
SP01	2x4	6 - 9	6 - 0	5 - 6	4 - 11	5 - 4	4 - 10	4 - 7	4 - 3	5 - 8	5 - 2	4 - 10	4 - 6
SP01	2x6	10 - 7	9 - 9	9 - 3	8 - 6	8 - 5	7 - 8	7 - 3	6 - 9	8 - 11	8 - 2	7 - 9	7 - 3
SP01	2x8	14 - 2	13 - 1	12 - 6	11 - 8	11 - 2	10 - 2	9 - 7	8 - 8	11 - 11	10 - 11	10 - 4	9 - 8
SP01	3x4	6 - 10	6 - 10	6 - 8	6 - 0	6 - 4	5 - 9	5 - 5	5 - 0	6 - 9	6 - 1	5 - 9	5 - 4
SP01	3x6	10 - 10	10 - 10	10 - 10	10 - 4	10 - 0	9 - 2	8 - 8	8 - 1	10 - 8	9 - 9	9 - 3	8 - 8
SP01	3x8	14 - 3	14 - 3	14 - 3	14 - 0	13 - 4	12 - 3	11 - 7	10 - 10	14 - 2	13 - 1	12 - 5	11 - 8
SP01	4x4	6 - 10	6 - 10	6 - 10	6 - 10	6 - 10	6 - 5	6 - 1	5 - 8	6 - 10	6 - 10	6 - 5	6 - 1
SP01	4x6	10 - 10	10 - 10	10 - 10	10 - 10	10 - 10	10 - 3	9 - 9	9 - 2	10 - 10	10 - 10	10 - 5	9 - 10
SP01	4x8	14 - 3	14 - 3	14 - 3	14 - 3	14 - 3	13 - 9	13 - 2	12 - 4	14 - 3	14 - 3	14 - 0	13 - 3
SP02	2x4	6 - 5	5 - 9	5 - 3	4 - 8	5 - 1	4 - 7	4 - 4	4 - 0	5 - 5	4 - 11	4 - 8	4 - 3
SP02	2x6	10 - 2	9 - 4	8 - 10	8 - 0	8 - 0	7 - 3	6 - 8	6 - 0	8 - 7	7 - 9	7 - 4	6 - 7
SP02	2x8	13 - 7	12 - 5	11 - 9	10 - 10	10 - 3	8 - 11	8 - 2	7 - 5	11 - 3	9 - 10	9 - 1	8 - 2
SP02	3x4	6 - 10	6 - 10	6 - 4	5 - 8	6 - 0	5 - 6	5 - 2	4 - 8	6 - 5	5 - 10	5 - 6	5 - 1
SP02	3x6	10 - 10	10 - 10	10 - 6	9 - 11	9 - 6	8 - 8	8 - 0	7 - 3	10 - 2	9 - 4	8 - 9	8 - 0
SP02	3x8	14 - 3	14 - 3	14 - 2	13 - 5	12 - 8	11 - 3	10 - 4	9 - 4	13 - 7	12 - 5	11 - 6	10 - 5
SP02	4x4	6 - 10	6 - 10	6 - 10	6 - 9	6 - 9	6 - 2	5 - 9	5 - 5	6 - 10	6 - 7	6 - 2	5 - 9
SP02	4x6	10 - 10	10 - 10	10 - 10	10 - 10	10 - 8	9 - 10	9 - 3	8 - 8	10 - 10	10 - 5	9 - 11	9 - 3
SP02	4x8	14 - 3	14 - 3	14 - 3	14 - 3	14 - 3	13 - 1	12 - 5	11 - 4	14 - 3	14 - 0	13 - 4	12 - 6

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: WALL STUD DESIGN TABLE

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-14

Sheet Number 14 of 45

ROOF BEAMS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/240
Limits and Assumption: See Appendix General Notes

Governing Span (ft-in)

Member Size and Plys	Wood Species	Slope	Exposure B, K_{zt} = 1.0						Exposure B, K_{zt} = 2.0						Exposure D, K_{zt} = 1.0					
			Tributary Width						Tributary Width						Tributary Width					
			10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft
(1) 2x8	DFL1	2:12 to 4:12	8 - 5	7 - 8	7 - 1	6 - 7	6 - 3	5 - 11	5 - 7	5 - 1	4 - 9	4 - 5	4 - 2	3 - 11	6 - 2	5 - 8	5 - 3	4 - 11	4 - 7	4 - 5
(2) 2x8	DFL1	2:12 to 4:12	11 - 3	10 - 7	10 - 0	9 - 5	8 - 10	8 - 5	7 - 11	7 - 3	6 - 9	6 - 3	5 - 11	5 - 7	8 - 10	8 - 1	7 - 5	7 - 0	6 - 7	6 - 3
(3) 2x8	DFL1	2:12 to 4:12	12 - 10	12 - 1	11 - 6	11 - 0	10 - 7	10 - 2	9 - 9	8 - 11	8 - 3	7 - 8	7 - 3	6 - 11	10 - 6	9 - 10	9 - 2	8 - 7	8 - 1	7 - 8
(4) 2x8	DFL1	2:12 to 4:12	14 - 2	13 - 4	12 - 8	12 - 1	11 - 8	11 - 3	10 - 10	10 - 2	9 - 6	8 - 11	8 - 5	7 - 11	11 - 7	10 - 11	10 - 4	9 - 10	9 - 4	8 - 10
(1) 2x10	DFL1	2:12 to 4:12	10 - 2	9 - 3	8 - 7	8 - 0	7 - 7	7 - 2	6 - 9	6 - 2	5 - 9	5 - 4	5 - 1	4 - 10	7 - 7	6 - 11	6 - 5	6 - 0	5 - 7	5 - 4
(2) 2x10	DFL1	2:12 to 4:12	14 - 4	13 - 2	12 - 3	11 - 5	10 - 10	10 - 3	9 - 8	8 - 10	8 - 2	7 - 8	7 - 3	6 - 10	10 - 9	9 - 10	9 - 1	8 - 6	8 - 0	7 - 7
(3) 2x10	DFL1	2:12 to 4:12	16 - 5	15 - 6	14 - 8	14 - 0	13 - 3	12 - 7	11 - 10	10 - 10	10 - 1	9 - 5	8 - 10	8 - 5	13 - 2	12 - 0	11 - 2	10 - 5	9 - 10	9 - 4
(4) 2x10	DFL1	2:12 to 4:12	18 - 1	17 - 0	16 - 2	15 - 6	14 - 10	14 - 4	13 - 8	12 - 6	11 - 7	10 - 10	10 - 3	9 - 8	14 - 10	13 - 10	12 - 10	12 - 0	11 - 4	10 - 9
(1) 2x12	DFL1	2:12 to 4:12	11 - 9	10 - 9	9 - 11	9 - 4	8 - 9	8 - 4	7 - 10	7 - 2	6 - 8	6 - 3	5 - 10	5 - 7	8 - 9	8 - 0	7 - 5	6 - 11	6 - 6	6 - 2
(2) 2x12	DFL1	2:12 to 4:12	16 - 8	15 - 3	14 - 2	13 - 3	12 - 6	11 - 11	11 - 3	10 - 3	9 - 6	8 - 11	8 - 5	7 - 11	12 - 6	11 - 5	10 - 7	9 - 11	9 - 4	8 - 10
(3) 2x12	DFL1	2:12 to 4:12	20 - 0	18 - 7	17 - 3	16 - 2	15 - 4	14 - 6	13 - 9	12 - 7	11 - 8	10 - 11	10 - 3	9 - 9	15 - 3	13 - 11	12 - 11	12 - 1	11 - 5	10 - 10
(4) 2x12	DFL1	2:12 to 4:12	22 - 0	20 - 9	19 - 8	18 - 8	17 - 7	16 - 9	15 - 10	14 - 6	13 - 5	12 - 7	11 - 10	11 - 3	17 - 6	16 - 0	14 - 11	13 - 11	13 - 2	12 - 6
(1) 2x14	DFL1	2:12 to 4:12	13 - 1	12 - 0	11 - 1	10 - 4	9 - 9	9 - 3	8 - 9	8 - 0	7 - 5	6 - 11	6 - 6	6 - 2	9 - 9	8 - 11	8 - 3	7 - 8	7 - 3	6 - 11
(2) 2x14	DFL1	2:12 to 4:12	18 - 7	17 - 0	15 - 10	14 - 10	14 - 0	13 - 3	12 - 6	11 - 5	10 - 7	9 - 11	9 - 4	8 - 11	13 - 11	12 - 9	11 - 9	11 - 0	10 - 5	9 - 10
(3) 2x14	DFL1	2:12 to 4:12	22 - 7	20 - 9	19 - 3	18 - 1	17 - 1	16 - 2	15 - 4	14 - 0	13 - 0	12 - 2	11 - 6	10 - 11	17 - 0	15 - 6	14 - 5	13 - 6	12 - 9	12 - 1
(4) 2x14	DFL1	2:12 to 4:12	25 - 0	23 - 9	22 - 1	20 - 9	19 - 7	18 - 8	17 - 8	16 - 2	15 - 0	14 - 0	13 - 3	12 - 7	19 - 6	17 - 11	16 - 7	15 - 7	14 - 8	13 - 11
(1) 3x8	DFL1	2:12 to 4:12	10 - 7	9 - 11	9 - 2	8 - 7	8 - 1	7 - 8	7 - 3	6 - 7	6 - 1	5 - 9	5 - 5	5 - 1	8 - 1	7 - 4	6 - 10	6 - 4	6 - 0	5 - 8
(1) 3x10	DFL1	2:12 to 4:12	13 - 2	12 - 1	11 - 2	10 - 5	9 - 10	9 - 4	8 - 10	8 - 1	7 - 6	7 - 0	6 - 7	6 - 3	9 - 10	9 - 0	8 - 4	7 - 9	7 - 4	6 - 11
(1) 3x12	DFL1	2:12 to 4:12	15 - 3	13 - 11	12 - 11	12 - 1	11 - 5	10 - 10	10 - 3	9 - 4	8 - 8	8 - 1	7 - 8	7 - 3	11 - 4	10 - 5	9 - 8	9 - 0	8 - 6	8 - 1
(1) 3x14	DFL1	2:12 to 4:12	17 - 0	15 - 7	14 - 5	13 - 6	12 - 9	12 - 1	11 - 5	10 - 5	9 - 8	9 - 1	8 - 6	8 - 1	12 - 8	11 - 7	10 - 9	10 - 1	9 - 6	9 - 0
(1) 4x8	DFL1	2:12 to 4:12	11 - 10	11 - 2	10 - 7	10 - 1	9 - 9	9 - 5	8 - 11	8 - 2	7 - 7	7 - 1	6 - 8	6 - 4	9 - 8	9 - 1	8 - 5	7 - 10	7 - 5	7 - 0
(1) 4x10	DFL1	2:12 to 4:12	15 - 1	14 - 3	13 - 6	12 - 11	12 - 2	11 - 7	10 - 11	10 - 0	9 - 3	8 - 8	8 - 2	7 - 9	12 - 2	11 - 1	10 - 3	9 - 7	9 - 1	8 - 7
(1) 4x12	DFL1	2:12 to 4:12	18 - 5	17 - 3	16 - 0	15 - 0	14 - 2	13 - 5	12 - 9	11 - 7	10 - 9	10 - 1	9 - 6	9 - 0	14 - 1	12 - 11	11 - 11	11 - 2	10 - 7	10 - 0
(1) 4x14	DFL1	2:12 to 4:12	21 - 2	19 - 4	18 - 0	16 - 10	15 - 11	15 - 1	14 - 3	13 - 0	12 - 1	11 - 4	10 - 8	10 - 1	15 - 10	14 - 6	13 - 5	12 - 7	11 - 10	11 - 3
(1) 2x8	DFL2	2:12 to 4:12	7 - 11	7 - 3	6 - 8	6 - 3	5 - 11	5 - 7	5 - 3	4 - 10	4 - 6	4 - 2	3 - 11	3 - 9	5 - 10	5 - 4	5 - 0	4 - 8	4 - 4	4 - 2
(2) 2x8	DFL2	2:12 to 4:12	11 - 0	10 - 3	9 - 6	8 - 11	8 - 5	8 - 0	7 - 6	6 - 11	6 - 4	5 - 11	5 - 7	5 - 4	8 - 4	7 - 8	7 - 1	6 - 7	6 - 3	5 - 11
(3) 2x8	DFL2	2:12 to 4:12	12 - 7	11 - 10	11 - 3	10 - 9	10 - 3	9 - 9	9 - 3	8 - 5	7 - 10	7 - 4	6 - 11	6 - 6	10 - 3	9 - 4	8 - 8	8 - 1	7 - 8	7 - 3
(4) 2x8	DFL2	2:12 to 4:12	13 - 11	13 - 1	12 - 5	11 - 10	11 - 5	11 - 0	10 - 7	9 - 9	9 - 0	8 - 5	7 - 11	7 - 6	11 - 4	10 - 8	10 - 0	9 - 4	8 - 10	8 - 5
(1) 2x10	DFL2	2:12 to 4:12	9 - 8	8 - 10	8 - 2	7 - 8	7 - 2	6 - 10	6 - 5	5 - 11	5 - 5	5 - 1	4 - 10	4 - 7	7 - 2	6 - 6	6 - 1	5 - 8	5 - 4	5 - 1
(2) 2x10	DFL2	2:12 to 4:12	13 - 8	12 - 6	11 - 7	10 - 10	10 - 3	9 - 9	9 - 2	8 - 5	7 - 9	7 - 3	6 - 10	6 - 6	10 - 2	9 - 4	8 - 8	8 - 1	7 - 7	7 - 3
(3) 2x10	DFL2	2:12 to 4:12	16 - 1	15 - 2	14 - 2	13 - 3	12 - 6	11 - 11	11 - 3	10 - 3	9 - 6	8 - 11	8 - 5	8 - 0	12 - 6	11 - 5	10 - 7	9 - 11	9 - 4	8 - 10
(4) 2x10	DFL2	2:12 to 4:12	17 - 9	16 - 8	15 - 10	15 - 2	14 - 5	13 - 9	13 - 0	11 - 10	11 - 0	10 - 3	9 - 8	9 - 2	14 - 4	13 - 2	12 - 2	11 - 5	10 - 9	10 - 3
(1) 2x12	DFL2	2:12 to 4:12	11 - 2	10 - 2	9 - 5	8 - 10	8 - 4	7 - 11	7 - 6	6 - 10	6 - 4	5 - 11	5 - 7	5 - 3	8 - 3	7 - 7	7 - 0	6 - 7	6 - 2	5 - 10
(2) 2x12	DFL2	2:12 to 4:12	15 - 10	14 - 6	13 - 5	12 - 7	11 - 10	11 - 3	10 - 8	9 - 9	9 - 0	8 - 5	7 - 11	7 - 7	11 - 10	10 - 10	10 - 0	9 - 4	8 - 10	8 - 5
(3) 2x12	DFL2	2:12 to 4:12	19 - 3	17 - 8	16 - 5	15 - 4	14 - 6	13 - 9	13 - 0	11 - 11	11 - 0	10 - 4	9 - 9	9 - 3	14 - 5	13 - 3	12 - 3	11 - 6	10 - 10	10 - 3
(4) 2x12	DFL2	2:12 to 4:12	21 - 7	20 - 3	18 - 10	17 - 8	16 - 8	15 - 10	15 - 0	13 - 9	12 - 9	11 - 11	11 - 3	10 - 8	16 - 7	15 - 3	14 - 1	13 - 3	12 - 6	11 - 10
(1) 2x14	DFL2	2:12 to 4:12	12 - 5	11 - 4	10 - 6	9 - 10	9 - 3	8 - 10	8 - 4	7 - 7	7 - 0	6 - 7	6 - 2	5 - 11	9 - 3	8 - 5	7 - 10	7 - 4	6 - 11	6 - 7
(2) 2x14	DFL2	2:12 to 4:12	17 - 8	16 - 2	15 - 0	14 - 0	13 - 3	12 - 7	11 - 11	10 - 10	10 - 1	9 - 5	8 - 11	8 - 5	13 - 2	12 - 1	11 - 2	10 - 6	9 - 10	9 - 4
(3) 2x14	DFL2	2:12 to 4:12	21 - 6	19 - 8	18 - 3	17 - 2	16 - 2	15 - 4	14 - 6	13 - 3	12 - 4	11 - 6	10 - 11	10 - 4	16 - 1	14 - 9	13 - 8	12 - 10	12 - 1	11 - 6
(4) 2x14	DFL2	2:12 to 4:12	24 - 7	22 - 7	21 - 0	19 - 8	18 - 7	17 - 8	16 - 9	15 - 4	14 - 2	13 - 4	12 - 7	11 - 11	18 - 6	17 - 0	15 - 9	14 - 9	13 - 11	13 - 3
(1) 3x8	DFL2	2:12 to 4:12	10 - 3	9 - 5	8 - 8	8 - 2	7 - 8	7 - 3	6 - 10	6 - 3	5 - 10	5 - 5	5 - 1	4 - 10	7 - 8	7 - 0	6 - 5	6 - 0	5 - 8	5 - 5
(1) 3x10	DFL2	2:12 to 4:12	12 - 6	11 - 5	10 - 7	9 - 11	9 - 4	8 - 11	8 - 5	7 - 8	7 - 1	6 - 8	6 - 3	5 - 11	9 - 4	8 - 6	7 - 11	7 - 4	6 - 11	6 - 7
(1) 3x12	DFL2	2:12 to 4:12	14 - 6	13 - 3	12 - 3	11 - 6	10 - 10	10 - 3	9 - 9	8 - 11	8 - 3	7 - 8	7 - 3	6 - 11	10 - 9	9 - 10	9 - 2	8 - 7	8 - 1	7 - 8
(1) 3x14	DFL2	2:12 to 4:12	22 - 7	20 - 8	19 - 3	18 - 0	17 - 0	16 - 2	15 - 4	14 - 0	13 - 0	12 - 2	11 - 6	10 - 11	16 - 11	15 - 6	14 - 5	13 - 6	12 - 9	12 - 1
(1) 4x8	DFL2	2:12 to 4:12	11 - 7	10 - 11	10 - 4	9 - 11	9 - 5	9 - 0	8 - 6	7 - 9	7 - 2	6 - 8	6 - 4	6 - 0	9 - 5	8 - 7	7 - 11	7 - 5	7 - 0	6 - 8
(1) 4x10	DFL2	2:12 to 4:12	14 - 10	13 - 11	13 - 1	12 - 3	11 - 7	11 - 0	10 - 4	9 - 6	8 - 9	8 - 3	7 - 9	7 - 4	11 - 6	10 - 6	9 - 9	9 - 1	8 - 7	8 - 2
(1) 4x12	DFL2	2:12 to 4:12	17 - 11	16 - 5	15 - 2	14 - 3	13 - 5	12 - 9	12 - 1	11 - 0	10 - 3	9 - 7	9 - 0	8 - 7	13 - 5	12 - 3	11 - 4	10 - 7	10 - 0	9 - 6
(1) 4x14	DFL2	2:12 to 4:12	25 - 0	25 - 0	23 - 10	22 - 4	21 - 1	20 - 1	19 - 0	17 - 5	16 - 2	15 - 1	14 - 3	13 - 7	21 - 0	19 - 3	17 - 11	16 - 9	15 - 10	15 - 0

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: ROOF BEAM DESIGN TABLE A

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-15

Sheet Number 15 of 45

ROOF BEAMS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/240
Limits and Assumption: See Appendix General Notes

Governing Span (ft-in)

Member Size and Plys	Wood Species	Slope	Exposure B, K_{zt} = 1.0						Exposure B, K_{zt} = 2.0						Exposure D, K_{zt} = 1.0					
			Tributary Width						Tributary Width						Tributary Width					
			10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft
(1) 2x8	SP01	2:12 to 4:12	8 - 6	7 - 9	7 - 2	6 - 9	6 - 4	6 - 0	5 - 8	5 - 2	4 - 10	4 - 6	4 - 3	4 - 0	6 - 4	5 - 9	5 - 4	5 - 0	4 - 8	4 - 5
(2) 2x8	SP01	2:12 to 4:12	11 - 0	10 - 4	9 - 10	9 - 5	9 - 0	8 - 7	8 - 1	7 - 5	6 - 10	6 - 5	6 - 0	5 - 9	9 - 0	8 - 3	7 - 7	7 - 1	6 - 9	6 - 4
(3) 2x8	SP01	2:12 to 4:12	12 - 7	11 - 10	11 - 3	10 - 9	10 - 4	10 - 0	9 - 7	9 - 1	8 - 5	7 - 10	7 - 5	7 - 0	10 - 4	9 - 9	9 - 3	8 - 9	8 - 3	7 - 10
(4) 2x8	SP01	2:12 to 4:12	13 - 11	13 - 1	12 - 5	11 - 10	11 - 5	11 - 0	10 - 7	10 - 0	9 - 6	9 - 1	8 - 7	8 - 1	11 - 4	10 - 8	10 - 2	9 - 9	9 - 4	9 - 0
(1) 2x10	SP01	2:12 to 4:12	9 - 11	9 - 1	8 - 5	7 - 10	7 - 5	7 - 0	6 - 8	6 - 1	5 - 7	5 - 3	4 - 11	4 - 8	7 - 4	6 - 9	6 - 3	5 - 10	5 - 6	5 - 2
(2) 2x10	SP01	2:12 to 4:12	14 - 1	12 - 11	11 - 11	11 - 2	10 - 7	10 - 0	9 - 6	8 - 8	8 - 0	7 - 6	7 - 1	6 - 8	10 - 6	9 - 7	8 - 11	8 - 4	7 - 10	7 - 5
(3) 2x10	SP01	2:12 to 4:12	16 - 1	15 - 2	14 - 5	13 - 8	12 - 11	12 - 3	11 - 7	10 - 7	9 - 10	9 - 2	8 - 8	8 - 3	12 - 10	11 - 9	10 - 11	10 - 2	9 - 7	9 - 1
(4) 2x10	SP01	2:12 to 4:12	17 - 9	16 - 8	15 - 10	15 - 2	14 - 7	14 - 1	13 - 4	12 - 2	11 - 4	10 - 7	10 - 0	9 - 6	14 - 6	13 - 6	12 - 7	11 - 9	11 - 1	10 - 6
(1) 2x12	SP01	2:12 to 4:12	11 - 9	10 - 8	9 - 11	9 - 3	8 - 9	8 - 4	7 - 10	7 - 2	6 - 8	6 - 2	5 - 10	5 - 7	8 - 9	7 - 11	7 - 4	6 - 11	6 - 6	6 - 2
(2) 2x12	SP01	2:12 to 4:12	16 - 8	15 - 3	14 - 2	13 - 3	12 - 6	11 - 10	11 - 3	10 - 3	9 - 6	8 - 11	8 - 5	7 - 11	12 - 5	11 - 5	10 - 7	9 - 10	9 - 4	8 - 10
(3) 2x12	SP01	2:12 to 4:12	19 - 7	18 - 5	17 - 3	16 - 2	15 - 3	14 - 6	13 - 9	12 - 7	11 - 8	10 - 11	10 - 3	9 - 9	15 - 3	13 - 11	12 - 11	12 - 1	11 - 5	10 - 10
(4) 2x12	SP01	2:12 to 4:12	21 - 7	20 - 4	19 - 3	18 - 5	17 - 7	16 - 8	15 - 10	14 - 5	13 - 5	12 - 7	11 - 10	11 - 3	17 - 6	16 - 0	14 - 10	13 - 11	13 - 2	12 - 6
(1) 2x14	SP01	2:12 to 4:12	12 - 8	11 - 7	10 - 8	10 - 0	9 - 5	9 - 0	8 - 6	7 - 9	7 - 2	6 - 8	6 - 4	6 - 0	9 - 5	8 - 7	7 - 11	7 - 5	7 - 0	6 - 8
(2) 2x14	SP01	2:12 to 4:12	17 - 11	16 - 5	15 - 3	14 - 3	13 - 6	12 - 10	12 - 1	11 - 1	10 - 3	9 - 7	9 - 0	8 - 7	13 - 5	12 - 3	11 - 4	10 - 8	10 - 0	9 - 6
(3) 2x14	SP01	2:12 to 4:12	21 - 10	20 - 0	18 - 7	17 - 5	16 - 5	15 - 8	14 - 9	13 - 6	12 - 6	11 - 9	11 - 1	10 - 6	16 - 5	15 - 0	13 - 11	13 - 0	12 - 3	11 - 8
(4) 2x14	SP01	2:12 to 4:12	24 - 11	22 - 11	21 - 4	20 - 0	18 - 11	18 - 0	17 - 0	15 - 7	14 - 5	13 - 6	12 - 9	12 - 1	18 - 10	17 - 3	16 - 0	15 - 0	14 - 2	13 - 5
(1) 3x8	SP01	2:12 to 4:12	10 - 4	9 - 9	9 - 3	8 - 9	8 - 3	7 - 10	7 - 5	6 - 9	6 - 3	5 - 10	5 - 6	5 - 3	8 - 2	7 - 6	6 - 11	6 - 6	6 - 1	5 - 10
(1) 3x10	SP01	2:12 to 4:12	12 - 10	11 - 9	10 - 11	10 - 2	9 - 8	9 - 2	8 - 8	7 - 11	7 - 4	6 - 10	6 - 5	6 - 1	9 - 7	8 - 9	8 - 1	7 - 7	7 - 2	6 - 9
(1) 3x12	SP01	2:12 to 4:12	15 - 3	13 - 11	12 - 11	12 - 1	11 - 5	10 - 10	10 - 3	9 - 4	8 - 8	8 - 1	7 - 8	7 - 3	11 - 4	10 - 5	9 - 7	9 - 0	8 - 6	8 - 1
(1) 3x14	SP01	2:12 to 4:12	22 - 11	21 - 0	19 - 6	18 - 4	17 - 4	16 - 5	15 - 7	14 - 3	13 - 2	12 - 4	11 - 8	11 - 1	17 - 3	15 - 9	14 - 8	13 - 9	12 - 11	12 - 4
(1) 4x8	SP01	2:12 to 4:12	11 - 7	10 - 11	10 - 4	9 - 11	9 - 6	9 - 2	8 - 10	8 - 4	7 - 9	7 - 3	6 - 10	6 - 6	9 - 6	8 - 11	8 - 6	8 - 1	7 - 7	7 - 3
(1) 4x10	SP01	2:12 to 4:12	14 - 10	13 - 11	13 - 3	12 - 8	11 - 11	11 - 4	10 - 9	9 - 10	9 - 1	8 - 6	8 - 0	7 - 7	11 - 11	10 - 10	10 - 1	9 - 5	8 - 11	8 - 5
(1) 4x12	SP01	2:12 to 4:12	18 - 0	16 - 11	16 - 0	15 - 0	14 - 2	13 - 5	12 - 8	11 - 7	10 - 9	10 - 1	9 - 6	9 - 0	14 - 1	12 - 11	11 - 11	11 - 2	10 - 7	10 - 0
(1) 4x14	SP01	2:12 to 4:12	25 - 0	25 - 0	23 - 11	22 - 7	21 - 4	20 - 4	19 - 3	17 - 7	16 - 4	15 - 4	14 - 5	13 - 9	21 - 3	19 - 6	18 - 1	17 - 0	16 - 0	15 - 3
(1) 2x8	SP02	2:12 to 4:12	7 - 4	6 - 8	6 - 2	5 - 9	5 - 5	5 - 2	4 - 11	4 - 6	4 - 2	3 - 10	3 - 8	3 - 5	5 - 5	4 - 11	4 - 7	4 - 3	4 - 1	3 - 10
(2) 2x8	SP02	2:12 to 4:12	10 - 5	9 - 6	8 - 10	8 - 3	7 - 9	7 - 4	7 - 0	6 - 4	5 - 11	5 - 6	5 - 2	4 - 11	7 - 9	7 - 1	6 - 6	6 - 1	5 - 9	5 - 6
(3) 2x8	SP02	2:12 to 4:12	12 - 1	11 - 4	10 - 9	10 - 1	9 - 6	9 - 0	8 - 6	7 - 9	7 - 3	6 - 9	6 - 4	6 - 0	9 - 6	8 - 8	8 - 0	7 - 6	7 - 1	6 - 9
(4) 2x8	SP02	2:12 to 4:12	13 - 3	12 - 6	11 - 10	11 - 4	10 - 11	10 - 5	9 - 10	9 - 0	8 - 4	7 - 9	7 - 4	7 - 0	10 - 10	10 - 0	9 - 3	8 - 8	8 - 2	7 - 9
(1) 2x10	SP02	2:12 to 4:12	8 - 8	7 - 11	7 - 4	6 - 10	6 - 6	6 - 2	5 - 10	5 - 3	4 - 11	4 - 7	4 - 4	4 - 1	6 - 5	5 - 11	5 - 5	5 - 1	4 - 10	4 - 7
(2) 2x10	SP02	2:12 to 4:12	12 - 3	11 - 3	10 - 5	9 - 9	9 - 2	8 - 9	8 - 3	7 - 6	7 - 0	6 - 6	6 - 2	5 - 10	9 - 2	8 - 5	7 - 9	7 - 3	6 - 10	6 - 6
(3) 2x10	SP02	2:12 to 4:12	15 - 0	13 - 9	12 - 9	11 - 11	11 - 3	10 - 8	10 - 1	9 - 3	8 - 7	8 - 0	7 - 7	7 - 2	11 - 2	10 - 3	9 - 6	8 - 11	8 - 5	7 - 11
(4) 2x10	SP02	2:12 to 4:12	16 - 11	15 - 9	14 - 8	13 - 9	13 - 0	12 - 4	11 - 8	10 - 8	9 - 10	9 - 3	8 - 9	8 - 3	12 - 11	11 - 10	10 - 11	10 - 3	9 - 8	9 - 2
(1) 2x12	SP02	2:12 to 4:12	10 - 2	9 - 4	8 - 7	8 - 1	7 - 7	7 - 3	6 - 10	6 - 3	5 - 9	5 - 5	5 - 1	4 - 10	7 - 7	6 - 11	6 - 5	6 - 0	5 - 8	5 - 4
(2) 2x12	SP02	2:12 to 4:12	14 - 5	13 - 3	12 - 3	11 - 6	10 - 10	10 - 3	9 - 9	8 - 10	8 - 3	7 - 8	7 - 3	6 - 11	10 - 9	9 - 10	9 - 2	8 - 7	8 - 1	7 - 8
(3) 2x12	SP02	2:12 to 4:12	17 - 7	16 - 1	14 - 11	14 - 0	13 - 3	12 - 7	11 - 11	10 - 10	10 - 1	9 - 5	8 - 11	8 - 5	13 - 2	12 - 1	11 - 2	10 - 5	9 - 10	9 - 4
(4) 2x12	SP02	2:12 to 4:12	20 - 2	18 - 6	17 - 2	16 - 1	15 - 3	14 - 6	13 - 8	12 - 6	11 - 7	10 - 10	10 - 3	9 - 9	15 - 2	13 - 10	12 - 10	12 - 1	11 - 4	10 - 10
(1) 2x14	SP02	2:12 to 4:12	11 - 1	10 - 2	9 - 5	8 - 10	8 - 4	7 - 10	7 - 5	6 - 9	6 - 3	5 - 11	5 - 7	5 - 3	8 - 3	7 - 7	7 - 0	6 - 6	6 - 2	5 - 10
(2) 2x14	SP02	2:12 to 4:12	15 - 9	14 - 5	13 - 4	12 - 6	11 - 10	11 - 3	10 - 7	9 - 8	9 - 0	8 - 5	7 - 11	7 - 6	11 - 9	10 - 9	10 - 0	9 - 4	8 - 10	8 - 4
(3) 2x14	SP02	2:12 to 4:12	19 - 1	17 - 6	16 - 3	15 - 3	14 - 5	13 - 8	12 - 11	11 - 10	11 - 0	10 - 3	9 - 8	9 - 2	14 - 4	13 - 2	12 - 2	11 - 5	10 - 9	10 - 3
(4) 2x14	SP02	2:12 to 4:12	21 - 10	20 - 1	18 - 8	17 - 6	16 - 7	15 - 9	14 - 11	13 - 8	12 - 8	11 - 10	11 - 2	10 - 7	16 - 6	15 - 1	14 - 0	13 - 2	12 - 5	11 - 9
(1) 3x8	SP02	2:12 to 4:12	9 - 6	8 - 8	8 - 0	7 - 6	7 - 1	6 - 9	6 - 4	5 - 10	5 - 4	5 - 0	4 - 9	4 - 6	7 - 1	6 - 5	6 - 0	5 - 7	5 - 3	5 - 0
(1) 3x10	SP02	2:12 to 4:12	11 - 3	10 - 3	9 - 6	8 - 11	8 - 5	8 - 0	7 - 6	6 - 11	6 - 4	6 - 0	5 - 7	5 - 4	8 - 4	7 - 8	7 - 1	6 - 7	6 - 3	5 - 11
(1) 3x12	SP02	2:12 to 4:12	13 - 2	12 - 1	11 - 2	10 - 6	9 - 11	9 - 5	8 - 10	8 - 1	7 - 6	7 - 0	6 - 7	6 - 3	9 - 10	9 - 0	8 - 4	7 - 10	7 - 4	7 - 0
(1) 3x14	SP02	2:12 to 4:12	20 - 1	18 - 5	17 - 1	16 - 1	15 - 2	14 - 5	13 - 8	12 - 6	11 - 7	10 - 10	10 - 3	9 - 8	15 - 1	13 - 10	12 - 10	12 - 0	11 - 4	10 - 9
(1) 4x8	SP02	2:12 to 4:12	11 - 1	10 - 5	9 - 11	9 - 4	8 - 10	8 - 4	7 - 11	7 - 2	6 - 8	6 - 3	5 - 11	5 - 7	8 - 9	8 - 0	7 - 5	6 - 11	6 - 6	6 - 2
(1) 4x10	SP02	2:12 to 4:12	13 - 11	12 - 9	11 - 10	11 - 1	10 - 5	9 - 11	9 - 4	8 - 7	7 - 11	7 - 5	7 - 0	6 - 8	10 - 5	9 - 6	8 - 9	8 - 3	7 - 9	7 - 4
(1) 4x12	SP02	2:12 to 4:12	16 - 4	14 - 11	13 - 10	13 - 0	12 - 3	11 - 8	11 - 0	10 - 1	9 - 4	8 - 9	8 - 3	7 - 10	12 - 2	11 - 2	10 - 4	9 - 8	9 - 2	8 - 8
(1) 4x14	SP02	2:12 to 4:12	24 - 7	22 - 8	21 - 1	19 - 9	18 - 8	17 - 9	16 - 10	15 - 5	14 - 4	13 - 5	12 - 8	12 - 0	18 - 8	17 - 1	15 - 10	14 - 10	14 - 0	13 - 4

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: ROOF BEAM DESIGN TABLE B

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-16

Sheet Number 16 of 45

ROOF BEAMS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/240
Limits and Assumption: See Appendix General Notes

Governing Span (ft-in)

Member Size and Plys	Wood Species	Slope	Exposure B, K_{zt} = 1.0						Exposure B, K_{zt} = 2.0						Exposure D, K_{zt} = 1.0					
			Tributary Width						Tributary Width						Tributary Width					
			10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft
(1) 2x8	DFL1	5:12 to 6:12	8 - 5	7 - 8	7 - 1	6 - 7	6 - 3	5 - 11	5 - 7	5 - 1	4 - 9	4 - 5	4 - 2	3 - 11	6 - 3	5 - 8	5 - 3	4 - 11	4 - 7	4 - 5
(2) 2x8	DFL1	5:12 to 6:12	11 - 3	10 - 7	10 - 0	9 - 5	8 - 10	8 - 5	7 - 11	7 - 3	6 - 9	6 - 3	5 - 11	5 - 7	8 - 10	8 - 1	7 - 6	7 - 0	6 - 7	6 - 3
(3) 2x8	DFL1	5:12 to 6:12	12 - 11	12 - 1	11 - 6	11 - 0	10 - 7	10 - 3	9 - 9	8 - 11	8 - 3	7 - 8	7 - 3	6 - 11	10 - 7	9 - 10	9 - 2	8 - 7	8 - 1	7 - 8
(4) 2x8	DFL1	5:12 to 6:12	14 - 2	13 - 4	12 - 8	12 - 1	11 - 8	11 - 3	10 - 10	10 - 2	9 - 6	8 - 11	8 - 5	7 - 11	11 - 7	10 - 11	10 - 4	9 - 10	9 - 4	8 - 10
(1) 2x10	DFL1	5:12 to 6:12	10 - 2	9 - 3	8 - 7	8 - 1	7 - 7	7 - 2	6 - 10	6 - 2	5 - 9	5 - 4	5 - 1	4 - 10	7 - 7	6 - 11	6 - 5	6 - 0	5 - 8	5 - 4
(2) 2x10	DFL1	5:12 to 6:12	14 - 4	13 - 3	12 - 3	11 - 6	10 - 10	10 - 3	9 - 8	8 - 10	8 - 2	7 - 8	7 - 3	6 - 10	10 - 9	9 - 10	9 - 1	8 - 6	8 - 0	7 - 8
(3) 2x10	DFL1	5:12 to 6:12	16 - 5	15 - 6	14 - 8	14 - 0	13 - 3	12 - 7	11 - 10	10 - 10	10 - 1	9 - 5	8 - 10	8 - 5	13 - 2	12 - 0	11 - 2	10 - 5	9 - 10	9 - 4
(4) 2x10	DFL1	5:12 to 6:12	18 - 1	17 - 0	16 - 2	15 - 6	14 - 10	14 - 4	13 - 8	12 - 6	11 - 7	10 - 10	10 - 3	9 - 9	14 - 10	13 - 10	12 - 10	12 - 1	11 - 4	10 - 9
(1) 2x12	DFL1	5:12 to 6:12	11 - 9	10 - 9	9 - 11	9 - 4	8 - 9	8 - 4	7 - 10	7 - 2	6 - 8	6 - 3	5 - 10	5 - 7	8 - 9	8 - 0	7 - 5	6 - 11	6 - 6	6 - 2
(2) 2x12	DFL1	5:12 to 6:12	16 - 8	15 - 3	14 - 2	13 - 3	12 - 6	11 - 11	11 - 3	10 - 3	9 - 6	8 - 11	8 - 5	8 - 0	12 - 6	11 - 5	10 - 7	9 - 11	9 - 4	8 - 10
(3) 2x12	DFL1	5:12 to 6:12	20 - 0	18 - 8	17 - 4	16 - 3	15 - 4	14 - 6	13 - 9	12 - 7	11 - 8	10 - 11	10 - 3	9 - 9	15 - 3	13 - 11	12 - 11	12 - 1	11 - 5	10 - 10
(4) 2x12	DFL1	5:12 to 6:12	22 - 0	20 - 9	19 - 8	18 - 8	17 - 7	16 - 9	15 - 10	14 - 6	13 - 5	12 - 7	11 - 10	11 - 3	17 - 6	16 - 1	14 - 11	13 - 11	13 - 2	12 - 6
(1) 2x14	DFL1	5:12 to 6:12	13 - 1	12 - 0	11 - 1	10 - 5	9 - 9	9 - 3	8 - 9	8 - 0	7 - 5	6 - 11	6 - 6	6 - 2	9 - 9	8 - 11	8 - 3	7 - 9	7 - 3	6 - 11
(2) 2x14	DFL1	5:12 to 6:12	18 - 7	17 - 0	15 - 10	14 - 10	14 - 0	13 - 3	12 - 6	11 - 6	10 - 7	9 - 11	9 - 4	8 - 11	13 - 11	12 - 9	11 - 9	11 - 0	10 - 5	9 - 11
(3) 2x14	DFL1	5:12 to 6:12	22 - 8	20 - 9	19 - 3	18 - 1	17 - 1	16 - 3	15 - 4	14 - 0	13 - 0	12 - 2	11 - 6	10 - 11	17 - 0	15 - 7	14 - 5	13 - 6	12 - 9	12 - 1
(4) 2x14	DFL1	5:12 to 6:12	25 - 0	23 - 10	22 - 2	20 - 9	19 - 7	18 - 8	17 - 8	16 - 2	15 - 0	14 - 0	13 - 3	12 - 7	19 - 6	17 - 11	16 - 7	15 - 7	14 - 8	13 - 11
(1) 3x8	DFL1	5:12 to 6:12	10 - 7	9 - 11	9 - 2	8 - 7	8 - 1	7 - 8	7 - 3	6 - 7	6 - 1	5 - 9	5 - 5	5 - 1	8 - 1	7 - 4	6 - 10	6 - 4	6 - 0	5 - 8
(1) 3x10	DFL1	5:12 to 6:12	13 - 2	12 - 1	11 - 2	10 - 6	9 - 10	9 - 4	8 - 10	8 - 1	7 - 6	7 - 0	6 - 7	6 - 3	9 - 10	9 - 0	8 - 4	7 - 9	7 - 4	6 - 11
(1) 3x12	DFL1	5:12 to 6:12	15 - 3	14 - 0	12 - 11	12 - 1	11 - 5	10 - 10	10 - 3	9 - 4	8 - 8	8 - 1	7 - 8	7 - 3	11 - 5	10 - 5	9 - 8	9 - 0	8 - 6	8 - 1
(1) 3x14	DFL1	5:12 to 6:12	17 - 0	15 - 7	14 - 5	13 - 6	12 - 9	12 - 1	11 - 5	10 - 5	9 - 8	9 - 1	8 - 7	8 - 1	12 - 8	11 - 7	10 - 9	10 - 1	9 - 6	9 - 0
(1) 4x8	DFL1	5:12 to 6:12	11 - 10	11 - 2	10 - 7	10 - 1	9 - 9	9 - 5	8 - 11	8 - 2	7 - 7	7 - 1	6 - 8	6 - 4	9 - 8	9 - 1	8 - 5	7 - 10	7 - 5	7 - 0
(1) 4x10	DFL1	5:12 to 6:12	15 - 1	14 - 3	13 - 6	12 - 11	12 - 2	11 - 7	10 - 11	10 - 0	9 - 3	8 - 8	8 - 2	7 - 9	12 - 2	11 - 1	10 - 3	9 - 7	9 - 1	8 - 7
(1) 4x12	DFL1	5:12 to 6:12	18 - 5	17 - 3	16 - 0	15 - 0	14 - 2	13 - 6	12 - 9	11 - 8	10 - 9	10 - 1	9 - 6	9 - 0	14 - 1	12 - 11	12 - 0	11 - 2	10 - 7	10 - 0
(1) 4x14	DFL1	5:12 to 6:12	21 - 2	19 - 4	18 - 0	16 - 10	15 - 11	15 - 1	14 - 3	13 - 1	12 - 1	11 - 4	10 - 8	10 - 2	15 - 10	14 - 6	13 - 5	12 - 7	11 - 10	11 - 3
(1) 2x8	DFL2	5:12 to 6:12	7 - 11	7 - 3	6 - 8	6 - 3	5 - 11	5 - 7	5 - 3	4 - 10	4 - 6	4 - 2	3 - 11	3 - 9	5 - 11	5 - 4	5 - 0	4 - 8	4 - 4	4 - 2
(2) 2x8	DFL2	5:12 to 6:12	11 - 0	10 - 3	9 - 6	8 - 11	8 - 5	8 - 0	7 - 6	6 - 11	6 - 4	5 - 11	5 - 7	5 - 4	8 - 4	7 - 8	7 - 1	6 - 7	6 - 3	5 - 11
(3) 2x8	DFL2	5:12 to 6:12	12 - 7	11 - 10	11 - 3	10 - 9	10 - 3	9 - 9	9 - 3	8 - 5	7 - 10	7 - 4	6 - 11	6 - 6	10 - 3	9 - 4	8 - 8	8 - 1	7 - 8	7 - 3
(4) 2x8	DFL2	5:12 to 6:12	13 - 11	13 - 1	12 - 5	11 - 10	11 - 5	11 - 0	10 - 7	9 - 9	9 - 0	8 - 5	7 - 11	7 - 7	11 - 5	10 - 8	10 - 0	9 - 4	8 - 10	8 - 5
(1) 2x10	DFL2	5:12 to 6:12	9 - 8	8 - 10	8 - 2	7 - 8	7 - 2	6 - 10	6 - 5	5 - 11	5 - 5	5 - 1	4 - 10	4 - 7	7 - 2	6 - 6	6 - 1	5 - 8	5 - 4	5 - 1
(2) 2x10	DFL2	5:12 to 6:12	13 - 8	12 - 6	11 - 7	10 - 10	10 - 3	9 - 9	9 - 2	8 - 5	7 - 9	7 - 3	6 - 10	6 - 6	10 - 3	9 - 4	8 - 8	8 - 1	7 - 8	7 - 3
(3) 2x10	DFL2	5:12 to 6:12	16 - 1	15 - 2	14 - 2	13 - 4	12 - 7	11 - 11	11 - 3	10 - 3	9 - 6	8 - 11	8 - 5	8 - 0	12 - 6	11 - 5	10 - 7	9 - 11	9 - 4	8 - 10
(4) 2x10	DFL2	5:12 to 6:12	17 - 9	16 - 8	15 - 10	15 - 2	14 - 5	13 - 9	13 - 0	11 - 10	11 - 0	10 - 3	9 - 8	9 - 3	14 - 5	13 - 2	12 - 2	11 - 5	10 - 9	10 - 3
(1) 2x12	DFL2	5:12 to 6:12	11 - 2	10 - 2	9 - 5	8 - 10	8 - 4	7 - 11	7 - 6	6 - 10	6 - 4	5 - 11	5 - 7	5 - 3	8 - 4	7 - 7	7 - 0	6 - 7	6 - 2	5 - 10
(2) 2x12	DFL2	5:12 to 6:12	15 - 10	14 - 6	13 - 5	12 - 7	11 - 11	11 - 3	10 - 8	9 - 9	9 - 0	8 - 5	7 - 11	7 - 7	11 - 10	10 - 10	10 - 0	9 - 4	8 - 10	8 - 5
(3) 2x12	DFL2	5:12 to 6:12	19 - 4	17 - 8	16 - 5	15 - 5	14 - 6	13 - 9	13 - 0	11 - 11	11 - 1	10 - 4	9 - 9	9 - 3	14 - 5	13 - 3	12 - 3	11 - 6	10 - 10	10 - 3
(4) 2x12	DFL2	5:12 to 6:12	21 - 7	20 - 4	18 - 10	17 - 8	16 - 8	15 - 11	15 - 0	13 - 9	12 - 9	11 - 11	11 - 3	10 - 8	16 - 8	15 - 3	14 - 1	13 - 3	12 - 6	11 - 10
(1) 2x14	DFL2	5:12 to 6:12	12 - 5	11 - 4	10 - 6	9 - 10	9 - 4	8 - 10	8 - 4	7 - 7	7 - 0	6 - 7	6 - 3	5 - 11	9 - 3	8 - 5	7 - 10	7 - 4	6 - 11	6 - 7
(2) 2x14	DFL2	5:12 to 6:12	17 - 8	16 - 2	15 - 0	14 - 1	13 - 3	12 - 7	11 - 11	10 - 10	10 - 1	9 - 5	8 - 11	8 - 5	13 - 2	12 - 1	11 - 2	10 - 6	9 - 10	9 - 4
(3) 2x14	DFL2	5:12 to 6:12	21 - 6	19 - 8	18 - 3	17 - 2	16 - 2	15 - 5	14 - 6	13 - 4	12 - 4	11 - 6	10 - 11	10 - 4	16 - 1	14 - 9	13 - 8	12 - 10	12 - 1	11 - 6
(4) 2x14	DFL2	5:12 to 6:12	24 - 7	22 - 7	21 - 0	19 - 8	18 - 7	17 - 8	16 - 9	15 - 4	14 - 2	13 - 4	12 - 7	11 - 11	18 - 6	17 - 0	15 - 9	14 - 9	13 - 11	13 - 3
(1) 3x8	DFL2	5:12 to 6:12	10 - 3	9 - 5	8 - 8	8 - 2	7 - 8	7 - 3	6 - 10	6 - 3	5 - 10	5 - 5	5 - 1	4 - 10	7 - 8	7 - 0	6 - 5	6 - 0	5 - 8	5 - 5
(1) 3x10	DFL2	5:12 to 6:12	12 - 6	11 - 5	10 - 7	9 - 11	9 - 4	8 - 11	8 - 5	7 - 8	7 - 1	6 - 8	6 - 3	5 - 11	9 - 4	8 - 6	7 - 11	7 - 5	6 - 11	6 - 7
(1) 3x12	DFL2	5:12 to 6:12	14 - 6	13 - 3	12 - 3	11 - 6	10 - 10	10 - 4	9 - 9	8 - 11	8 - 3	7 - 8	7 - 3	6 - 11	10 - 10	9 - 10	9 - 2	8 - 7	8 - 1	7 - 8
(1) 3x14	DFL2	5:12 to 6:12	22 - 7	20 - 9	19 - 3	18 - 0	17 - 1	16 - 2	15 - 4	14 - 0	13 - 0	12 - 2	11 - 6	10 - 11	17 - 0	15 - 6	14 - 5	13 - 6	12 - 9	12 - 1
(1) 4x8	DFL2	5:12 to 6:12	11 - 7	10 - 11	10 - 4	9 - 11	9 - 5	9 - 0	8 - 6	7 - 9	7 - 2	6 - 8	6 - 4	6 - 0	9 - 5	8 - 7	8 - 0	7 - 5	7 - 0	6 - 8
(1) 4x10	DFL2	5:12 to 6:12	14 - 10	13 - 11	13 - 1	12 - 3	11 - 7	11 - 0	10 - 5	9 - 6	8 - 9	8 - 3	7 - 9	7 - 4	11 - 6	10 - 6	9 - 9	9 - 2	8 - 7	8 - 2
(1) 4x12	DFL2	5:12 to 6:12	17 - 11	16 - 5	15 - 3	14 - 3	13 - 5	12 - 9	12 - 1	11 - 0	10 - 3	9 - 7	9 - 0	8 - 7	13 - 5	12 - 3	11 - 4	10 - 7	10 - 0	9 - 6
(1) 4x14	DFL2	5:12 to 6:12	25 - 0	25 - 0	23 - 10	22 - 4	21 - 2	20 - 1	19 - 0	17 - 5	16 - 2	15 - 2	14 - 3	13 - 7	21 - 0	19 - 3	17 - 11	16 - 9	15 - 10	15 - 0

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: ROOF BEAM DESIGN TABLE C

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-17

Sheet Number 17 of 45

ROOF BEAMS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/240
Limits and Assumption: See Appendix General Notes

Governing Span (ft-in)

Member Size and Plys	Wood Species	Slope	Exposure B, K_{zt} = 1.0						Exposure B, K_{zt} = 2.0						Exposure D, K_{zt} = 1.0					
			Tributary Width						Tributary Width						Tributary Width					
			10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft
(1) 2x8	SP01	5:12 to 6:12	8 - 6	7 - 9	7 - 2	6 - 9	6 - 4	6 - 0	5 - 8	5 - 2	4 - 10	4 - 6	4 - 3	4 - 0	6 - 4	5 - 9	5 - 4	5 - 0	4 - 8	4 - 5
(2) 2x8	SP01	5:12 to 6:12	11 - 0	10 - 4	9 - 10	9 - 5	9 - 0	8 - 7	8 - 1	7 - 5	6 - 10	6 - 5	6 - 1	5 - 9	9 - 0	8 - 3	7 - 7	7 - 1	6 - 9	6 - 4
(3) 2x8	SP01	5:12 to 6:12	12 - 7	11 - 10	11 - 3	10 - 9	10 - 4	10 - 0	9 - 8	9 - 1	8 - 5	7 - 10	7 - 5	7 - 0	10 - 4	9 - 9	9 - 3	8 - 9	8 - 3	7 - 10
(4) 2x8	SP01	5:12 to 6:12	13 - 11	13 - 1	12 - 5	11 - 10	11 - 5	11 - 0	10 - 7	10 - 0	9 - 6	9 - 1	8 - 7	8 - 1	11 - 5	10 - 8	10 - 2	9 - 9	9 - 4	9 - 0
(1) 2x10	SP01	5:12 to 6:12	9 - 11	9 - 1	8 - 5	7 - 10	7 - 5	7 - 0	6 - 8	6 - 1	5 - 7	5 - 3	4 - 11	4 - 8	7 - 4	6 - 9	6 - 3	5 - 10	5 - 6	5 - 3
(2) 2x10	SP01	5:12 to 6:12	14 - 1	12 - 11	11 - 11	11 - 2	10 - 7	10 - 0	9 - 6	8 - 8	8 - 0	7 - 6	7 - 1	6 - 8	10 - 6	9 - 7	8 - 11	8 - 4	7 - 10	7 - 5
(3) 2x10	SP01	5:12 to 6:12	16 - 1	15 - 2	14 - 5	13 - 8	12 - 11	12 - 3	11 - 7	10 - 7	9 - 10	9 - 2	8 - 8	8 - 3	12 - 10	11 - 9	10 - 11	10 - 2	9 - 7	9 - 2
(4) 2x10	SP01	5:12 to 6:12	17 - 9	16 - 8	15 - 10	15 - 2	14 - 7	14 - 1	13 - 4	12 - 2	11 - 4	10 - 7	10 - 0	9 - 6	14 - 6	13 - 6	12 - 7	11 - 9	11 - 1	10 - 6
(1) 2x12	SP01	5:12 to 6:12	11 - 9	10 - 9	9 - 11	9 - 3	8 - 9	8 - 4	7 - 10	7 - 2	6 - 8	6 - 2	5 - 10	5 - 7	8 - 9	8 - 0	7 - 4	6 - 11	6 - 6	6 - 2
(2) 2x12	SP01	5:12 to 6:12	16 - 8	15 - 3	14 - 2	13 - 3	12 - 6	11 - 11	11 - 3	10 - 3	9 - 6	8 - 11	8 - 5	7 - 11	12 - 5	11 - 5	10 - 7	9 - 10	9 - 4	8 - 10
(3) 2x12	SP01	5:12 to 6:12	19 - 7	18 - 5	17 - 3	16 - 2	15 - 3	14 - 6	13 - 9	12 - 7	11 - 8	10 - 11	10 - 3	9 - 9	15 - 3	13 - 11	12 - 11	12 - 1	11 - 5	10 - 10
(4) 2x12	SP01	5:12 to 6:12	21 - 7	20 - 4	19 - 3	18 - 5	17 - 7	16 - 9	15 - 10	14 - 6	13 - 5	12 - 7	11 - 10	11 - 3	17 - 6	16 - 0	14 - 10	13 - 11	13 - 2	12 - 6
(1) 2x14	SP01	5:12 to 6:12	12 - 8	11 - 7	10 - 8	10 - 0	9 - 5	9 - 0	8 - 6	7 - 9	7 - 2	6 - 8	6 - 4	6 - 0	9 - 5	8 - 7	8 - 0	7 - 5	7 - 0	6 - 8
(2) 2x14	SP01	5:12 to 6:12	17 - 11	16 - 5	15 - 3	14 - 3	13 - 6	12 - 10	12 - 1	11 - 1	10 - 3	9 - 7	9 - 1	8 - 7	13 - 5	12 - 3	11 - 5	10 - 8	10 - 1	9 - 6
(3) 2x14	SP01	5:12 to 6:12	21 - 10	20 - 0	18 - 7	17 - 5	16 - 6	15 - 8	14 - 9	13 - 6	12 - 6	11 - 9	11 - 1	10 - 6	16 - 5	15 - 0	13 - 11	13 - 0	12 - 4	11 - 8
(4) 2x14	SP01	5:12 to 6:12	25 - 0	22 - 11	21 - 4	20 - 0	18 - 11	18 - 0	17 - 0	15 - 7	14 - 5	13 - 6	12 - 9	12 - 2	18 - 10	17 - 3	16 - 0	15 - 0	14 - 2	13 - 5
(1) 3x8	SP01	5:12 to 6:12	10 - 4	9 - 9	9 - 3	8 - 9	8 - 3	7 - 10	7 - 5	6 - 9	6 - 3	5 - 10	5 - 6	5 - 3	8 - 3	7 - 6	6 - 11	6 - 6	6 - 1	5 - 10
(1) 3x10	SP01	5:12 to 6:12	12 - 10	11 - 9	10 - 11	10 - 3	9 - 8	9 - 2	8 - 8	7 - 11	7 - 4	6 - 10	6 - 5	6 - 1	9 - 7	8 - 9	8 - 1	7 - 7	7 - 2	6 - 10
(1) 3x12	SP01	5:12 to 6:12	15 - 3	13 - 11	12 - 11	12 - 1	11 - 5	10 - 10	10 - 3	9 - 4	8 - 8	8 - 1	7 - 8	7 - 3	11 - 4	10 - 5	9 - 7	9 - 0	8 - 6	8 - 1
(1) 3x14	SP01	5:12 to 6:12	22 - 11	21 - 0	19 - 7	18 - 4	17 - 4	16 - 6	15 - 7	14 - 3	13 - 3	12 - 4	11 - 8	11 - 1	17 - 3	15 - 10	14 - 8	13 - 9	12 - 11	12 - 4
(1) 4x8	SP01	5:12 to 6:12	11 - 7	10 - 11	10 - 4	9 - 11	9 - 6	9 - 2	8 - 10	8 - 4	7 - 9	7 - 3	6 - 10	6 - 6	9 - 6	8 - 11	8 - 6	8 - 1	7 - 7	7 - 3
(1) 4x10	SP01	5:12 to 6:12	14 - 10	13 - 11	13 - 3	12 - 8	11 - 11	11 - 4	10 - 9	9 - 10	9 - 1	8 - 6	8 - 0	7 - 7	11 - 11	10 - 11	10 - 1	9 - 5	8 - 11	8 - 5
(1) 4x12	SP01	5:12 to 6:12	18 - 0	16 - 11	16 - 0	15 - 0	14 - 2	13 - 5	12 - 9	11 - 7	10 - 9	10 - 1	9 - 6	9 - 0	14 - 1	12 - 11	11 - 11	11 - 2	10 - 7	10 - 0
(1) 4x14	SP01	5:12 to 6:12	25 - 0	25 - 0	23 - 11	22 - 7	21 - 4	20 - 4	19 - 3	17 - 7	16 - 4	15 - 4	14 - 5	13 - 9	21 - 3	19 - 6	18 - 1	17 - 0	16 - 0	15 - 3
(1) 2x8	SP02	5:12 to 6:12	7 - 4	6 - 8	6 - 2	5 - 10	5 - 6	5 - 2	4 - 11	4 - 6	4 - 2	3 - 10	3 - 8	3 - 5	5 - 5	5 - 0	4 - 7	4 - 4	4 - 1	3 - 10
(2) 2x8	SP02	5:12 to 6:12	10 - 5	9 - 6	8 - 10	8 - 3	7 - 9	7 - 5	7 - 0	6 - 4	5 - 11	5 - 6	5 - 2	4 - 11	7 - 9	7 - 1	6 - 7	6 - 1	5 - 9	5 - 6
(3) 2x8	SP02	5:12 to 6:12	12 - 1	11 - 4	10 - 9	10 - 1	9 - 6	9 - 0	8 - 6	7 - 10	7 - 3	6 - 9	6 - 4	6 - 1	9 - 6	8 - 8	8 - 0	7 - 6	7 - 1	6 - 9
(4) 2x8	SP02	5:12 to 6:12	13 - 3	12 - 6	11 - 10	11 - 4	10 - 11	10 - 5	9 - 10	9 - 0	8 - 4	7 - 10	7 - 4	7 - 0	10 - 11	10 - 0	9 - 3	8 - 8	8 - 2	7 - 9
(1) 2x10	SP02	5:12 to 6:12	8 - 8	7 - 11	7 - 4	6 - 10	6 - 6	6 - 2	5 - 10	5 - 4	4 - 11	4 - 7	4 - 4	4 - 1	6 - 5	5 - 11	5 - 5	5 - 1	4 - 10	4 - 7
(2) 2x10	SP02	5:12 to 6:12	12 - 4	11 - 3	10 - 5	9 - 9	9 - 3	8 - 9	8 - 3	7 - 7	7 - 0	6 - 6	6 - 2	5 - 10	9 - 2	8 - 5	7 - 9	7 - 3	6 - 10	6 - 6
(3) 2x10	SP02	5:12 to 6:12	15 - 0	13 - 9	12 - 9	11 - 11	11 - 3	10 - 8	10 - 1	9 - 3	8 - 7	8 - 0	7 - 7	7 - 2	11 - 3	10 - 3	9 - 6	8 - 11	8 - 5	8 - 0
(4) 2x10	SP02	5:12 to 6:12	17 - 0	15 - 9	14 - 8	13 - 9	13 - 0	12 - 4	11 - 8	10 - 8	9 - 10	9 - 3	8 - 9	8 - 3	12 - 11	11 - 10	10 - 11	10 - 3	9 - 8	9 - 2
(1) 2x12	SP02	5:12 to 6:12	10 - 2	9 - 4	8 - 7	8 - 1	7 - 7	7 - 3	6 - 10	6 - 3	5 - 9	5 - 5	5 - 1	4 - 10	7 - 7	6 - 11	6 - 5	6 - 0	5 - 8	5 - 4
(2) 2x12	SP02	5:12 to 6:12	14 - 5	13 - 3	12 - 3	11 - 6	10 - 10	10 - 3	9 - 9	8 - 11	8 - 3	7 - 8	7 - 3	6 - 11	10 - 9	9 - 10	9 - 2	8 - 7	8 - 1	7 - 8
(3) 2x12	SP02	5:12 to 6:12	17 - 7	16 - 1	14 - 11	14 - 0	13 - 3	12 - 7	11 - 11	10 - 10	10 - 1	9 - 5	8 - 11	8 - 5	13 - 2	12 - 1	11 - 2	10 - 6	9 - 10	9 - 4
(4) 2x12	SP02	5:12 to 6:12	20 - 2	18 - 6	17 - 2	16 - 1	15 - 3	14 - 6	13 - 8	12 - 6	11 - 7	10 - 10	10 - 3	9 - 9	15 - 2	13 - 11	12 - 10	12 - 1	11 - 5	10 - 10
(1) 2x14	SP02	5:12 to 6:12	11 - 1	10 - 2	9 - 5	8 - 10	8 - 4	7 - 11	7 - 5	6 - 10	6 - 3	5 - 11	5 - 7	5 - 3	8 - 3	7 - 7	7 - 0	6 - 6	6 - 2	5 - 10
(2) 2x14	SP02	5:12 to 6:12	15 - 9	14 - 5	13 - 4	12 - 6	11 - 10	11 - 3	10 - 7	9 - 8	9 - 0	8 - 5	7 - 11	7 - 6	11 - 9	10 - 9	10 - 0	9 - 4	8 - 10	8 - 4
(3) 2x14	SP02	5:12 to 6:12	19 - 1	17 - 6	16 - 3	15 - 3	14 - 5	13 - 8	12 - 11	11 - 10	11 - 0	10 - 3	9 - 8	9 - 3	14 - 4	13 - 2	12 - 2	11 - 5	10 - 9	10 - 3
(4) 2x14	SP02	5:12 to 6:12	21 - 11	20 - 1	18 - 8	17 - 6	16 - 7	15 - 9	14 - 11	13 - 8	12 - 8	11 - 10	11 - 2	10 - 7	16 - 6	15 - 1	14 - 0	13 - 2	12 - 5	11 - 9
(1) 3x8	SP02	5:12 to 6:12	9 - 6	8 - 8	8 - 0	7 - 6	7 - 1	6 - 9	6 - 4	5 - 10	5 - 4	5 - 0	4 - 9	4 - 6	7 - 1	6 - 5	6 - 0	5 - 7	5 - 3	5 - 0
(1) 3x10	SP02	5:12 to 6:12	11 - 3	10 - 3	9 - 6	8 - 11	8 - 5	8 - 0	7 - 6	6 - 11	6 - 4	6 - 0	5 - 7	5 - 4	8 - 4	7 - 8	7 - 1	6 - 8	6 - 3	5 - 11
(1) 3x12	SP02	5:12 to 6:12	13 - 2	12 - 1	11 - 2	10 - 6	9 - 11	9 - 5	8 - 10	8 - 1	7 - 6	7 - 0	6 - 7	6 - 3	9 - 10	9 - 0	8 - 4	7 - 10	7 - 4	7 - 0
(1) 3x14	SP02	5:12 to 6:12	20 - 1	18 - 5	17 - 2	16 - 1	15 - 2	14 - 5	13 - 8	12 - 6	11 - 7	10 - 10	10 - 3	9 - 8	15 - 1	13 - 10	12 - 10	12 - 0	11 - 4	10 - 9
(1) 4x8	SP02	5:12 to 6:12	11 - 1	10 - 5	9 - 11	9 - 4	8 - 10	8 - 4	7 - 11	7 - 3	6 - 8	6 - 3	5 - 11	5 - 7	8 - 9	8 - 0	7 - 5	6 - 11	6 - 7	6 - 3
(1) 4x10	SP02	5:12 to 6:12	13 - 11	12 - 9	11 - 10	11 - 1	10 - 5	9 - 11	9 - 4	8 - 7	7 - 11	7 - 5	7 - 0	6 - 8	10 - 5	9 - 6	8 - 10	8 - 3	7 - 9	7 - 4
(1) 4x12	SP02	5:12 to 6:12	16 - 4	14 - 11	13 - 10	13 - 0	12 - 3	11 - 8	11 - 0	10 - 1	9 - 4	8 - 9	8 - 3	7 - 10	12 - 3	11 - 2	10 - 4	9 - 8	9 - 2	8 - 8
(1) 4x14	SP02	5:12 to 6:12	24 - 8	22 - 8	21 - 1	19 - 10	18 - 9	17 - 10	16 - 10	15 - 5	14 - 4	13 - 5	12 - 8	12 - 0	18 - 8	17 - 1	15 - 10	14 - 10	14 - 0	13 - 4

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: ROOF BEAM DESIGN TABLE D

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-18

Sheet Number 18 of 45

ROOF BEAMS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/240
Limits and Assumption: See Appendix General Notes

Governing Span (ft-in)

Member Size and Plys	Wood Species	Slope	Exposure B, K_{zt} = 1.0						Exposure B, K_{zt} = 2.0						Exposure D, K_{zt} = 1.0					
			Tributary Width						Tributary Width						Tributary Width					
			10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft
(1) 2x8	DFL1	7:12 to 12:12	8 - 6	7 - 9	7 - 2	6 - 9	6 - 4	6 - 0	5 - 8	5 - 2	4 - 9	4 - 6	4 - 3	4 - 0	6 - 4	5 - 9	5 - 4	5 - 0	4 - 8	4 - 5
(2) 2x8	DFL1	7:12 to 12:12	11 - 4	10 - 8	10 - 2	9 - 6	9 - 0	8 - 6	8 - 1	7 - 4	6 - 10	6 - 4	6 - 0	5 - 8	8 - 11	8 - 2	7 - 7	7 - 1	6 - 8	6 - 4
(3) 2x8	DFL1	7:12 to 12:12	13 - 0	12 - 3	11 - 7	11 - 1	10 - 8	10 - 4	9 - 10	9 - 0	8 - 4	7 - 10	7 - 4	7 - 0	10 - 8	10 - 0	9 - 3	8 - 8	8 - 2	7 - 9
(4) 2x8	DFL1	7:12 to 12:12	14 - 4	13 - 6	12 - 10	12 - 3	11 - 9	11 - 4	10 - 11	10 - 3	9 - 8	9 - 0	8 - 6	8 - 1	11 - 9	11 - 0	10 - 6	10 - 0	9 - 5	9 - 0
(1) 2x10	DFL1	7:12 to 12:12	10 - 4	9 - 5	8 - 9	8 - 2	7 - 8	7 - 4	6 - 11	6 - 3	5 - 10	5 - 5	5 - 2	4 - 10	7 - 8	7 - 0	6 - 6	6 - 1	5 - 8	5 - 5
(2) 2x10	DFL1	7:12 to 12:12	14 - 6	13 - 5	12 - 5	11 - 8	11 - 0	10 - 5	9 - 10	9 - 0	8 - 4	7 - 9	7 - 4	7 - 0	10 - 11	10 - 0	9 - 3	8 - 8	8 - 2	7 - 9
(3) 2x10	DFL1	7:12 to 12:12	16 - 7	15 - 8	14 - 10	14 - 2	13 - 5	12 - 9	12 - 0	11 - 0	10 - 2	9 - 6	9 - 0	8 - 6	13 - 4	12 - 2	11 - 4	10 - 7	10 - 0	9 - 6
(4) 2x10	DFL1	7:12 to 12:12	18 - 3	17 - 2	16 - 4	15 - 8	15 - 0	14 - 6	13 - 10	12 - 8	11 - 9	11 - 0	10 - 4	9 - 10	15 - 0	14 - 1	13 - 0	12 - 3	11 - 6	10 - 11
(1) 2x12	DFL1	7:12 to 12:12	11 - 11	10 - 11	10 - 1	9 - 5	8 - 11	8 - 5	8 - 0	7 - 3	6 - 9	6 - 4	5 - 11	5 - 8	8 - 10	8 - 1	7 - 6	7 - 0	6 - 7	6 - 3
(2) 2x12	DFL1	7:12 to 12:12	16 - 11	15 - 6	14 - 5	13 - 6	12 - 9	12 - 1	11 - 5	10 - 5	9 - 8	9 - 0	8 - 6	8 - 1	12 - 8	11 - 7	10 - 8	10 - 0	9 - 5	9 - 0
(3) 2x12	DFL1	7:12 to 12:12	20 - 2	18 - 11	17 - 7	16 - 5	15 - 6	14 - 9	13 - 11	12 - 9	11 - 10	11 - 1	10 - 5	9 - 11	15 - 5	14 - 2	13 - 1	12 - 3	11 - 7	11 - 0
(4) 2x12	DFL1	7:12 to 12:12	22 - 3	20 - 11	19 - 11	18 - 11	17 - 11	17 - 0	16 - 0	14 - 8	13 - 7	12 - 9	12 - 0	11 - 5	17 - 9	16 - 3	15 - 1	14 - 2	13 - 4	12 - 8
(1) 2x14	DFL1	7:12 to 12:12	13 - 4	12 - 2	11 - 3	10 - 6	9 - 11	9 - 5	8 - 11	8 - 1	7 - 6	7 - 0	6 - 8	6 - 3	9 - 11	9 - 0	8 - 4	7 - 10	7 - 4	7 - 0
(2) 2x14	DFL1	7:12 to 12:12	18 - 11	17 - 4	16 - 1	15 - 0	14 - 2	13 - 6	12 - 9	11 - 7	10 - 9	10 - 1	9 - 6	9 - 0	14 - 1	12 - 11	11 - 11	11 - 2	10 - 7	10 - 0
(3) 2x14	DFL1	7:12 to 12:12	23 - 0	21 - 1	19 - 7	18 - 4	17 - 4	16 - 5	15 - 6	14 - 2	13 - 2	12 - 4	11 - 8	11 - 1	17 - 3	15 - 9	14 - 7	13 - 8	12 - 11	12 - 3
(4) 2x14	DFL1	7:12 to 12:12	25 - 0	24 - 2	22 - 5	21 - 1	19 - 11	18 - 11	17 - 11	16 - 4	15 - 2	14 - 3	13 - 5	12 - 9	19 - 10	18 - 2	16 - 10	15 - 9	14 - 11	14 - 2
(1) 3x8	DFL1	7:12 to 12:12	10 - 8	10 - 1	9 - 4	8 - 8	8 - 3	7 - 10	7 - 4	6 - 8	6 - 3	5 - 10	5 - 6	5 - 2	8 - 2	7 - 5	6 - 11	6 - 5	6 - 1	5 - 9
(1) 3x10	DFL1	7:12 to 12:12	13 - 5	12 - 3	11 - 4	10 - 7	10 - 0	9 - 6	9 - 0	8 - 2	7 - 7	7 - 1	6 - 8	6 - 4	10 - 0	9 - 1	8 - 5	7 - 11	7 - 5	7 - 1
(1) 3x12	DFL1	7:12 to 12:12	15 - 6	14 - 2	13 - 2	12 - 4	11 - 7	11 - 0	10 - 5	9 - 6	8 - 9	8 - 3	7 - 9	7 - 4	11 - 6	10 - 7	9 - 9	9 - 2	8 - 7	8 - 2
(1) 3x14	DFL1	7:12 to 12:12	17 - 3	15 - 10	14 - 8	13 - 9	12 - 11	12 - 4	11 - 7	10 - 7	9 - 10	9 - 2	8 - 8	8 - 3	12 - 11	11 - 9	10 - 11	10 - 2	9 - 7	9 - 2
(1) 4x8	DFL1	7:12 to 12:12	12 - 0	11 - 3	10 - 8	10 - 3	9 - 10	9 - 6	9 - 1	8 - 3	7 - 8	7 - 2	6 - 9	6 - 5	9 - 9	9 - 2	8 - 6	8 - 0	7 - 6	7 - 1
(1) 4x10	DFL1	7:12 to 12:12	15 - 3	14 - 4	13 - 8	13 - 1	12 - 5	11 - 9	11 - 1	10 - 2	9 - 5	8 - 9	8 - 3	7 - 10	12 - 4	11 - 3	10 - 5	9 - 9	9 - 2	8 - 9
(1) 4x12	DFL1	7:12 to 12:12	18 - 7	17 - 6	16 - 3	15 - 3	14 - 5	13 - 8	12 - 11	11 - 9	10 - 11	10 - 3	9 - 8	9 - 2	14 - 4	13 - 1	12 - 2	11 - 4	10 - 8	10 - 2
(1) 4x14	DFL1	7:12 to 12:12	21 - 5	19 - 8	18 - 3	17 - 1	16 - 2	15 - 4	14 - 6	13 - 3	12 - 3	11 - 6	10 - 10	10 - 3	16 - 1	14 - 8	13 - 7	12 - 9	12 - 0	11 - 5
(1) 2x8	DFL2	7:12 to 12:12	8 - 0	7 - 4	6 - 10	6 - 4	6 - 0	5 - 8	5 - 4	4 - 11	4 - 6	4 - 3	4 - 0	3 - 9	6 - 0	5 - 5	5 - 0	4 - 8	4 - 5	4 - 2
(2) 2x8	DFL2	7:12 to 12:12	11 - 2	10 - 5	9 - 8	9 - 1	8 - 6	8 - 1	7 - 8	7 - 0	6 - 5	6 - 0	5 - 8	5 - 5	8 - 6	7 - 9	7 - 2	6 - 9	6 - 4	6 - 0
(3) 2x8	DFL2	7:12 to 12:12	12 - 9	12 - 0	11 - 5	10 - 11	10 - 5	9 - 11	9 - 4	8 - 7	7 - 11	7 - 5	7 - 0	6 - 7	10 - 5	9 - 6	8 - 9	8 - 3	7 - 9	7 - 4
(4) 2x8	DFL2	7:12 to 12:12	14 - 0	13 - 2	12 - 6	12 - 0	11 - 6	11 - 2	10 - 8	9 - 10	9 - 2	8 - 7	8 - 1	7 - 8	11 - 6	10 - 10	10 - 2	9 - 6	8 - 11	8 - 6
(1) 2x10	DFL2	7:12 to 12:12	9 - 9	8 - 11	8 - 3	7 - 9	7 - 4	6 - 11	6 - 6	6 - 0	5 - 6	5 - 2	4 - 10	4 - 7	7 - 3	6 - 8	6 - 2	5 - 9	5 - 5	5 - 2
(2) 2x10	DFL2	7:12 to 12:12	13 - 11	12 - 9	11 - 9	11 - 0	10 - 5	9 - 11	9 - 4	8 - 6	7 - 11	7 - 5	6 - 11	6 - 7	10 - 4	9 - 6	8 - 9	8 - 2	7 - 9	7 - 4
(3) 2x10	DFL2	7:12 to 12:12	16 - 3	15 - 4	14 - 5	13 - 6	12 - 9	12 - 1	11 - 5	10 - 5	9 - 8	9 - 0	8 - 6	8 - 1	12 - 8	11 - 7	10 - 9	10 - 1	9 - 6	9 - 0
(4) 2x10	DFL2	7:12 to 12:12	17 - 11	16 - 10	16 - 0	15 - 4	14 - 8	13 - 11	13 - 2	12 - 0	11 - 2	10 - 5	9 - 10	9 - 4	14 - 7	13 - 4	12 - 4	11 - 7	10 - 11	10 - 4
(1) 2x12	DFL2	7:12 to 12:12	11 - 4	10 - 4	9 - 7	9 - 0	8 - 6	8 - 0	7 - 7	6 - 11	6 - 5	6 - 0	5 - 8	5 - 4	8 - 5	7 - 8	7 - 1	6 - 8	6 - 3	5 - 11
(2) 2x12	DFL2	7:12 to 12:12	16 - 1	14 - 9	13 - 8	12 - 9	12 - 1	11 - 5	10 - 10	9 - 10	9 - 2	8 - 7	8 - 1	7 - 8	12 - 0	11 - 0	10 - 2	9 - 6	9 - 0	8 - 6
(3) 2x12	DFL2	7:12 to 12:12	19 - 7	17 - 11	16 - 8	15 - 7	14 - 9	14 - 0	13 - 3	12 - 1	11 - 2	10 - 6	9 - 11	9 - 5	14 - 8	13 - 5	12 - 5	11 - 8	11 - 0	10 - 5
(4) 2x12	DFL2	7:12 to 12:12	21 - 10	20 - 6	19 - 2	17 - 11	16 - 11	16 - 1	15 - 3	13 - 11	12 - 11	12 - 1	11 - 5	10 - 10	16 - 10	15 - 5	14 - 4	13 - 5	12 - 8	12 - 0
(1) 2x14	DFL2	7:12 to 12:12	12 - 7	11 - 6	10 - 8	10 - 0	9 - 5	8 - 11	8 - 5	7 - 9	7 - 2	6 - 8	6 - 4	6 - 0	9 - 5	8 - 7	7 - 11	7 - 5	7 - 0	6 - 8
(2) 2x14	DFL2	7:12 to 12:12	17 - 11	16 - 5	15 - 3	14 - 3	13 - 6	12 - 9	12 - 1	11 - 0	10 - 2	9 - 7	9 - 0	8 - 7	13 - 5	12 - 3	11 - 4	10 - 7	10 - 0	9 - 6
(3) 2x14	DFL2	7:12 to 12:12	21 - 9	20 - 0	18 - 7	17 - 5	16 - 5	15 - 7	14 - 9	13 - 6	12 - 6	11 - 8	11 - 0	10 - 6	16 - 4	14 - 11	13 - 10	13 - 0	12 - 3	11 - 8
(4) 2x14	DFL2	7:12 to 12:12	24 - 11	22 - 11	21 - 4	20 - 0	18 - 11	17 - 11	16 - 11	15 - 6	14 - 5	13 - 6	12 - 9	12 - 1	18 - 9	17 - 2	16 - 0	14 - 11	14 - 1	13 - 5
(1) 3x8	DFL2	7:12 to 12:12	10 - 5	9 - 6	8 - 10	8 - 3	7 - 9	7 - 5	7 - 0	6 - 4	5 - 11	5 - 6	5 - 2	4 - 11	7 - 9	7 - 1	6 - 7	6 - 1	5 - 9	5 - 6
(1) 3x10	DFL2	7:12 to 12:12	12 - 8	11 - 7	10 - 9	10 - 1	9 - 6	9 - 0	8 - 6	7 - 9	7 - 2	6 - 9	6 - 4	6 - 0	9 - 5	8 - 8	8 - 0	7 - 6	7 - 1	6 - 8
(1) 3x12	DFL2	7:12 to 12:12	14 - 8	13 - 5	12 - 6	11 - 8	11 - 0	10 - 5	9 - 10	9 - 0	8 - 4	7 - 10	7 - 4	7 - 0	10 - 11	10 - 0	9 - 3	8 - 8	8 - 2	7 - 9
(1) 3x14	DFL2	7:12 to 12:12	22 - 11	21 - 0	19 - 6	18 - 4	17 - 4	16 - 5	15 - 6	14 - 2	13 - 2	12 - 4	11 - 8	11 - 0	17 - 2	15 - 9	14 - 7	13 - 8	12 - 11	12 - 3
(1) 4x8	DFL2	7:12 to 12:12	11 - 9	11 - 0	10 - 6	10 - 0	9 - 7	9 - 1	8 - 7	7 - 10	7 - 3	6 - 10	6 - 5	6 - 1	9 - 6	8 - 9	8 - 1	7 - 7	7 - 1	6 - 9
(1) 4x10	DFL2	7:12 to 12:12	15 - 0	14 - 1	13 - 4	12 - 5	11 - 9	11 - 2	10 - 6	9 - 7	8 - 11	8 - 4	7 - 10	7 - 5	11 - 8	10 - 8	9 - 11	9 - 3	8 - 9	8 - 3
(1) 4x12	DFL2	7:12 to 12:12	18 - 2	16 - 8	15 - 5	14 - 6	13 - 8	13 - 0	12 - 3	11 - 2	10 - 4	9 - 8	9 - 2	8 - 8	13 - 7	12 - 5	11 - 6	10 - 9	10 - 2	9 - 8
(1) 4x14	DFL2	7:12 to 12:12	25 - 0	25 - 0	24 - 2	22 - 8	21 - 5	20 - 5	19 - 3	17 - 8	16 - 4	15 - 4	14 - 6	13 - 9	21 - 4	19 - 6	18 - 2	17 - 0	16 - 1	15 - 3

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: ROOF BEAM DESIGN TABLE E

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-19

Sheet Number 19 of 45

ROOF BEAMS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/240
Limits and Assumption: See Appendix General Notes

Governing Span (ft-in)

Member Size and Plys	Wood Species	Slope	Exposure B, K_{zt} = 1.0						Exposure B, K_{zt} = 2.0						Exposure D, K_{zt} = 1.0					
			Tributary Width						Tributary Width						Tributary Width					
			10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft	10 ft	12 ft	14 ft	16 ft	18 ft	20 ft
(1) 2x8	SP01	7:12 to 12:12	8 - 8	7 - 11	7 - 4	6 - 10	6 - 5	6 - 1	5 - 9	5 - 3	4 - 10	4 - 7	4 - 3	4 - 1	6 - 5	5 - 10	5 - 5	5 - 1	4 - 9	4 - 6
(2) 2x8	SP01	7:12 to 12:12	11 - 2	10 - 6	9 - 11	9 - 6	9 - 2	8 - 9	8 - 3	7 - 6	6 - 11	6 - 6	6 - 2	5 - 10	9 - 1	8 - 4	7 - 9	7 - 3	6 - 10	6 - 6
(3) 2x8	SP01	7:12 to 12:12	12 - 9	12 - 0	11 - 5	10 - 11	10 - 6	10 - 1	9 - 9	9 - 2	8 - 6	8 - 0	7 - 6	7 - 2	10 - 5	9 - 10	9 - 4	8 - 10	8 - 4	7 - 11
(4) 2x8	SP01	7:12 to 12:12	14 - 0	13 - 2	12 - 6	12 - 0	11 - 6	11 - 2	10 - 8	10 - 1	9 - 7	9 - 2	8 - 8	8 - 3	11 - 6	10 - 10	10 - 3	9 - 10	9 - 5	9 - 1
(1) 2x10	SP01	7:12 to 12:12	10 - 1	9 - 2	8 - 6	8 - 0	7 - 6	7 - 2	6 - 9	6 - 2	5 - 8	5 - 4	5 - 0	4 - 9	7 - 6	6 - 10	6 - 4	5 - 11	5 - 7	5 - 3
(2) 2x10	SP01	7:12 to 12:12	14 - 3	13 - 1	12 - 2	11 - 4	10 - 9	10 - 2	9 - 7	8 - 9	8 - 1	7 - 7	7 - 2	6 - 10	10 - 8	9 - 9	9 - 0	8 - 5	8 - 0	7 - 7
(3) 2x10	SP01	7:12 to 12:12	16 - 3	15 - 4	14 - 7	13 - 11	13 - 1	12 - 5	11 - 9	10 - 9	9 - 11	9 - 4	8 - 9	8 - 4	13 - 0	11 - 11	11 - 0	10 - 4	9 - 9	9 - 3
(4) 2x10	SP01	7:12 to 12:12	17 - 11	16 - 10	16 - 0	15 - 4	14 - 9	14 - 3	13 - 6	12 - 4	11 - 6	10 - 9	10 - 2	9 - 7	14 - 8	13 - 9	12 - 9	11 - 11	11 - 3	10 - 8
(1) 2x12	SP01	7:12 to 12:12	11 - 11	10 - 11	10 - 1	9 - 5	8 - 11	8 - 5	7 - 11	7 - 3	6 - 9	6 - 3	5 - 11	5 - 8	8 - 10	8 - 1	7 - 6	7 - 0	6 - 7	6 - 3
(2) 2x12	SP01	7:12 to 12:12	16 - 11	15 - 6	14 - 4	13 - 6	12 - 8	12 - 1	11 - 5	10 - 5	9 - 8	9 - 0	8 - 6	8 - 1	12 - 8	11 - 7	10 - 8	10 - 0	9 - 5	9 - 0
(3) 2x12	SP01	7:12 to 12:12	19 - 10	18 - 8	17 - 6	16 - 5	15 - 6	14 - 9	13 - 11	12 - 9	11 - 9	11 - 0	10 - 5	9 - 11	15 - 5	14 - 1	13 - 1	12 - 3	11 - 7	11 - 0
(4) 2x12	SP01	7:12 to 12:12	21 - 10	20 - 6	19 - 6	18 - 8	17 - 10	17 - 0	16 - 0	14 - 8	13 - 7	12 - 9	12 - 0	11 - 5	17 - 9	16 - 3	15 - 1	14 - 1	13 - 4	12 - 8
(1) 2x14	SP01	7:12 to 12:12	12 - 10	11 - 9	10 - 10	10 - 2	9 - 7	9 - 1	8 - 7	7 - 10	7 - 3	6 - 10	6 - 5	6 - 1	9 - 7	8 - 9	8 - 1	7 - 7	7 - 1	6 - 9
(2) 2x14	SP01	7:12 to 12:12	18 - 3	16 - 8	15 - 6	14 - 6	13 - 8	13 - 0	12 - 3	11 - 3	10 - 5	9 - 9	9 - 2	8 - 8	13 - 7	12 - 5	11 - 6	10 - 10	10 - 2	9 - 8
(3) 2x14	SP01	7:12 to 12:12	22 - 2	20 - 4	18 - 10	17 - 8	16 - 9	15 - 11	15 - 0	13 - 9	12 - 9	11 - 11	11 - 3	10 - 8	16 - 7	15 - 2	14 - 1	13 - 3	12 - 6	11 - 10
(4) 2x14	SP01	7:12 to 12:12	25 - 0	23 - 3	21 - 8	20 - 4	19 - 2	18 - 3	17 - 3	15 - 9	14 - 8	13 - 9	12 - 11	12 - 4	19 - 1	17 - 6	16 - 3	15 - 3	14 - 4	13 - 8
(1) 3x8	SP01	7:12 to 12:12	10 - 6	9 - 10	9 - 4	8 - 11	8 - 5	7 - 11	7 - 6	6 - 10	6 - 4	5 - 11	5 - 7	5 - 4	8 - 4	7 - 7	7 - 0	6 - 7	6 - 3	5 - 11
(1) 3x10	SP01	7:12 to 12:12	13 - 1	11 - 11	11 - 1	10 - 4	9 - 9	9 - 3	8 - 9	8 - 0	7 - 5	6 - 11	6 - 6	6 - 2	9 - 9	8 - 11	8 - 3	7 - 8	7 - 3	6 - 11
(1) 3x12	SP01	7:12 to 12:12	15 - 6	14 - 2	13 - 1	12 - 3	11 - 7	11 - 0	10 - 5	9 - 6	8 - 9	8 - 3	7 - 9	7 - 4	11 - 6	10 - 6	9 - 9	9 - 2	8 - 7	8 - 2
(1) 3x14	SP01	7:12 to 12:12	23 - 3	21 - 4	19 - 10	18 - 7	17 - 7	16 - 9	15 - 9	14 - 5	13 - 5	12 - 6	11 - 10	11 - 3	17 - 6	16 - 0	14 - 10	13 - 11	13 - 2	12 - 6
(1) 4x8	SP01	7:12 to 12:12	11 - 9	11 - 0	10 - 6	10 - 0	9 - 8	9 - 4	8 - 11	8 - 5	7 - 10	7 - 4	6 - 11	6 - 7	9 - 7	9 - 0	8 - 7	8 - 2	7 - 9	7 - 4
(1) 4x10	SP01	7:12 to 12:12	15 - 0	14 - 1	13 - 4	12 - 9	12 - 2	11 - 6	10 - 10	9 - 11	9 - 2	8 - 7	8 - 1	7 - 8	12 - 1	11 - 0	10 - 3	9 - 7	9 - 0	8 - 7
(1) 4x12	SP01	7:12 to 12:12	18 - 2	17 - 2	16 - 3	15 - 3	14 - 5	13 - 8	12 - 11	11 - 9	10 - 11	10 - 3	9 - 8	9 - 2	14 - 4	13 - 1	12 - 1	11 - 4	10 - 8	10 - 2
(1) 4x14	SP01	7:12 to 12:12	25 - 0	25 - 0	24 - 2	22 - 11	21 - 8	20 - 7	19 - 6	17 - 10	16 - 7	15 - 6	14 - 8	13 - 11	21 - 7	19 - 9	18 - 4	17 - 2	16 - 3	15 - 5
(1) 2x8	SP02	7:12 to 12:12	7 - 5	6 - 9	6 - 3	5 - 11	5 - 7	5 - 3	4 - 11	4 - 6	4 - 2	3 - 11	3 - 8	3 - 6	5 - 6	5 - 0	4 - 8	4 - 4	4 - 1	3 - 11
(2) 2x8	SP02	7:12 to 12:12	10 - 7	9 - 8	8 - 11	8 - 4	7 - 11	7 - 6	7 - 1	6 - 5	6 - 0	5 - 7	5 - 3	5 - 0	7 - 10	7 - 2	6 - 8	6 - 3	5 - 10	5 - 7
(3) 2x8	SP02	7:12 to 12:12	12 - 2	11 - 6	10 - 11	10 - 3	9 - 8	9 - 2	8 - 8	7 - 11	7 - 4	6 - 10	6 - 5	6 - 1	9 - 7	8 - 9	8 - 2	7 - 7	7 - 2	6 - 10
(4) 2x8	SP02	7:12 to 12:12	13 - 5	12 - 8	12 - 0	11 - 6	11 - 0	10 - 7	10 - 0	9 - 1	8 - 5	7 - 11	7 - 5	7 - 1	11 - 0	10 - 1	9 - 4	8 - 9	8 - 3	7 - 10
(1) 2x10	SP02	7:12 to 12:12	8 - 10	8 - 1	7 - 5	7 - 0	6 - 7	6 - 3	5 - 11	5 - 4	5 - 0	4 - 8	4 - 5	4 - 2	6 - 6	6 - 0	5 - 6	5 - 2	4 - 10	4 - 7
(2) 2x10	SP02	7:12 to 12:12	12 - 6	11 - 5	10 - 7	9 - 11	9 - 4	8 - 11	8 - 4	7 - 8	7 - 1	6 - 8	6 - 3	5 - 11	9 - 4	8 - 6	7 - 10	7 - 4	6 - 11	6 - 7
(3) 2x10	SP02	7:12 to 12:12	15 - 2	13 - 11	12 - 11	12 - 1	11 - 5	10 - 10	10 - 3	9 - 4	8 - 8	8 - 1	7 - 8	7 - 3	11 - 4	10 - 5	9 - 8	9 - 0	8 - 6	8 - 1
(4) 2x10	SP02	7:12 to 12:12	17 - 2	16 - 0	14 - 10	13 - 11	13 - 2	12 - 6	11 - 10	10 - 10	10 - 0	9 - 4	8 - 10	8 - 5	13 - 1	12 - 0	11 - 1	10 - 5	9 - 10	9 - 4
(1) 2x12	SP02	7:12 to 12:12	10 - 4	9 - 5	8 - 9	8 - 2	7 - 9	7 - 4	6 - 11	6 - 4	5 - 10	5 - 6	5 - 2	4 - 11	7 - 8	7 - 0	6 - 6	6 - 1	5 - 9	5 - 5
(2) 2x12	SP02	7:12 to 12:12	14 - 8	13 - 5	12 - 5	11 - 8	11 - 0	10 - 5	9 - 10	9 - 0	8 - 4	7 - 10	7 - 4	7 - 0	10 - 11	10 - 0	9 - 3	8 - 8	8 - 2	7 - 9
(3) 2x12	SP02	7:12 to 12:12	17 - 10	16 - 4	15 - 2	14 - 3	13 - 5	12 - 9	12 - 1	11 - 0	10 - 2	9 - 7	9 - 0	8 - 7	13 - 4	12 - 3	11 - 4	10 - 7	10 - 0	9 - 6
(4) 2x12	SP02	7:12 to 12:12	20 - 5	18 - 9	17 - 5	16 - 4	15 - 5	14 - 8	13 - 10	12 - 8	11 - 9	11 - 0	10 - 5	9 - 10	15 - 4	14 - 1	13 - 1	12 - 3	11 - 6	10 - 11
(1) 2x14	SP02	7:12 to 12:12	11 - 3	10 - 4	9 - 7	8 - 11	8 - 5	8 - 0	7 - 7	6 - 11	6 - 5	6 - 0	5 - 7	5 - 4	8 - 5	7 - 8	7 - 1	6 - 8	6 - 3	5 - 11
(2) 2x14	SP02	7:12 to 12:12	16 - 0	14 - 7	13 - 7	12 - 9	12 - 0	11 - 5	10 - 9	9 - 10	9 - 1	8 - 6	8 - 0	7 - 7	11 - 11	10 - 11	10 - 1	9 - 6	8 - 11	8 - 6
(3) 2x14	SP02	7:12 to 12:12	19 - 5	17 - 9	16 - 6	15 - 6	14 - 8	13 - 11	13 - 2	12 - 0	11 - 2	10 - 5	9 - 10	9 - 4	14 - 7	13 - 4	12 - 4	11 - 7	10 - 11	10 - 4
(4) 2x14	SP02	7:12 to 12:12	22 - 2	20 - 5	19 - 0	17 - 10	16 - 10	16 - 0	15 - 1	13 - 10	12 - 10	12 - 0	11 - 4	10 - 9	16 - 9	15 - 4	14 - 3	13 - 4	12 - 7	11 - 11
(1) 3x8	SP02	7:12 to 12:12	9 - 8	8 - 10	8 - 2	7 - 8	7 - 2	6 - 10	6 - 5	5 - 11	5 - 5	5 - 1	4 - 10	4 - 7	7 - 2	6 - 6	6 - 1	5 - 8	5 - 4	5 - 1
(1) 3x10	SP02	7:12 to 12:12	11 - 5	10 - 5	9 - 8	9 - 1	8 - 6	8 - 1	7 - 8	7 - 0	6 - 6	6 - 1	5 - 8	5 - 5	8 - 6	7 - 9	7 - 2	6 - 9	6 - 4	6 - 0
(1) 3x12	SP02	7:12 to 12:12	13 - 5	12 - 3	11 - 4	10 - 8	10 - 1	9 - 6	9 - 0	8 - 3	7 - 7	7 - 1	6 - 9	6 - 4	10 - 0	9 - 1	8 - 5	7 - 11	7 - 5	7 - 1
(1) 3x14	SP02	7:12 to 12:12	20 - 5	18 - 8	17 - 5	16 - 4	15 - 5	14 - 8	13 - 10	12 - 8	11 - 9	11 - 0	10 - 4	9 - 10	15 - 4	14 - 0	13 - 0	12 - 2	11 - 6	10 - 11
(1) 4x8	SP02	7:12 to 12:12	11 - 2	10 - 7	10 - 0	9 - 6	8 - 11	8 - 6	8 - 0	7 - 4	6 - 9	6 - 4	6 - 0	5 - 8	8 - 11	8 - 1	7 - 6	7 - 0	6 - 8	6 - 4
(1) 4x10	SP02	7:12 to 12:12	14 - 1	12 - 11	12 - 0	11 - 3	10 - 7	10 - 1	9 - 6	8 - 8	8 - 0	7 - 6	7 - 1	6 - 9	10 - 6	9 - 7	8 - 11	8 - 4	7 - 10	7 - 6
(1) 4x12	SP02	7:12 to 12:12	16 - 7	15 - 2	14 - 1	13 - 2	12 - 5	11 - 10	11 - 2	10 - 2	9 - 5	8 - 10	8 - 4	7 - 11	12 - 5	11 - 4	10 - 6	9 - 10	9 - 3	8 - 10
(1) 4x14	SP02	7:12 to 12:12	25 - 0	23 - 0	21 - 5	20 - 1	19 - 0	18 - 1	17 - 1	15 - 8	14 - 6	13 - 7	12 - 10	12 - 2	18 - 11	17 - 4	16 - 1	15 - 1	14 - 3	13 - 6

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: ROOF BEAM DESIGN TABLE F

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-20

Sheet Number 20 of 45

HIP & VALLEY ROOF BEAM ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/240
Limits and Assumption: See Appendix General Notes

Horizontal Projection (ft-in)

BEAM SIZE & PLYS	Exposure B, K_{zt} = 1.0				Exposure B, K_{zt} = 2.0				Exposure D, K_{zt} = 1.0			
	Wood Species				Wood Species				Wood Species			
	DFL1	DFL2	SP01	SP02	DFL1	DFL2	SP01	SP02	DFL1	DFL2	SP01	SP02
(1) 2x8	9 - 10	9 - 6	9 - 9	9 - 0	7 - 9	7 - 6	7 - 11	7 - 2	8 - 3	8 - 0	8 - 5	7 - 7
(2) 2x8	11 - 10	11 - 8	11 - 8	11 - 3	9 - 10	9 - 6	9 - 9	9 - 1	10 - 5	10 - 2	10 - 3	9 - 8
(3) 2x8	13 - 1	12 - 11	12 - 11	12 - 6	11 - 0	10 - 10	10 - 10	10 - 4	11 - 6	11 - 4	11 - 4	11 - 0
(4) 2x8	14 - 1	13 - 10	13 - 10	13 - 5	11 - 10	11 - 8	11 - 8	11 - 3	12 - 5	12 - 3	12 - 3	11 - 10
(1) 2x10	11 - 2	10 - 10	11 - 0	10 - 1	8 - 11	8 - 7	8 - 9	8 - 0	9 - 5	9 - 2	9 - 4	8 - 6
(2) 2x10	14 - 3	13 - 9	14 - 0	12 - 9	11 - 3	10 - 11	11 - 1	10 - 2	12 - 0	11 - 7	11 - 10	10 - 10
(3) 2x10	15 - 9	15 - 6	15 - 6	14 - 8	12 - 11	12 - 6	12 - 9	11 - 7	13 - 9	13 - 3	13 - 7	12 - 5
(4) 2x10	16 - 11	16 - 8	16 - 8	16 - 1	14 - 2	13 - 9	14 - 0	12 - 10	14 - 11	14 - 8	14 - 8	13 - 8
(1) 2x12	12 - 4	11 - 11	12 - 4	11 - 3	9 - 10	9 - 6	9 - 9	8 - 11	10 - 5	10 - 1	10 - 5	9 - 6
(2) 2x12	15 - 8	15 - 2	15 - 8	14 - 3	12 - 5	12 - 0	12 - 5	11 - 4	13 - 3	12 - 10	13 - 3	12 - 1
(3) 2x12	18 - 0	17 - 5	17 - 11	16 - 4	14 - 3	13 - 9	14 - 3	13 - 0	15 - 2	14 - 8	15 - 2	13 - 10
(4) 2x12	19 - 7	19 - 2	19 - 3	18 - 0	15 - 9	15 - 2	15 - 9	14 - 3	16 - 9	16 - 2	16 - 9	15 - 2
(1) 2x14	13 - 4	12 - 10	13 - 0	11 - 11	10 - 6	10 - 2	10 - 4	9 - 5	11 - 3	10 - 10	11 - 0	10 - 1
(2) 2x14	16 - 11	16 - 4	16 - 6	15 - 2	13 - 5	12 - 11	13 - 1	12 - 0	14 - 3	13 - 9	13 - 11	12 - 9
(3) 2x14	19 - 5	18 - 9	18 - 11	17 - 4	15 - 4	14 - 10	15 - 0	13 - 9	16 - 4	15 - 10	16 - 0	14 - 8
(4) 2x14	21 - 4	20 - 7	20 - 10	19 - 1	16 - 11	16 - 4	16 - 6	15 - 2	18 - 0	17 - 5	17 - 7	16 - 2
(1) 3x8	11 - 4	11 - 2	11 - 2	10 - 9	9 - 3	8 - 11	9 - 4	8 - 6	9 - 11	9 - 6	9 - 10	9 - 1
(1) 3x10	13 - 4	12 - 11	13 - 2	12 - 0	10 - 7	10 - 3	10 - 5	9 - 6	11 - 3	10 - 11	11 - 1	10 - 2
(1) 3x12	14 - 9	14 - 3	14 - 9	13 - 5	11 - 8	11 - 4	11 - 8	10 - 8	12 - 6	12 - 0	12 - 6	11 - 4
(1) 3x14	15 - 11	19 - 5	19 - 7	18 - 0	12 - 7	15 - 4	15 - 7	14 - 3	13 - 5	16 - 4	16 - 7	15 - 2
(1) 4x8	12 - 4	12 - 1	12 - 1	11 - 9	10 - 4	10 - 2	10 - 2	9 - 10	10 - 10	10 - 8	10 - 8	10 - 4
(1) 4x10	14 - 9	14 - 7	14 - 7	13 - 11	12 - 3	11 - 10	12 - 1	11 - 0	13 - 0	12 - 7	12 - 10	11 - 9
(1) 4x12	17 - 1	16 - 6	16 - 10	15 - 6	13 - 6	13 - 1	13 - 6	12 - 4	14 - 5	13 - 11	14 - 5	13 - 1
(1) 4x14	18 - 5	22 - 6	22 - 8	20 - 9	14 - 8	17 - 10	18 - 0	16 - 6	15 - 7	19 - 0	19 - 2	17 - 6

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: HIP & VALLEY ROOF BEAM DESIGN TABLE

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:
A-21
Sheet Number 21 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
DFL1	3:12	1	4	6 - 2	5 - 6	5 - 2	4 - 9	7 - 6	6 - 8	6 - 3	5 - 9	8 - 6	7 - 7	7 - 1	6 - 6
DFL1	3:12	1	6	10 - 6	9 - 4	8 - 8	7 - 11	13 - 4	11 - 8	10 - 9	9 - 9	15 - 7	13 - 8	12 - 7	11 - 4
DFL1	3:12	1	8	15 - 6	13 - 6	12 - 6	11 - 3	19 - 0	17 - 2	15 - 9	14 - 3	21 - 3	19 - 4	18 - 2	16 - 7
DFL1	3:12	1	10	20 - 5	18 - 7	17 - 5	15 - 9	24 - 4	22 - 1	20 - 9	19 - 3	26 - 0	24 - 9	23 - 3	21 - 7
DFL1	3:12	1	12	25 - 0	22 - 8	21 - 3	19 - 9	26 - 0	26 - 0	25 - 4	23 - 6	26 - 11	26 - 0	26 - 0	26 - 11
DFL1	3:12	1	14	26 - 0	26 - 0	25 - 2	23 - 4	26 - 0	26 - 0	26 - 11	26 - 0	26 - 0	26 - 0	26 - 11	26 - 0
DFL1	3:12	2n	4	5 - 3	4 - 8	4 - 5	4 - 1	6 - 6	5 - 9	5 - 4	4 - 11	7 - 6	6 - 8	6 - 2	5 - 8
DFL1	3:12	2n	6	9 - 3	8 - 2	7 - 7	6 - 11	11 - 5	10 - 1	9 - 5	8 - 7	13 - 2	11 - 8	10 - 9	9 - 10
DFL1	3:12	2n	8	13 - 0	11 - 7	10 - 8	9 - 9	16 - 0	14 - 3	13 - 3	12 - 1	18 - 3	16 - 3	15 - 2	13 - 10
DFL1	3:12	2n	10	17 - 5	15 - 7	14 - 6	13 - 3	21 - 2	18 - 11	17 - 8	16 - 3	24 - 3	21 - 7	20 - 1	18 - 6
DFL1	3:12	2n	12	21 - 10	19 - 6	18 - 3	16 - 6	26 - 0	23 - 11	22 - 2	20 - 4	26 - 0	26 - 0	25 - 5	23 - 3
DFL1	3:12	2n	14	26 - 0	23 - 9	21 - 9	18 - 11	26 - 0	26 - 0	26 - 11	24 - 9	26 - 0	26 - 0	26 - 11	26 - 11
DFL1	4:12	1	4	6 - 2	5 - 6	5 - 2	4 - 9	7 - 6	6 - 8	6 - 3	5 - 9	8 - 6	7 - 7	7 - 1	6 - 6
DFL1	4:12	1	6	10 - 6	9 - 4	8 - 8	7 - 11	13 - 4	11 - 8	10 - 9	9 - 9	15 - 7	13 - 8	12 - 7	11 - 4
DFL1	4:12	1	8	15 - 6	13 - 6	12 - 6	11 - 3	19 - 0	17 - 2	15 - 9	14 - 3	21 - 3	19 - 4	18 - 2	16 - 7
DFL1	4:12	1	10	20 - 5	18 - 7	17 - 5	15 - 9	24 - 4	22 - 1	20 - 9	19 - 3	26 - 0	24 - 9	23 - 3	21 - 7
DFL1	4:12	1	12	25 - 0	22 - 8	21 - 3	19 - 9	26 - 0	26 - 0	25 - 4	23 - 6	26 - 11	26 - 0	26 - 0	26 - 0
DFL1	4:12	1	14	26 - 0	26 - 0	25 - 2	23 - 4	26 - 0	26 - 0	26 - 11	26 - 0	26 - 0	26 - 0	26 - 11	26 - 0
DFL1	4:12	2n	4	5 - 3	4 - 8	4 - 5	4 - 1	6 - 6	5 - 9	5 - 4	4 - 11	7 - 6	6 - 8	6 - 2	5 - 8
DFL1	4:12	2n	6	9 - 3	8 - 2	7 - 7	6 - 11	11 - 5	10 - 1	9 - 5	8 - 7	13 - 2	11 - 8	10 - 9	9 - 10
DFL1	4:12	2n	8	13 - 0	11 - 7	10 - 8	9 - 9	16 - 0	14 - 3	13 - 3	12 - 1	18 - 3	16 - 3	15 - 2	13 - 10
DFL1	4:12	2n	10	17 - 5	15 - 7	14 - 6	13 - 3	21 - 2	18 - 11	17 - 8	16 - 3	24 - 3	21 - 7	20 - 1	18 - 6
DFL1	4:12	2n	12	21 - 10	19 - 6	18 - 3	16 - 6	26 - 11	23 - 11	22 - 2	20 - 4	26 - 0	26 - 0	25 - 5	23 - 3
DFL1	4:12	2n	14	26 - 0	23 - 9	21 - 9	18 - 11	26 - 0	26 - 0	26 - 0	24 - 9	26 - 0	26 - 11	26 - 0	26 - 11
DFL1	5:12	1	4	6 - 5	5 - 9	5 - 4	4 - 11	7 - 10	7 - 0	6 - 6	6 - 0	8 - 10	7 - 11	7 - 5	6 - 10
DFL1	5:12	1	6	10 - 7	9 - 7	8 - 11	8 - 3	12 - 9	11 - 6	10 - 9	9 - 11	14 - 4	13 - 0	12 - 2	11 - 3
DFL1	5:12	1	8	14 - 3	12 - 11	12 - 1	11 - 2	17 - 1	15 - 5	14 - 6	13 - 5	19 - 2	17 - 4	16 - 3	15 - 1
DFL1	5:12	1	10	18 - 5	16 - 8	15 - 8	14 - 6	21 - 11	19 - 11	18 - 8	17 - 3	24 - 7	22 - 4	21 - 0	19 - 5
DFL1	5:12	1	12	22 - 6	20 - 5	19 - 2	17 - 9	26 - 0	24 - 4	22 - 10	21 - 2	26 - 0	26 - 0	25 - 8	23 - 9
DFL1	5:12	1	14	26 - 11	24 - 2	22 - 8	20 - 5	26 - 11	26 - 0	26 - 11	25 - 0	26 - 0	26 - 0	26 - 0	26 - 11
DFL1	5:12	2n	4	5 - 6	4 - 11	4 - 6	4 - 2	6 - 11	6 - 1	5 - 7	5 - 2	7 - 11	7 - 0	6 - 6	5 - 11
DFL1	5:12	2n	6	9 - 8	8 - 8	8 - 1	7 - 4	11 - 10	10 - 6	9 - 10	9 - 0	13 - 4	12 - 1	11 - 2	10 - 3
DFL1	5:12	2n	8	13 - 3	11 - 11	11 - 1	10 - 2	16 - 0	14 - 4	13 - 6	12 - 5	18 - 1	16 - 3	15 - 2	14 - 0
DFL1	5:12	2n	10	17 - 4	15 - 7	14 - 7	13 - 5	20 - 11	18 - 10	17 - 7	16 - 2	23 - 5	21 - 4	19 - 11	18 - 4
DFL1	5:12	2n	12	21 - 6	19 - 4	18 - 1	16 - 5	25 - 6	23 - 2	21 - 9	20 - 1	26 - 0	25 - 11	24 - 5	22 - 8
DFL1	5:12	2n	14	25 - 4	23 - 0	21 - 3	18 - 8	26 - 11	26 - 11	25 - 8	23 - 10	26 - 11	26 - 0	26 - 0	26 - 0
DFL1	6:12	1	4	6 - 5	5 - 9	5 - 4	4 - 11	7 - 10	7 - 0	6 - 6	6 - 0	8 - 10	7 - 11	7 - 5	6 - 10
DFL1	6:12	1	6	10 - 7	9 - 7	8 - 11	8 - 3	12 - 9	11 - 6	10 - 9	9 - 11	14 - 4	13 - 0	12 - 2	11 - 3
DFL1	6:12	1	8	14 - 3	12 - 11	12 - 1	11 - 2	17 - 1	15 - 5	14 - 6	13 - 5	19 - 2	17 - 4	16 - 3	15 - 1
DFL1	6:12	1	10	18 - 5	16 - 8	15 - 8	14 - 6	21 - 11	19 - 11	18 - 8	17 - 3	24 - 7	22 - 4	21 - 0	19 - 5
DFL1	6:12	1	12	22 - 6	20 - 5	19 - 2	17 - 9	26 - 0	24 - 4	22 - 10	21 - 2	26 - 0	26 - 0	25 - 8	23 - 9
DFL1	6:12	1	14	26 - 0	24 - 2	22 - 8	20 - 5	26 - 11	26 - 11	26 - 11	25 - 0	26 - 0	26 - 11	26 - 0	26 - 11
DFL1	6:12	2n	4	5 - 6	4 - 11	4 - 6	4 - 2	6 - 11	6 - 1	5 - 7	5 - 2	7 - 11	7 - 0	6 - 6	5 - 11
DFL1	6:12	2n	6	9 - 8	8 - 8	8 - 1	7 - 4	11 - 10	10 - 6	9 - 10	9 - 0	13 - 4	12 - 1	11 - 2	10 - 3
DFL1	6:12	2n	8	13 - 3	11 - 11	11 - 1	10 - 2	16 - 0	14 - 4	13 - 6	12 - 5	18 - 1	16 - 3	15 - 2	14 - 0
DFL1	6:12	2n	10	17 - 4	15 - 7	14 - 7	13 - 5	20 - 11	18 - 10	17 - 7	16 - 2	23 - 5	21 - 4	19 - 11	18 - 4
DFL1	6:12	2n	12	21 - 6	19 - 4	18 - 1	16 - 5	25 - 6	23 - 2	21 - 9	20 - 1	26 - 0	25 - 11	24 - 5	22 - 8
DFL1	6:12	2n	14	25 - 4	23 - 0	21 - 3	18 - 8	26 - 0	26 - 0	25 - 8	23 - 10	26 - 0	26 - 0	26 - 11	26 - 0
DFL1	7:12	1	4	6 - 6	5 - 10	5 - 6	5 - 1	8 - 0	7 - 2	6 - 8	6 - 1	9 - 1	8 - 2	7 - 7	6 - 11
DFL1	7:12	1	6	11 - 1	9 - 10	9 - 2	8 - 5	13 - 8	12 - 2	11 - 3	10 - 3	15 - 8	13 - 11	12 - 11	11 - 10
DFL1	7:12	1	8	15 - 6	13 - 10	12 - 10	11 - 9	18 - 11	17 - 1	15 - 9	14 - 5	21 - 2	19 - 2	18 - 1	16 - 7
DFL1	7:12	1	10	20 - 4	18 - 6	17 - 5	15 - 9	24 - 1	21 - 11	20 - 7	19 - 2	26 - 0	24 - 6	23 - 1	21 - 5
DFL1	7:12	1	12	24 - 9	22 - 6	21 - 2	19 - 8	26 - 0	26 - 11	25 - 1	23 - 3	26 - 0	26 - 0	26 - 0	26 - 0
DFL1	7:12	1	14	26 - 0	26 - 11	24 - 11	23 - 1	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 11	26 - 0
DFL1	7:12	2n	4	6 - 0	5 - 4	5 - 0	4 - 8	7 - 3	6 - 6	6 - 1	5 - 7	8 - 3	7 - 5	6 - 11	6 - 4
DFL1	7:12	2n	6	10 - 0	9 - 0	8 - 4	7 - 9	12 - 2	10 - 10	10 - 2	9 - 4	13 - 9	12 - 5	11 - 6	10 - 7
DFL1	7:12	2n	8	13 - 8	12 - 4	11 - 5	10 - 6	16 - 7	14 - 10	13 - 11	12 - 9	18 - 10	16 - 11	15 - 9	14 - 6
DFL1	7:12	2n	10	18 - 0	16 - 2	15 - 1	13 - 10	21 - 10	19 - 7	18 - 4	16 - 10	24 - 10	22 - 3	20 - 9	19 - 1
DFL1	7:12	2n	12	22 - 6	20 - 2	18 - 10	17 - 4	26 - 0	24 - 7	22 - 10	21 - 0	26 - 0	26 - 0	25 - 10	23 - 11
DFL1	7:12	2n	14	26 - 0	24 - 4	22 - 8	19 - 11	26 - 0	26 - 0	26 - 0	25 - 3	26 - 0	26 - 0	26 - 0	26 - 0

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE A-EXP. B, Kzt = 1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-22

Sheet Number 22 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
DFL1	8:12	1	4	6 - 6	5 - 10	5 - 6	5 - 1	8 - 0	7 - 2	6 - 8	6 - 1	9 - 1	8 - 2	7 - 7	6 - 11
DFL1	8:12	1	6	11 - 1	9 - 10	9 - 2	8 - 5	13 - 8	12 - 2	11 - 3	10 - 3	15 - 8	13 - 11	12 - 11	11 - 10
DFL1	8:12	1	8	15 - 6	13 - 10	12 - 10	11 - 9	18 - 11	17 - 1	15 - 9	14 - 5	21 - 2	19 - 2	18 - 1	16 - 7
DFL1	8:12	1	10	20 - 4	18 - 6	17 - 5	15 - 9	24 - 1	21 - 11	20 - 7	19 - 2	26 - 0	24 - 6	23 - 1	21 - 5
DFL1	8:12	1	12	24 - 9	22 - 6	21 - 2	19 - 8	26 - 0	26 - 0	25 - 1	23 - 3	26 - 11	26 - 0	26 - 0	26 - 0
DFL1	8:12	1	14	26 - 11	26 - 0	24 - 11	23 - 1	26 - 0	26 - 0	26 - 11	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0
DFL1	8:12	2n	4	6 - 0	5 - 4	5 - 0	4 - 8	7 - 3	6 - 6	6 - 1	5 - 7	8 - 3	7 - 5	6 - 11	6 - 4
DFL1	8:12	2n	6	10 - 0	9 - 0	8 - 4	7 - 9	12 - 2	10 - 10	10 - 2	9 - 4	13 - 9	12 - 5	11 - 6	10 - 7
DFL1	8:12	2n	8	13 - 8	12 - 4	11 - 5	10 - 6	16 - 7	14 - 10	13 - 11	12 - 9	18 - 10	16 - 11	15 - 9	14 - 6
DFL1	8:12	2n	10	18 - 0	16 - 2	15 - 1	13 - 10	21 - 10	19 - 7	18 - 4	16 - 10	24 - 10	22 - 3	20 - 9	19 - 1
DFL1	8:12	2n	12	22 - 6	20 - 2	18 - 10	17 - 4	26 - 0	24 - 7	22 - 10	21 - 0	26 - 0	26 - 11	25 - 10	23 - 11
DFL1	8:12	2n	14	26 - 0	24 - 4	22 - 8	19 - 11	26 - 11	26 - 0	26 - 0	25 - 3	26 - 0	26 - 0	26 - 0	26 - 0
DFL1	9:12	1	4	6 - 6	5 - 10	5 - 6	5 - 1	8 - 0	7 - 2	6 - 8	6 - 1	9 - 1	8 - 2	7 - 7	6 - 11
DFL1	9:12	1	6	11 - 1	9 - 10	9 - 2	8 - 5	13 - 8	12 - 2	11 - 3	10 - 3	15 - 8	13 - 11	12 - 11	11 - 10
DFL1	9:12	1	8	15 - 6	13 - 10	12 - 10	11 - 9	18 - 11	17 - 1	15 - 9	14 - 5	21 - 2	19 - 2	18 - 1	16 - 7
DFL1	9:12	1	10	20 - 4	18 - 6	17 - 5	15 - 9	24 - 1	21 - 11	20 - 7	19 - 2	26 - 11	24 - 6	23 - 1	21 - 5
DFL1	9:12	1	12	24 - 9	22 - 6	21 - 2	19 - 8	26 - 0	26 - 0	25 - 1	23 - 3	26 - 11	26 - 0	26 - 0	26 - 0
DFL1	9:12	1	14	26 - 0	26 - 11	24 - 11	23 - 1	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 11	26 - 11
DFL1	9:12	2n	4	6 - 0	5 - 4	5 - 0	4 - 8	7 - 3	6 - 6	6 - 1	5 - 7	8 - 3	7 - 5	6 - 11	6 - 4
DFL1	9:12	2n	6	10 - 0	9 - 0	8 - 4	7 - 9	12 - 2	10 - 10	10 - 2	9 - 4	13 - 9	12 - 5	11 - 6	10 - 7
DFL1	9:12	2n	8	13 - 8	12 - 4	11 - 5	10 - 6	16 - 7	14 - 10	13 - 11	12 - 9	18 - 10	16 - 11	15 - 9	14 - 6
DFL1	9:12	2n	10	18 - 0	16 - 2	15 - 1	13 - 10	21 - 10	19 - 7	18 - 4	16 - 10	24 - 10	22 - 3	20 - 9	19 - 1
DFL1	9:12	2n	12	22 - 6	20 - 2	18 - 10	17 - 4	26 - 0	24 - 7	22 - 10	21 - 0	26 - 0	26 - 11	25 - 10	23 - 11
DFL1	9:12	2n	14	26 - 0	24 - 4	22 - 8	19 - 11	26 - 11	26 - 0	26 - 0	25 - 3	26 - 0	26 - 0	26 - 0	26 - 0
DFL1	10:12	1	4	6 - 6	5 - 10	5 - 6	5 - 1	8 - 0	7 - 2	6 - 8	6 - 1	9 - 1	8 - 2	7 - 7	6 - 11
DFL1	10:12	1	6	11 - 1	9 - 10	9 - 2	8 - 5	13 - 8	12 - 2	11 - 3	10 - 3	15 - 8	13 - 11	12 - 11	11 - 10
DFL1	10:12	1	8	15 - 6	13 - 10	12 - 10	11 - 9	18 - 11	17 - 1	15 - 9	14 - 5	21 - 2	19 - 2	18 - 1	16 - 7
DFL1	10:12	1	10	20 - 4	18 - 6	17 - 5	15 - 9	24 - 1	21 - 11	20 - 7	19 - 2	26 - 11	24 - 6	23 - 1	21 - 5
DFL1	10:12	1	12	24 - 9	22 - 6	21 - 2	19 - 8	26 - 0	26 - 0	25 - 1	23 - 3	26 - 0	26 - 0	26 - 11	26 - 0
DFL1	10:12	1	14	26 - 0	26 - 0	24 - 11	23 - 1	26 - 0	26 - 11	26 - 0	26 - 0	26 - 0	26 - 0	26 - 11	26 - 0
DFL1	10:12	2n	4	6 - 0	5 - 4	5 - 0	4 - 8	7 - 3	6 - 6	6 - 1	5 - 7	8 - 3	7 - 5	6 - 11	6 - 4
DFL1	10:12	2n	6	10 - 0	9 - 0	8 - 4	7 - 9	12 - 2	10 - 10	10 - 2	9 - 4	13 - 9	12 - 5	11 - 6	10 - 7
DFL1	10:12	2n	8	13 - 8	12 - 4	11 - 5	10 - 6	16 - 7	14 - 10	13 - 11	12 - 9	18 - 10	16 - 11	15 - 9	14 - 6
DFL1	10:12	2n	10	18 - 0	16 - 2	15 - 1	13 - 10	21 - 10	19 - 7	18 - 4	16 - 10	24 - 10	22 - 3	20 - 9	19 - 1
DFL1	10:12	2n	12	22 - 6	20 - 2	18 - 10	17 - 4	26 - 0	24 - 7	22 - 10	21 - 0	26 - 11	26 - 0	25 - 10	23 - 11
DFL1	10:12	2n	14	26 - 0	24 - 4	22 - 8	19 - 11	26 - 0	26 - 0	26 - 0	25 - 3	26 - 11	26 - 0	26 - 11	26 - 0
DFL1	11:12	1	4	6 - 6	5 - 10	5 - 6	5 - 1	8 - 0	7 - 2	6 - 8	6 - 1	9 - 1	8 - 2	7 - 7	6 - 11
DFL1	11:12	1	6	11 - 1	9 - 10	9 - 2	8 - 5	13 - 8	12 - 2	11 - 3	10 - 3	15 - 8	13 - 11	12 - 11	11 - 10
DFL1	11:12	1	8	15 - 6	13 - 10	12 - 10	11 - 9	18 - 11	17 - 1	15 - 9	14 - 5	21 - 2	19 - 2	18 - 1	16 - 7
DFL1	11:12	1	10	20 - 4	18 - 6	17 - 5	15 - 9	24 - 1	21 - 11	20 - 7	19 - 2	26 - 0	24 - 6	23 - 1	21 - 5
DFL1	11:12	1	12	24 - 9	22 - 6	21 - 2	19 - 8	26 - 0	26 - 0	25 - 1	23 - 3	26 - 11	26 - 0	26 - 11	26 - 0
DFL1	11:12	1	14	26 - 11	26 - 0	24 - 11	23 - 1	26 - 0	26 - 0	26 - 11	26 - 11	26 - 0	26 - 11	26 - 0	26 - 0
DFL1	11:12	2n	4	6 - 0	5 - 4	5 - 0	4 - 8	7 - 3	6 - 6	6 - 1	5 - 7	8 - 3	7 - 5	6 - 11	6 - 4
DFL1	11:12	2n	6	10 - 0	9 - 0	8 - 4	7 - 9	12 - 2	10 - 10	10 - 2	9 - 4	13 - 9	12 - 5	11 - 6	10 - 7
DFL1	11:12	2n	8	13 - 8	12 - 4	11 - 5	10 - 6	16 - 7	14 - 10	13 - 11	12 - 9	18 - 10	16 - 11	15 - 9	14 - 6
DFL1	11:12	2n	10	18 - 0	16 - 2	15 - 1	13 - 10	21 - 10	19 - 7	18 - 4	16 - 10	24 - 10	22 - 3	20 - 9	19 - 1
DFL1	11:12	2n	12	22 - 6	20 - 2	18 - 10	17 - 4	26 - 0	24 - 7	22 - 10	21 - 0	26 - 0	26 - 0	25 - 10	23 - 11
DFL1	11:12	2n	14	26 - 0	24 - 4	22 - 8	19 - 11	26 - 0	26 - 0	26 - 0	25 - 3	26 - 0	26 - 11	26 - 0	26 - 0
DFL1	12:12	1	4	6 - 6	5 - 10	5 - 6	5 - 1	8 - 0	7 - 2	6 - 8	6 - 1	9 - 1	8 - 2	7 - 7	6 - 11
DFL1	12:12	1	6	11 - 1	9 - 10	9 - 2	8 - 5	13 - 8	12 - 2	11 - 3	10 - 3	15 - 8	13 - 11	12 - 11	11 - 10
DFL1	12:12	1	8	15 - 6	13 - 10	12 - 10	11 - 9	18 - 11	17 - 1	15 - 9	14 - 5	21 - 2	19 - 2	18 - 1	16 - 7
DFL1	12:12	1	10	20 - 4	18 - 6	17 - 5	15 - 9	24 - 1	21 - 11	20 - 7	19 - 2	26 - 0	24 - 6	23 - 1	21 - 5
DFL1	12:12	1	12	24 - 9	22 - 6	21 - 2	19 - 8	26 - 0	26 - 0	25 - 1	23 - 3	26 - 11	26 - 0	26 - 11	26 - 11
DFL1	12:12	1	14	26 - 11	26 - 0	24 - 11	23 - 1	26 - 0	26 - 0	26 - 0	26 - 11	26 - 0	26 - 0	26 - 0	26 - 0
DFL1	12:12	2n	4	6 - 0	5 - 4	5 - 0	4 - 8	7 - 3	6 - 6	6 - 1	5 - 7	8 - 3	7 - 5	6 - 11	6 - 4
DFL1	12:12	2n	6	10 - 0	9 - 0	8 - 4	7 - 9	12 - 2	10 - 10	10 - 2	9 - 4	13 - 9	12 - 5	11 - 6	10 - 7
DFL1	12:12	2n	8	13 - 8	12 - 4	11 - 5	10 - 6	16 - 7	14 - 10	13 - 11	12 - 9	18 - 10	16 - 11	15 - 9	14 - 6
DFL1	12:12	2n	10	18 - 0	16 - 2	15 - 1	13 - 10	21 - 10	19 - 7	18 - 4	16 - 10	24 - 10	22 - 3	20 - 9	19 - 1
DFL1	12:12	2n	12	22 - 6	20 - 2	18 - 10	17 - 4	26 - 0	24 - 7	22 - 10	21 - 0	26 - 0	26 - 0	25 - 10	23 - 11
DFL1	12:12	2n	14	26 - 0	24 - 4	22 - 8	19 - 11	26 - 11	26 - 0	26 - 0	25 - 3	26 - 0	26 - 0	26 - 0	26 - 0

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE B-EXP. B, Kzt = 1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-23

Sheet Number 23 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
DFL2	3:12	1	4	6 - 0	5 - 5	5 - 0	4 - 7	7 - 4	6 - 7	6 - 1	5 - 7	8 - 4	7 - 5	6 - 11	6 - 5
DFL2	3:12	1	6	10 - 3	9 - 1	8 - 5	7 - 9	13 - 0	11 - 4	10 - 5	9 - 6	15 - 2	13 - 3	12 - 3	11 - 0
DFL2	3:12	1	8	15 - 1	13 - 2	12 - 2	10 - 11	18 - 7	16 - 8	15 - 4	13 - 10	20 - 10	18 - 11	17 - 9	16 - 2
DFL2	3:12	1	10	20 - 0	18 - 2	17 - 0	15 - 4	23 - 10	21 - 7	20 - 4	18 - 10	26 - 0	24 - 3	22 - 9	21 - 1
DFL2	3:12	1	12	24 - 6	22 - 2	20 - 10	19 - 4	26 - 0	26 - 0	24 - 10	23 - 0	26 - 0	26 - 0	26 - 0	25 - 10
DFL2	3:12	1	14	26 - 0	26 - 11	24 - 8	22 - 8	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0
DFL2	3:12	2n	4	5 - 2	4 - 7	4 - 3	3 - 11	6 - 4	5 - 8	5 - 3	4 - 10	7 - 4	6 - 6	6 - 0	5 - 6
DFL2	3:12	2n	6	9 - 0	8 - 0	7 - 5	6 - 9	11 - 2	9 - 10	9 - 2	8 - 4	12 - 10	11 - 4	10 - 6	9 - 7
DFL2	3:12	2n	8	12 - 9	11 - 3	10 - 5	9 - 6	15 - 7	13 - 11	12 - 11	11 - 10	17 - 10	15 - 11	14 - 10	13 - 6
DFL2	3:12	2n	10	17 - 0	15 - 2	14 - 1	12 - 8	20 - 8	18 - 6	17 - 4	15 - 10	23 - 8	21 - 1	19 - 8	18 - 1
DFL2	3:12	2n	12	21 - 4	19 - 1	17 - 9	15 - 5	26 - 0	23 - 4	21 - 8	19 - 10	26 - 0	26 - 0	24 - 10	22 - 8
DFL2	3:12	2n	14	26 - 0	22 - 11	20 - 4	17 - 9	26 - 0	26 - 0	26 - 0	24 - 2	26 - 0	26 - 0	26 - 11	26 - 0
DFL2	4:12	1	4	6 - 0	5 - 5	5 - 0	4 - 7	7 - 4	6 - 7	6 - 1	5 - 7	8 - 4	7 - 5	6 - 11	6 - 5
DFL2	4:12	1	6	10 - 3	9 - 1	8 - 5	7 - 9	13 - 0	11 - 4	10 - 5	9 - 6	15 - 2	13 - 3	12 - 3	11 - 0
DFL2	4:12	1	8	15 - 1	13 - 2	12 - 2	10 - 11	18 - 7	16 - 8	15 - 4	13 - 10	20 - 10	18 - 11	17 - 9	16 - 2
DFL2	4:12	1	10	20 - 0	18 - 2	17 - 0	15 - 4	23 - 10	21 - 7	20 - 4	18 - 10	26 - 0	24 - 3	22 - 9	21 - 1
DFL2	4:12	1	12	24 - 6	22 - 2	20 - 10	19 - 4	26 - 0	26 - 0	24 - 10	23 - 0	26 - 0	26 - 0	26 - 0	25 - 10
DFL2	4:12	1	14	26 - 0	26 - 0	24 - 8	22 - 8	26 - 0	26 - 0	26 - 11	26 - 11	26 - 0	26 - 11	26 - 0	26 - 0
DFL2	4:12	2n	4	5 - 2	4 - 7	4 - 3	3 - 11	6 - 4	5 - 8	5 - 3	4 - 10	7 - 4	6 - 6	6 - 0	5 - 6
DFL2	4:12	2n	6	9 - 0	8 - 0	7 - 5	6 - 9	11 - 2	9 - 10	9 - 2	8 - 4	12 - 10	11 - 4	10 - 6	9 - 7
DFL2	4:12	2n	8	12 - 9	11 - 3	10 - 5	9 - 6	15 - 7	13 - 11	12 - 11	11 - 10	17 - 10	15 - 11	14 - 10	13 - 6
DFL2	4:12	2n	10	17 - 0	15 - 2	14 - 1	12 - 8	20 - 8	18 - 6	17 - 4	15 - 10	23 - 8	21 - 1	19 - 8	18 - 1
DFL2	4:12	2n	12	21 - 4	19 - 1	17 - 9	15 - 5	26 - 0	23 - 4	21 - 8	19 - 10	26 - 0	26 - 0	24 - 10	22 - 8
DFL2	4:12	2n	14	26 - 0	22 - 11	20 - 4	17 - 9	26 - 0	26 - 0	26 - 0	24 - 2	26 - 0	26 - 0	26 - 11	26 - 0
DFL2	5:12	1	4	6 - 3	5 - 7	5 - 3	4 - 10	7 - 7	6 - 10	6 - 4	5 - 10	8 - 8	7 - 9	7 - 3	6 - 8
DFL2	5:12	1	6	10 - 5	9 - 4	8 - 9	8 - 1	12 - 6	11 - 3	10 - 7	9 - 9	14 - 1	12 - 9	11 - 11	11 - 0
DFL2	5:12	1	8	14 - 0	12 - 8	11 - 10	10 - 11	16 - 8	15 - 1	14 - 2	13 - 1	18 - 9	17 - 0	15 - 11	14 - 9
DFL2	5:12	1	10	18 - 0	16 - 4	15 - 4	14 - 2	21 - 6	19 - 6	18 - 3	16 - 11	24 - 1	21 - 10	20 - 6	19 - 0
DFL2	5:12	1	12	22 - 1	20 - 0	18 - 9	17 - 2	26 - 0	23 - 10	22 - 5	20 - 9	26 - 0	26 - 0	25 - 1	23 - 3
DFL2	5:12	1	14	26 - 0	23 - 8	21 - 8	19 - 3	26 - 0	26 - 0	26 - 11	24 - 6	26 - 0	26 - 11	26 - 0	26 - 0
DFL2	5:12	2n	4	5 - 5	4 - 9	4 - 5	4 - 1	6 - 8	5 - 11	5 - 6	5 - 0	7 - 9	6 - 10	6 - 4	5 - 9
DFL2	5:12	2n	6	9 - 5	8 - 5	7 - 10	7 - 2	11 - 6	10 - 4	9 - 7	8 - 10	13 - 1	11 - 9	10 - 11	10 - 0
DFL2	5:12	2n	8	13 - 0	11 - 8	10 - 10	9 - 11	15 - 7	14 - 1	13 - 2	12 - 2	17 - 8	15 - 11	14 - 10	13 - 9
DFL2	5:12	2n	10	16 - 11	15 - 3	14 - 3	13 - 1	20 - 5	18 - 5	17 - 3	15 - 10	23 - 0	20 - 10	19 - 6	17 - 11
DFL2	5:12	2n	12	21 - 1	18 - 11	17 - 7	15 - 5	25 - 0	22 - 8	21 - 4	19 - 8	26 - 0	25 - 5	23 - 11	22 - 2
DFL2	5:12	2n	14	24 - 10	22 - 1	20 - 0	17 - 7	26 - 11	26 - 11	25 - 2	23 - 4	26 - 0	26 - 11	26 - 0	26 - 11
DFL2	6:12	1	4	6 - 3	5 - 7	5 - 3	4 - 10	7 - 7	6 - 10	6 - 4	5 - 10	8 - 8	7 - 9	7 - 3	6 - 8
DFL2	6:12	1	6	10 - 5	9 - 4	8 - 9	8 - 1	12 - 6	11 - 3	10 - 7	9 - 9	14 - 1	12 - 9	11 - 11	11 - 0
DFL2	6:12	1	8	14 - 0	12 - 8	11 - 10	10 - 11	16 - 8	15 - 1	14 - 2	13 - 1	18 - 9	17 - 0	15 - 11	14 - 9
DFL2	6:12	1	10	18 - 0	16 - 4	15 - 4	14 - 2	21 - 6	19 - 6	18 - 3	16 - 11	24 - 1	21 - 10	20 - 6	19 - 0
DFL2	6:12	1	12	22 - 1	20 - 0	18 - 9	17 - 2	26 - 11	23 - 10	22 - 5	20 - 9	26 - 0	26 - 11	25 - 1	23 - 3
DFL2	6:12	1	14	26 - 0	23 - 8	21 - 8	19 - 3	26 - 0	26 - 0	26 - 0	24 - 6	26 - 0	26 - 0	26 - 0	26 - 0
DFL2	6:12	2n	4	5 - 5	4 - 9	4 - 5	4 - 1	6 - 8	5 - 11	5 - 6	5 - 0	7 - 9	6 - 10	6 - 4	5 - 9
DFL2	6:12	2n	6	9 - 5	8 - 5	7 - 10	7 - 2	11 - 6	10 - 4	9 - 7	8 - 10	13 - 1	11 - 9	10 - 11	10 - 0
DFL2	6:12	2n	8	13 - 0	11 - 8	10 - 10	9 - 11	15 - 7	14 - 1	13 - 2	12 - 2	17 - 8	15 - 11	14 - 10	13 - 9
DFL2	6:12	2n	10	16 - 11	15 - 3	14 - 3	13 - 1	20 - 5	18 - 5	17 - 3	15 - 10	23 - 0	20 - 10	19 - 6	17 - 11
DFL2	6:12	2n	12	21 - 1	18 - 11	17 - 7	15 - 5	25 - 0	22 - 8	21 - 4	19 - 8	26 - 0	25 - 5	23 - 11	22 - 2
DFL2	6:12	2n	14	24 - 10	22 - 1	20 - 0	17 - 7	26 - 0	26 - 0	25 - 2	23 - 4	26 - 0	26 - 0	26 - 0	26 - 0
DFL2	7:12	1	4	6 - 5	5 - 9	5 - 4	5 - 0	7 - 10	7 - 0	6 - 6	6 - 0	8 - 10	7 - 11	7 - 5	6 - 9
DFL2	7:12	1	6	10 - 10	9 - 8	9 - 0	8 - 3	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
DFL2	7:12	1	8	15 - 1	13 - 6	12 - 7	11 - 5	18 - 6	16 - 8	15 - 5	14 - 0	20 - 9	18 - 10	17 - 8	16 - 2
DFL2	7:12	1	10	19 - 11	18 - 1	16 - 11	15 - 4	23 - 8	21 - 6	20 - 2	18 - 9	26 - 11	24 - 0	22 - 7	21 - 0
DFL2	7:12	1	12	24 - 3	22 - 0	20 - 9	19 - 3	26 - 11	26 - 11	24 - 7	22 - 10	26 - 0	26 - 0	26 - 0	25 - 6
DFL2	7:12	1	14	26 - 11	25 - 11	24 - 5	22 - 4	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 11	26 - 0
DFL2	7:12	2n	4	5 - 10	5 - 3	4 - 10	4 - 6	7 - 1	6 - 4	5 - 11	5 - 6	8 - 1	7 - 3	6 - 9	6 - 2
DFL2	7:12	2n	6	9 - 9	8 - 9	8 - 2	7 - 6	11 - 11	10 - 7	9 - 11	9 - 1	13 - 6	12 - 1	11 - 3	10 - 4
DFL2	7:12	2n	8	13 - 5	12 - 0	11 - 2	10 - 3	16 - 3	14 - 6	13 - 7	12 - 6	18 - 5	16 - 6	15 - 5	14 - 2
DFL2	7:12	2n	10	17 - 8	15 - 10	14 - 9	13 - 7	21 - 4	19 - 2	17 - 11	16 - 5	24 - 4	21 - 9	20 - 3	18 - 8
DFL2	7:12	2n	12	22 - 0	19 - 8	18 - 5	16 - 5	26 - 0	24 - 0	22 - 4	20 - 6	26 - 0	26 - 0	25 - 4	23 - 4
DFL2	7:12	2n	14	26 - 0	23 - 9	21 - 5	18 - 9	26 - 0	26 - 0	26 - 0	24 - 9	26 - 0	26 - 0	26 - 0	26 - 0

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE C-EXP. B, Kzt = 1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-24

Sheet Number 24 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
DFL2	8:12	1	4	6 - 5	5 - 9	5 - 4	5 - 0	7 - 10	7 - 0	6 - 6	6 - 0	8 - 10	7 - 11	7 - 5	6 - 9
DFL2	8:12	1	6	10 - 10	9 - 8	9 - 0	8 - 3	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
DFL2	8:12	1	8	15 - 1	13 - 6	12 - 7	11 - 5	18 - 6	16 - 8	15 - 5	14 - 0	20 - 9	18 - 10	17 - 8	16 - 2
DFL2	8:12	1	10	19 - 11	18 - 1	16 - 11	15 - 4	23 - 8	21 - 6	20 - 2	18 - 9	26 - 0	24 - 0	22 - 7	21 - 0
DFL2	8:12	1	12	24 - 3	22 - 0	20 - 9	19 - 3	26 - 0	26 - 0	24 - 7	22 - 10	26 - 0	26 - 11	26 - 11	25 - 6
DFL2	8:12	1	14	26 - 11	25 - 11	24 - 5	22 - 4	26 - 0	26 - 0	26 - 0	26 - 11	26 - 11	26 - 0	26 - 11	26 - 11
DFL2	8:12	2n	4	5 - 10	5 - 3	4 - 10	4 - 6	7 - 1	6 - 4	5 - 11	5 - 6	8 - 1	7 - 3	6 - 9	6 - 2
DFL2	8:12	2n	6	9 - 9	8 - 9	8 - 2	7 - 6	11 - 11	10 - 7	9 - 11	9 - 1	13 - 6	12 - 1	11 - 3	10 - 4
DFL2	8:12	2n	8	13 - 5	12 - 0	11 - 2	10 - 3	16 - 3	14 - 6	13 - 7	12 - 6	18 - 5	16 - 6	15 - 5	14 - 2
DFL2	8:12	2n	10	17 - 8	15 - 10	14 - 9	13 - 7	21 - 4	19 - 2	17 - 11	16 - 5	24 - 4	21 - 9	20 - 3	18 - 8
DFL2	8:12	2n	12	22 - 0	19 - 8	18 - 5	16 - 5	26 - 0	24 - 0	22 - 4	20 - 6	26 - 0	26 - 0	25 - 4	23 - 4
DFL2	8:12	2n	14	26 - 0	23 - 9	21 - 5	18 - 9	26 - 0	26 - 0	26 - 11	24 - 9	26 - 0	26 - 0	26 - 0	26 - 0
DFL2	9:12	1	4	6 - 5	5 - 9	5 - 4	5 - 0	7 - 10	7 - 0	6 - 6	6 - 0	8 - 10	7 - 11	7 - 5	6 - 9
DFL2	9:12	1	6	10 - 10	9 - 8	9 - 0	8 - 3	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
DFL2	9:12	1	8	15 - 1	13 - 6	12 - 7	11 - 5	18 - 6	16 - 8	15 - 5	14 - 0	20 - 9	18 - 10	17 - 8	16 - 2
DFL2	9:12	1	10	19 - 11	18 - 1	16 - 11	15 - 4	23 - 8	21 - 6	20 - 2	18 - 9	26 - 0	24 - 0	22 - 7	21 - 0
DFL2	9:12	1	12	24 - 3	22 - 0	20 - 9	19 - 3	26 - 11	26 - 0	24 - 7	22 - 10	26 - 0	26 - 0	26 - 0	25 - 6
DFL2	9:12	1	14	26 - 11	25 - 11	24 - 5	22 - 4	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0
DFL2	9:12	2n	4	5 - 10	5 - 3	4 - 10	4 - 6	7 - 1	6 - 4	5 - 11	5 - 6	8 - 1	7 - 3	6 - 9	6 - 2
DFL2	9:12	2n	6	9 - 9	8 - 9	8 - 2	7 - 6	11 - 11	10 - 7	9 - 11	9 - 1	13 - 6	12 - 1	11 - 3	10 - 4
DFL2	9:12	2n	8	13 - 5	12 - 0	11 - 2	10 - 3	16 - 3	14 - 6	13 - 7	12 - 6	18 - 5	16 - 6	15 - 5	14 - 2
DFL2	9:12	2n	10	17 - 8	15 - 10	14 - 9	13 - 7	21 - 4	19 - 2	17 - 11	16 - 5	24 - 4	21 - 9	20 - 3	18 - 8
DFL2	9:12	2n	12	22 - 0	19 - 8	18 - 5	16 - 5	26 - 0	24 - 0	22 - 4	20 - 6	26 - 0	26 - 0	25 - 4	23 - 4
DFL2	9:12	2n	14	26 - 0	23 - 9	21 - 5	18 - 9	26 - 0	26 - 0	26 - 11	24 - 9	26 - 0	26 - 0	26 - 0	26 - 0
DFL2	10:12	1	4	6 - 5	5 - 9	5 - 4	5 - 0	7 - 10	7 - 0	6 - 6	6 - 0	8 - 10	7 - 11	7 - 5	6 - 9
DFL2	10:12	1	6	10 - 10	9 - 8	9 - 0	8 - 3	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
DFL2	10:12	1	8	15 - 1	13 - 6	12 - 7	11 - 5	18 - 6	16 - 8	15 - 5	14 - 0	20 - 9	18 - 10	17 - 8	16 - 2
DFL2	10:12	1	10	19 - 11	18 - 1	16 - 11	15 - 4	23 - 8	21 - 6	20 - 2	18 - 9	26 - 0	24 - 0	22 - 7	21 - 0
DFL2	10:12	1	12	24 - 3	22 - 0	20 - 9	19 - 3	26 - 0	26 - 0	24 - 7	22 - 10	26 - 11	26 - 11	26 - 0	25 - 6
DFL2	10:12	1	14	26 - 0	25 - 11	24 - 5	22 - 4	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0
DFL2	10:12	2n	4	5 - 10	5 - 3	4 - 10	4 - 6	7 - 1	6 - 4	5 - 11	5 - 6	8 - 1	7 - 3	6 - 9	6 - 2
DFL2	10:12	2n	6	9 - 9	8 - 9	8 - 2	7 - 6	11 - 11	10 - 7	9 - 11	9 - 1	13 - 6	12 - 1	11 - 3	10 - 4
DFL2	10:12	2n	8	13 - 5	12 - 0	11 - 2	10 - 3	16 - 3	14 - 6	13 - 7	12 - 6	18 - 5	16 - 6	15 - 5	14 - 2
DFL2	10:12	2n	10	17 - 8	15 - 10	14 - 9	13 - 7	21 - 4	19 - 2	17 - 11	16 - 5	24 - 4	21 - 9	20 - 3	18 - 8
DFL2	10:12	2n	12	22 - 0	19 - 8	18 - 5	16 - 5	26 - 0	24 - 0	22 - 4	20 - 6	26 - 0	26 - 0	25 - 4	23 - 4
DFL2	10:12	2n	14	26 - 0	23 - 9	21 - 5	18 - 9	26 - 0	26 - 0	26 - 0	24 - 9	26 - 0	26 - 0	26 - 0	26 - 0
DFL2	11:12	1	4	6 - 5	5 - 9	5 - 4	5 - 0	7 - 10	7 - 0	6 - 6	6 - 0	8 - 10	7 - 11	7 - 5	6 - 9
DFL2	11:12	1	6	10 - 10	9 - 8	9 - 0	8 - 3	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
DFL2	11:12	1	8	15 - 1	13 - 6	12 - 7	11 - 5	18 - 6	16 - 8	15 - 5	14 - 0	20 - 9	18 - 10	17 - 8	16 - 2
DFL2	11:12	1	10	19 - 11	18 - 1	16 - 11	15 - 4	23 - 8	21 - 6	20 - 2	18 - 9	26 - 0	24 - 0	22 - 7	21 - 0
DFL2	11:12	1	12	24 - 3	22 - 0	20 - 9	19 - 3	26 - 11	26 - 0	24 - 7	22 - 10	26 - 0	26 - 0	26 - 0	25 - 6
DFL2	11:12	1	14	26 - 11	25 - 11	24 - 5	22 - 4	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0
DFL2	11:12	2n	4	5 - 10	5 - 3	4 - 10	4 - 6	7 - 1	6 - 4	5 - 11	5 - 6	8 - 1	7 - 3	6 - 9	6 - 2
DFL2	11:12	2n	6	9 - 9	8 - 9	8 - 2	7 - 6	11 - 11	10 - 7	9 - 11	9 - 1	13 - 6	12 - 1	11 - 3	10 - 4
DFL2	11:12	2n	8	13 - 5	12 - 0	11 - 2	10 - 3	16 - 3	14 - 6	13 - 7	12 - 6	18 - 5	16 - 6	15 - 5	14 - 2
DFL2	11:12	2n	10	17 - 8	15 - 10	14 - 9	13 - 7	21 - 4	19 - 2	17 - 11	16 - 5	24 - 4	21 - 9	20 - 3	18 - 8
DFL2	11:12	2n	12	22 - 0	19 - 8	18 - 5	16 - 5	26 - 11	24 - 0	22 - 4	20 - 6	26 - 0	26 - 0	25 - 4	23 - 4
DFL2	11:12	2n	14	26 - 0	23 - 9	21 - 5	18 - 9	26 - 0	26 - 0	26 - 0	24 - 9	26 - 0	26 - 11	26 - 0	26 - 11
DFL2	12:12	1	4	6 - 5	5 - 9	5 - 4	5 - 0	7 - 10	7 - 0	6 - 6	6 - 0	8 - 10	7 - 11	7 - 5	6 - 9
DFL2	12:12	1	6	10 - 10	9 - 8	9 - 0	8 - 3	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
DFL2	12:12	1	8	15 - 1	13 - 6	12 - 7	11 - 5	18 - 6	16 - 8	15 - 5	14 - 0	20 - 9	18 - 10	17 - 8	16 - 2
DFL2	12:12	1	10	19 - 11	18 - 1	16 - 11	15 - 4	23 - 8	21 - 6	20 - 2	18 - 9	26 - 11	24 - 0	22 - 7	21 - 0
DFL2	12:12	1	12	24 - 3	22 - 0	20 - 9	19 - 3	26 - 0	26 - 11	24 - 7	22 - 10	26 - 0	26 - 11	26 - 0	25 - 6
DFL2	12:12	1	14	26 - 0	25 - 11	24 - 5	22 - 4	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 11	26 - 11
DFL2	12:12	2n	4	5 - 10	5 - 3	4 - 10	4 - 6	7 - 1	6 - 4	5 - 11	5 - 6	8 - 1	7 - 3	6 - 9	6 - 2
DFL2	12:12	2n	6	9 - 9	8 - 9	8 - 2	7 - 6	11 - 11	10 - 7	9 - 11	9 - 1	13 - 6	12 - 1	11 - 3	10 - 4
DFL2	12:12	2n	8	13 - 5	12 - 0	11 - 2	10 - 3	16 - 3	14 - 6	13 - 7	12 - 6	18 - 5	16 - 6	15 - 5	14 - 2
DFL2	12:12	2n	10	17 - 8	15 - 10	14 - 9	13 - 7	21 - 4	19 - 2	17 - 11	16 - 5	24 - 4	21 - 9	20 - 3	18 - 8
DFL2	12:12	2n	12	22 - 0	19 - 8	18 - 5	16 - 5	26 - 11	24 - 0	22 - 4	20 - 6	26 - 0	26 - 0	25 - 4	23 - 4
DFL2	12:12	2n	14	26 - 0	23 - 9	21 - 5	18 - 9	26 - 0	26 - 0	26 - 0	24 - 9	26 - 0	26 - 0	26 - 11	26 - 0

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE D-EXP. B Kzt = 1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-25

Sheet Number 25 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
SP01	3:12	1	4	6 - 0	5 - 5	5 - 0	4 - 7	7 - 4	6 - 7	6 - 1	5 - 7	8 - 4	7 - 5	6 - 11	6 - 5
SP01	3:12	1	6	10 - 3	9 - 1	8 - 5	7 - 9	13 - 0	11 - 4	10 - 5	9 - 6	15 - 2	13 - 3	12 - 3	11 - 0
SP01	3:12	1	8	15 - 1	13 - 2	12 - 2	10 - 11	18 - 7	16 - 8	15 - 4	13 - 10	20 - 10	18 - 11	17 - 9	16 - 2
SP01	3:12	1	10	20 - 0	18 - 2	17 - 0	15 - 4	23 - 10	21 - 7	20 - 4	18 - 10	26 - 0	24 - 3	22 - 9	21 - 1
SP01	3:12	1	12	24 - 6	22 - 2	20 - 10	19 - 4	26 - 0	26 - 0	24 - 10	23 - 0	26 - 0	26 - 11	26 - 0	25 - 10
SP01	3:12	1	14	26 - 0	26 - 11	24 - 8	22 - 10	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0
SP01	3:12	2n	4	5 - 2	4 - 7	4 - 3	3 - 11	6 - 4	5 - 8	5 - 3	4 - 10	7 - 4	6 - 6	6 - 0	5 - 6
SP01	3:12	2n	6	9 - 0	8 - 0	7 - 5	6 - 9	11 - 2	9 - 10	9 - 2	8 - 4	12 - 10	11 - 4	10 - 6	9 - 7
SP01	3:12	2n	8	12 - 9	11 - 3	10 - 5	9 - 6	15 - 7	13 - 11	12 - 11	11 - 10	17 - 10	15 - 11	14 - 10	13 - 6
SP01	3:12	2n	10	17 - 0	15 - 2	14 - 1	12 - 11	20 - 8	18 - 6	17 - 4	15 - 10	23 - 8	21 - 1	19 - 8	18 - 1
SP01	3:12	2n	12	21 - 4	19 - 1	17 - 10	16 - 4	26 - 0	23 - 4	21 - 8	19 - 10	26 - 0	26 - 0	24 - 10	22 - 8
SP01	3:12	2n	14	26 - 0	23 - 1	20 - 10	18 - 2	26 - 0	26 - 0	26 - 0	24 - 2	26 - 0	26 - 0	26 - 0	26 - 0
SP01	4:12	1	4	6 - 0	5 - 5	5 - 0	4 - 7	7 - 4	6 - 7	6 - 1	5 - 7	8 - 4	7 - 5	6 - 11	6 - 5
SP01	4:12	1	6	10 - 3	9 - 1	8 - 5	7 - 9	13 - 0	11 - 4	10 - 5	9 - 6	15 - 2	13 - 3	12 - 3	11 - 0
SP01	4:12	1	8	15 - 1	13 - 2	12 - 2	10 - 11	18 - 7	16 - 8	15 - 4	13 - 10	20 - 10	18 - 11	17 - 9	16 - 2
SP01	4:12	1	10	20 - 0	18 - 2	17 - 0	15 - 4	23 - 10	21 - 7	20 - 4	18 - 10	26 - 0	24 - 3	22 - 9	21 - 1
SP01	4:12	1	12	24 - 6	22 - 2	20 - 10	19 - 4	26 - 0	26 - 0	24 - 10	23 - 0	26 - 0	26 - 0	26 - 0	25 - 10
SP01	4:12	1	14	26 - 11	26 - 0	24 - 8	22 - 10	26 - 0	26 - 0	26 - 0	26 - 11	26 - 11	26 - 0	26 - 0	26 - 0
SP01	4:12	2n	4	5 - 2	4 - 7	4 - 3	3 - 11	6 - 4	5 - 8	5 - 3	4 - 10	7 - 4	6 - 6	6 - 0	5 - 6
SP01	4:12	2n	6	9 - 0	8 - 0	7 - 5	6 - 9	11 - 2	9 - 10	9 - 2	8 - 4	12 - 10	11 - 4	10 - 6	9 - 7
SP01	4:12	2n	8	12 - 9	11 - 3	10 - 5	9 - 6	15 - 7	13 - 11	12 - 11	11 - 10	17 - 10	15 - 11	14 - 10	13 - 6
SP01	4:12	2n	10	17 - 0	15 - 2	14 - 1	12 - 11	20 - 8	18 - 6	17 - 4	15 - 10	23 - 8	21 - 1	19 - 8	18 - 1
SP01	4:12	2n	12	21 - 4	19 - 1	17 - 10	16 - 4	26 - 11	23 - 4	21 - 8	19 - 10	26 - 0	26 - 0	24 - 10	22 - 8
SP01	4:12	2n	14	26 - 0	23 - 1	20 - 10	18 - 2	26 - 0	26 - 0	26 - 0	24 - 2	26 - 0	26 - 0	26 - 0	26 - 0
SP01	5:12	1	4	6 - 3	5 - 7	5 - 3	4 - 10	7 - 7	6 - 10	6 - 4	5 - 10	8 - 8	7 - 9	7 - 3	6 - 8
SP01	5:12	1	6	10 - 5	9 - 4	8 - 9	8 - 1	12 - 6	11 - 3	10 - 7	9 - 9	14 - 1	12 - 9	11 - 11	11 - 0
SP01	5:12	1	8	14 - 0	12 - 8	11 - 10	10 - 11	16 - 8	15 - 1	14 - 2	13 - 1	18 - 9	17 - 0	15 - 11	14 - 9
SP01	5:12	1	10	18 - 0	16 - 4	15 - 4	14 - 2	21 - 6	19 - 6	18 - 3	16 - 11	24 - 1	21 - 10	20 - 6	19 - 0
SP01	5:12	1	12	22 - 1	20 - 0	18 - 9	17 - 5	26 - 0	23 - 10	22 - 5	20 - 9	26 - 0	26 - 0	25 - 1	23 - 3
SP01	5:12	1	14	26 - 0	23 - 8	22 - 1	19 - 8	26 - 0	26 - 0	26 - 11	24 - 6	26 - 0	26 - 11	26 - 0	26 - 0
SP01	5:12	2n	4	5 - 5	4 - 9	4 - 5	4 - 1	6 - 8	5 - 11	5 - 6	5 - 0	7 - 9	6 - 10	6 - 4	5 - 9
SP01	5:12	2n	6	9 - 5	8 - 5	7 - 10	7 - 2	11 - 6	10 - 4	9 - 7	8 - 10	13 - 1	11 - 9	10 - 11	10 - 0
SP01	5:12	2n	8	13 - 0	11 - 8	10 - 10	9 - 11	15 - 7	14 - 1	13 - 2	12 - 2	17 - 8	15 - 11	14 - 10	13 - 9
SP01	5:12	2n	10	16 - 11	15 - 3	14 - 3	13 - 2	20 - 5	18 - 5	17 - 3	15 - 10	23 - 0	20 - 10	19 - 6	17 - 11
SP01	5:12	2n	12	21 - 1	18 - 11	17 - 8	16 - 3	25 - 0	22 - 8	21 - 4	19 - 8	26 - 0	25 - 5	23 - 11	22 - 2
SP01	5:12	2n	14	24 - 10	22 - 6	20 - 5	18 - 0	26 - 11	26 - 11	25 - 2	23 - 4	26 - 0	26 - 11	26 - 0	26 - 11
SP01	6:12	1	4	6 - 3	5 - 7	5 - 3	4 - 10	7 - 7	6 - 10	6 - 4	5 - 10	8 - 8	7 - 9	7 - 3	6 - 8
SP01	6:12	1	6	10 - 5	9 - 4	8 - 9	8 - 1	12 - 6	11 - 3	10 - 7	9 - 9	14 - 1	12 - 9	11 - 11	11 - 0
SP01	6:12	1	8	14 - 0	12 - 8	11 - 10	10 - 11	16 - 8	15 - 1	14 - 2	13 - 1	18 - 9	17 - 0	15 - 11	14 - 9
SP01	6:12	1	10	18 - 0	16 - 4	15 - 4	14 - 2	21 - 6	19 - 6	18 - 3	16 - 11	24 - 1	21 - 10	20 - 6	19 - 0
SP01	6:12	1	12	22 - 1	20 - 0	18 - 9	17 - 5	26 - 0	23 - 10	22 - 5	20 - 9	26 - 0	26 - 11	25 - 1	23 - 3
SP01	6:12	1	14	26 - 0	23 - 8	22 - 1	19 - 8	26 - 0	26 - 0	26 - 0	24 - 6	26 - 0	26 - 0	26 - 0	26 - 0
SP01	6:12	2n	4	5 - 5	4 - 9	4 - 5	4 - 1	6 - 8	5 - 11	5 - 6	5 - 0	7 - 9	6 - 10	6 - 4	5 - 9
SP01	6:12	2n	6	9 - 5	8 - 5	7 - 10	7 - 2	11 - 6	10 - 4	9 - 7	8 - 10	13 - 1	11 - 9	10 - 11	10 - 0
SP01	6:12	2n	8	13 - 0	11 - 8	10 - 10	9 - 11	15 - 7	14 - 1	13 - 2	12 - 2	17 - 8	15 - 11	14 - 10	13 - 9
SP01	6:12	2n	10	16 - 11	15 - 3	14 - 3	13 - 2	20 - 5	18 - 5	17 - 3	15 - 10	23 - 0	20 - 10	19 - 6	17 - 11
SP01	6:12	2n	12	21 - 1	18 - 11	17 - 8	16 - 3	25 - 0	22 - 8	21 - 4	19 - 8	26 - 0	25 - 5	23 - 11	22 - 2
SP01	6:12	2n	14	24 - 10	22 - 6	20 - 5	18 - 0	26 - 0	26 - 0	25 - 2	23 - 4	26 - 0	26 - 0	26 - 0	26 - 0
SP01	7:12	1	4	6 - 5	5 - 9	5 - 4	5 - 0	7 - 10	7 - 0	6 - 6	6 - 0	8 - 10	7 - 11	7 - 5	6 - 9
SP01	7:12	1	6	10 - 10	9 - 8	9 - 0	8 - 3	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
SP01	7:12	1	8	15 - 1	13 - 6	12 - 7	11 - 5	18 - 6	16 - 8	15 - 5	14 - 0	20 - 9	18 - 10	17 - 8	16 - 2
SP01	7:12	1	10	19 - 11	18 - 1	16 - 11	15 - 4	23 - 8	21 - 6	20 - 2	18 - 9	26 - 11	24 - 0	22 - 7	21 - 0
SP01	7:12	1	12	24 - 3	22 - 0	20 - 9	19 - 3	26 - 11	26 - 11	24 - 7	22 - 10	26 - 0	26 - 0	26 - 0	25 - 6
SP01	7:12	1	14	26 - 0	25 - 11	24 - 5	22 - 8	26 - 0	26 - 0	26 - 0	26 - 11	26 - 0	26 - 0	26 - 11	26 - 0
SP01	7:12	2n	4	5 - 10	5 - 3	4 - 10	4 - 6	7 - 1	6 - 4	5 - 11	5 - 6	8 - 1	7 - 3	6 - 9	6 - 2
SP01	7:12	2n	6	9 - 9	8 - 9	8 - 2	7 - 6	11 - 11	10 - 7	9 - 11	9 - 1	13 - 6	12 - 1	11 - 3	10 - 4
SP01	7:12	2n	8	13 - 5	12 - 0	11 - 2	10 - 3	16 - 3	14 - 6	13 - 7	12 - 6	18 - 5	16 - 6	15 - 5	14 - 2
SP01	7:12	2n	10	17 - 8	15 - 10	14 - 9	13 - 7	21 - 4	19 - 2	17 - 11	16 - 5	24 - 4	21 - 9	20 - 3	18 - 8
SP01	7:12	2n	12	22 - 0	19 - 8	18 - 5	16 - 11	26 - 0	24 - 0	22 - 4	20 - 6	26 - 0	26 - 0	25 - 4	23 - 4
SP01	7:12	2n	14	26 - 0	23 - 9	21 - 11	19 - 2	26 - 0	26 - 0	26 - 0	24 - 9	26 - 0	26 - 0	26 - 0	26 - 0

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE E-EXP. B, Kzt = 1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-26

Sheet Number 26 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
SP01	8:12	1	4	6 - 5	5 - 9	5 - 4	5 - 0	7 - 10	7 - 0	6 - 6	6 - 0	8 - 10	7 - 11	7 - 5	6 - 9
SP01	8:12	1	6	10 - 10	9 - 8	9 - 0	8 - 3	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
SP01	8:12	1	8	15 - 1	13 - 6	12 - 7	11 - 5	18 - 6	16 - 8	15 - 5	14 - 0	20 - 9	18 - 10	17 - 8	16 - 2
SP01	8:12	1	10	19 - 11	18 - 1	16 - 11	15 - 4	23 - 8	21 - 6	20 - 2	18 - 9	26 - 0	24 - 0	22 - 7	21 - 0
SP01	8:12	1	12	24 - 3	22 - 0	20 - 9	19 - 3	26 - 0	26 - 0	24 - 7	22 - 10	26 - 0	26 - 0	26 - 0	25 - 6
SP01	8:12	1	14	26 - 11	25 - 11	24 - 5	22 - 8	26 - 0	26 - 0	26 - 0	26 - 11	26 - 0	26 - 0	26 - 0	26 - 11
SP01	8:12	2n	4	5 - 10	5 - 3	4 - 10	4 - 6	7 - 1	6 - 4	5 - 11	5 - 6	8 - 1	7 - 3	6 - 9	6 - 2
SP01	8:12	2n	6	9 - 9	8 - 9	8 - 2	7 - 6	11 - 11	10 - 7	9 - 11	9 - 1	13 - 6	12 - 1	11 - 3	10 - 4
SP01	8:12	2n	8	13 - 5	12 - 0	11 - 2	10 - 3	16 - 3	14 - 6	13 - 7	12 - 6	18 - 5	16 - 6	15 - 5	14 - 2
SP01	8:12	2n	10	17 - 8	15 - 10	14 - 9	13 - 7	21 - 4	19 - 2	17 - 11	16 - 5	24 - 4	21 - 9	20 - 3	18 - 8
SP01	8:12	2n	12	22 - 0	19 - 8	18 - 5	16 - 11	26 - 0	24 - 0	22 - 4	20 - 6	26 - 0	26 - 0	25 - 4	23 - 4
SP01	8:12	2n	14	26 - 0	23 - 9	21 - 11	19 - 2	26 - 0	26 - 0	26 - 0	24 - 9	26 - 0	26 - 0	26 - 0	26 - 0
SP01	9:12	1	4	6 - 5	5 - 9	5 - 4	5 - 0	7 - 10	7 - 0	6 - 6	6 - 0	8 - 10	7 - 11	7 - 5	6 - 9
SP01	9:12	1	6	10 - 10	9 - 8	9 - 0	8 - 3	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
SP01	9:12	1	8	15 - 1	13 - 6	12 - 7	11 - 5	18 - 6	16 - 8	15 - 5	14 - 0	20 - 9	18 - 10	17 - 8	16 - 2
SP01	9:12	1	10	19 - 11	18 - 1	16 - 11	15 - 4	23 - 8	21 - 6	20 - 2	18 - 9	26 - 0	24 - 0	22 - 7	21 - 0
SP01	9:12	1	12	24 - 3	22 - 0	20 - 9	19 - 3	26 - 11	26 - 0	24 - 7	22 - 10	26 - 0	26 - 11	26 - 0	25 - 6
SP01	9:12	1	14	26 - 11	25 - 11	24 - 5	22 - 8	26 - 0	26 - 11	26 - 0	26 - 0	26 - 0	26 - 11	26 - 0	26 - 0
SP01	9:12	2n	4	5 - 10	5 - 3	4 - 10	4 - 6	7 - 1	6 - 4	5 - 11	5 - 6	8 - 1	7 - 3	6 - 9	6 - 2
SP01	9:12	2n	6	9 - 9	8 - 9	8 - 2	7 - 6	11 - 11	10 - 7	9 - 11	9 - 1	13 - 6	12 - 1	11 - 3	10 - 4
SP01	9:12	2n	8	13 - 5	12 - 0	11 - 2	10 - 3	16 - 3	14 - 6	13 - 7	12 - 6	18 - 5	16 - 6	15 - 5	14 - 2
SP01	9:12	2n	10	17 - 8	15 - 10	14 - 9	13 - 7	21 - 4	19 - 2	17 - 11	16 - 5	24 - 4	21 - 9	20 - 3	18 - 8
SP01	9:12	2n	12	22 - 0	19 - 8	18 - 5	16 - 11	26 - 0	24 - 0	22 - 4	20 - 6	26 - 0	26 - 11	25 - 4	23 - 4
SP01	9:12	2n	14	26 - 0	23 - 9	21 - 11	19 - 2	26 - 0	26 - 0	26 - 11	24 - 9	26 - 0	26 - 0	26 - 0	26 - 0
SP01	10:12	1	4	6 - 5	5 - 9	5 - 4	5 - 0	7 - 10	7 - 0	6 - 6	6 - 0	8 - 10	7 - 11	7 - 5	6 - 9
SP01	10:12	1	6	10 - 10	9 - 8	9 - 0	8 - 3	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
SP01	10:12	1	8	15 - 1	13 - 6	12 - 7	11 - 5	18 - 6	16 - 8	15 - 5	14 - 0	20 - 9	18 - 10	17 - 8	16 - 2
SP01	10:12	1	10	19 - 11	18 - 1	16 - 11	15 - 4	23 - 8	21 - 6	20 - 2	18 - 9	26 - 11	24 - 0	22 - 7	21 - 0
SP01	10:12	1	12	24 - 3	22 - 0	20 - 9	19 - 3	26 - 0	26 - 0	24 - 7	22 - 10	26 - 11	26 - 0	26 - 0	25 - 6
SP01	10:12	1	14	26 - 11	25 - 11	24 - 5	22 - 8	26 - 11	26 - 0	26 - 0	26 - 0	26 - 11	26 - 0	26 - 0	26 - 0
SP01	10:12	2n	4	5 - 10	5 - 3	4 - 10	4 - 6	7 - 1	6 - 4	5 - 11	5 - 6	8 - 1	7 - 3	6 - 9	6 - 2
SP01	10:12	2n	6	9 - 9	8 - 9	8 - 2	7 - 6	11 - 11	10 - 7	9 - 11	9 - 1	13 - 6	12 - 1	11 - 3	10 - 4
SP01	10:12	2n	8	13 - 5	12 - 0	11 - 2	10 - 3	16 - 3	14 - 6	13 - 7	12 - 6	18 - 5	16 - 6	15 - 5	14 - 2
SP01	10:12	2n	10	17 - 8	15 - 10	14 - 9	13 - 7	21 - 4	19 - 2	17 - 11	16 - 5	24 - 4	21 - 9	20 - 3	18 - 8
SP01	10:12	2n	12	22 - 0	19 - 8	18 - 5	16 - 11	26 - 0	24 - 0	22 - 4	20 - 6	26 - 0	26 - 0	25 - 4	23 - 4
SP01	10:12	2n	14	26 - 0	23 - 9	21 - 11	19 - 2	26 - 0	26 - 0	26 - 0	24 - 9	26 - 0	26 - 0	26 - 0	26 - 11
SP01	11:12	1	4	6 - 5	5 - 9	5 - 4	5 - 0	7 - 10	7 - 0	6 - 6	6 - 0	8 - 10	7 - 11	7 - 5	6 - 9
SP01	11:12	1	6	10 - 10	9 - 8	9 - 0	8 - 3	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
SP01	11:12	1	8	15 - 1	13 - 6	12 - 7	11 - 5	18 - 6	16 - 8	15 - 5	14 - 0	20 - 9	18 - 10	17 - 8	16 - 2
SP01	11:12	1	10	19 - 11	18 - 1	16 - 11	15 - 4	23 - 8	21 - 6	20 - 2	18 - 9	26 - 0	24 - 0	22 - 7	21 - 0
SP01	11:12	1	12	24 - 3	22 - 0	20 - 9	19 - 3	26 - 11	26 - 0	24 - 7	22 - 10	26 - 0	26 - 0	26 - 11	25 - 6
SP01	11:12	1	14	26 - 0	25 - 11	24 - 5	22 - 8	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0
SP01	11:12	2n	4	5 - 10	5 - 3	4 - 10	4 - 6	7 - 1	6 - 4	5 - 11	5 - 6	8 - 1	7 - 3	6 - 9	6 - 2
SP01	11:12	2n	6	9 - 9	8 - 9	8 - 2	7 - 6	11 - 11	10 - 7	9 - 11	9 - 1	13 - 6	12 - 1	11 - 3	10 - 4
SP01	11:12	2n	8	13 - 5	12 - 0	11 - 2	10 - 3	16 - 3	14 - 6	13 - 7	12 - 6	18 - 5	16 - 6	15 - 5	14 - 2
SP01	11:12	2n	10	17 - 8	15 - 10	14 - 9	13 - 7	21 - 4	19 - 2	17 - 11	16 - 5	24 - 4	21 - 9	20 - 3	18 - 8
SP01	11:12	2n	12	22 - 0	19 - 8	18 - 5	16 - 11	26 - 0	24 - 0	22 - 4	20 - 6	26 - 0	26 - 0	25 - 4	23 - 4
SP01	11:12	2n	14	26 - 0	23 - 9	21 - 11	19 - 2	26 - 0	26 - 0	26 - 0	24 - 9	26 - 0	26 - 0	26 - 0	26 - 0
SP01	12:12	1	4	6 - 5	5 - 9	5 - 4	5 - 0	7 - 10	7 - 0	6 - 6	6 - 0	8 - 10	7 - 11	7 - 5	6 - 9
SP01	12:12	1	6	10 - 10	9 - 8	9 - 0	8 - 3	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
SP01	12:12	1	8	15 - 1	13 - 6	12 - 7	11 - 5	18 - 6	16 - 8	15 - 5	14 - 0	20 - 9	18 - 10	17 - 8	16 - 2
SP01	12:12	1	10	19 - 11	18 - 1	16 - 11	15 - 4	23 - 8	21 - 6	20 - 2	18 - 9	26 - 11	24 - 0	22 - 7	21 - 0
SP01	12:12	1	12	24 - 3	22 - 0	20 - 9	19 - 3	26 - 0	26 - 11	24 - 7	22 - 10	26 - 0	26 - 11	26 - 0	25 - 6
SP01	12:12	1	14	26 - 0	25 - 11	24 - 5	22 - 8	26 - 0	26 - 0	26 - 11	26 - 11	26 - 11	26 - 11	26 - 11	26 - 11
SP01	12:12	2n	4	5 - 10	5 - 3	4 - 10	4 - 6	7 - 1	6 - 4	5 - 11	5 - 6	8 - 1	7 - 3	6 - 9	6 - 2
SP01	12:12	2n	6	9 - 9	8 - 9	8 - 2	7 - 6	11 - 11	10 - 7	9 - 11	9 - 1	13 - 6	12 - 1	11 - 3	10 - 4
SP01	12:12	2n	8	13 - 5	12 - 0	11 - 2	10 - 3	16 - 3	14 - 6	13 - 7	12 - 6	18 - 5	16 - 6	15 - 5	14 - 2
SP01	12:12	2n	10	17 - 8	15 - 10	14 - 9	13 - 7	21 - 4	19 - 2	17 - 11	16 - 5	24 - 4	21 - 9	20 - 3	18 - 8
SP01	12:12	2n	12	22 - 0	19 - 8	18 - 5	16 - 11	26 - 11	24 - 0	22 - 4	20 - 6	26 - 0	26 - 0	25 - 4	23 - 4
SP01	12:12	2n	14	26 - 0	23 - 9	21 - 11	19 - 2	26 - 0	26 - 0	26 - 11	24 - 9	26 - 0	26 - 0	26 - 11	26 - 11

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE F-EXP. B, Kzt = 1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-27

Sheet Number 27 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
SP02	3:12	1	4	5 - 9	5 - 1	4 - 9	4 - 5	6 - 11	6 - 3	5 - 10	5 - 4	7 - 11	7 - 1	6 - 7	6 - 1
SP02	3:12	1	6	9 - 8	8 - 7	8 - 0	7 - 4	12 - 3	10 - 8	9 - 10	9 - 0	14 - 3	12 - 6	11 - 6	10 - 4
SP02	3:12	1	8	14 - 2	12 - 5	11 - 4	10 - 3	17 - 9	15 - 8	14 - 5	13 - 0	19 - 11	18 - 1	16 - 10	15 - 3
SP02	3:12	1	10	19 - 2	17 - 4	15 - 11	14 - 5	22 - 9	20 - 8	19 - 5	18 - 0	25 - 7	23 - 2	21 - 9	20 - 2
SP02	3:12	1	12	23 - 5	21 - 2	19 - 11	18 - 5	26 - 0	25 - 3	23 - 9	22 - 0	26 - 0	26 - 11	26 - 0	24 - 8
SP02	3:12	1	14	26 - 0	24 - 10	22 - 7	20 - 1	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 11	26 - 11
SP02	3:12	2n	4	4 - 11	4 - 4	4 - 1	3 - 8	6 - 0	5 - 4	5 - 0	4 - 7	6 - 11	6 - 2	5 - 8	5 - 3
SP02	3:12	2n	6	8 - 6	7 - 7	7 - 0	6 - 1	10 - 6	9 - 4	8 - 8	7 - 11	12 - 2	10 - 9	9 - 11	9 - 1
SP02	3:12	2n	8	12 - 1	10 - 8	9 - 10	8 - 7	14 - 10	13 - 2	12 - 3	11 - 2	16 - 11	15 - 1	14 - 0	12 - 10
SP02	3:12	2n	10	16 - 2	14 - 5	12 - 9	10 - 11	19 - 8	17 - 8	16 - 5	15 - 0	22 - 5	20 - 0	18 - 8	17 - 2
SP02	3:12	2n	12	20 - 3	17 - 9	15 - 10	13 - 8	24 - 10	22 - 1	20 - 7	18 - 10	26 - 0	25 - 4	23 - 6	21 - 6
SP02	3:12	2n	14	23 - 11	19 - 9	17 - 9	15 - 4	26 - 0	26 - 0	24 - 8	21 - 2	26 - 11	26 - 0	26 - 0	26 - 0
SP02	4:12	1	4	5 - 9	5 - 1	4 - 9	4 - 5	6 - 11	6 - 3	5 - 10	5 - 4	7 - 11	7 - 1	6 - 7	6 - 1
SP02	4:12	1	6	9 - 8	8 - 7	8 - 0	7 - 4	12 - 3	10 - 8	9 - 10	9 - 0	14 - 3	12 - 6	11 - 6	10 - 4
SP02	4:12	1	8	14 - 2	12 - 5	11 - 4	10 - 3	17 - 9	15 - 8	14 - 5	13 - 0	19 - 11	18 - 1	16 - 10	15 - 3
SP02	4:12	1	10	19 - 2	17 - 4	15 - 11	14 - 5	22 - 9	20 - 8	19 - 5	18 - 0	25 - 7	23 - 2	21 - 9	20 - 2
SP02	4:12	1	12	23 - 5	21 - 2	19 - 11	18 - 5	26 - 0	25 - 3	23 - 9	22 - 0	26 - 0	26 - 0	26 - 0	24 - 8
SP02	4:12	1	14	26 - 0	24 - 10	22 - 7	20 - 1	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 0	26 - 11	26 - 0
SP02	4:12	2n	4	4 - 11	4 - 4	4 - 1	3 - 8	6 - 0	5 - 4	5 - 0	4 - 7	6 - 11	6 - 2	5 - 8	5 - 3
SP02	4:12	2n	6	8 - 6	7 - 7	7 - 0	6 - 1	10 - 6	9 - 4	8 - 8	7 - 11	12 - 2	10 - 9	9 - 11	9 - 1
SP02	4:12	2n	8	12 - 1	10 - 8	9 - 10	8 - 7	14 - 10	13 - 2	12 - 3	11 - 2	16 - 11	15 - 1	14 - 0	12 - 10
SP02	4:12	2n	10	16 - 2	14 - 5	12 - 9	10 - 11	19 - 8	17 - 8	16 - 5	15 - 0	22 - 5	20 - 0	18 - 8	17 - 2
SP02	4:12	2n	12	20 - 3	17 - 9	15 - 10	13 - 8	24 - 10	22 - 1	20 - 7	18 - 10	26 - 11	25 - 4	23 - 6	21 - 6
SP02	4:12	2n	14	23 - 11	19 - 9	17 - 9	15 - 4	26 - 0	26 - 0	24 - 8	21 - 2	26 - 0	26 - 11	26 - 0	26 - 11
SP02	5:12	1	4	6 - 0	5 - 4	5 - 0	4 - 7	7 - 3	6 - 6	6 - 1	5 - 7	8 - 3	7 - 5	6 - 11	6 - 4
SP02	5:12	1	6	9 - 11	8 - 11	8 - 4	7 - 8	11 - 11	10 - 9	10 - 1	9 - 3	13 - 5	12 - 2	11 - 4	10 - 6
SP02	5:12	1	8	13 - 4	12 - 1	11 - 3	10 - 5	15 - 11	14 - 5	13 - 6	12 - 6	17 - 11	16 - 3	15 - 3	14 - 1
SP02	5:12	1	10	17 - 3	15 - 7	14 - 7	13 - 1	20 - 6	18 - 7	17 - 6	16 - 2	23 - 1	20 - 11	19 - 7	18 - 2
SP02	5:12	1	12	21 - 1	19 - 1	17 - 6	15 - 7	25 - 1	22 - 9	21 - 5	19 - 10	26 - 0	25 - 6	24 - 0	22 - 3
SP02	5:12	1	14	24 - 7	21 - 2	19 - 2	17 - 1	26 - 11	26 - 0	25 - 1	22 - 4	26 - 0	26 - 0	26 - 0	26 - 0
SP02	5:12	2n	4	5 - 1	4 - 6	4 - 2	3 - 10	6 - 4	5 - 7	5 - 2	4 - 9	7 - 4	6 - 6	6 - 0	5 - 6
SP02	5:12	2n	6	9 - 0	8 - 0	7 - 5	6 - 9	10 - 11	9 - 9	9 - 1	8 - 4	12 - 6	11 - 2	10 - 5	9 - 6
SP02	5:12	2n	8	12 - 5	11 - 1	10 - 4	9 - 3	14 - 10	13 - 5	12 - 7	11 - 6	16 - 10	15 - 2	14 - 2	13 - 1
SP02	5:12	2n	10	16 - 1	14 - 6	13 - 1	11 - 6	19 - 6	17 - 6	16 - 4	15 - 1	22 - 0	19 - 10	18 - 6	17 - 1
SP02	5:12	2n	12	20 - 0	17 - 7	15 - 10	13 - 11	23 - 11	21 - 8	20 - 4	18 - 8	26 - 0	24 - 3	22 - 10	21 - 3
SP02	5:12	2n	14	22 - 10	19 - 6	17 - 7	15 - 5	26 - 0	25 - 6	23 - 3	20 - 9	26 - 0	26 - 0	26 - 11	25 - 0
SP02	6:12	1	4	6 - 0	5 - 4	5 - 0	4 - 7	7 - 3	6 - 6	6 - 1	5 - 7	8 - 3	7 - 5	6 - 11	6 - 4
SP02	6:12	1	6	9 - 11	8 - 11	8 - 4	7 - 8	11 - 11	10 - 9	10 - 1	9 - 3	13 - 5	12 - 2	11 - 4	10 - 6
SP02	6:12	1	8	13 - 4	12 - 1	11 - 3	10 - 5	15 - 11	14 - 5	13 - 6	12 - 6	17 - 11	16 - 3	15 - 3	14 - 1
SP02	6:12	1	10	17 - 3	15 - 7	14 - 7	13 - 1	20 - 6	18 - 7	17 - 6	16 - 2	23 - 1	20 - 11	19 - 7	18 - 2
SP02	6:12	1	12	21 - 1	19 - 1	17 - 6	15 - 7	25 - 1	22 - 9	21 - 5	19 - 10	26 - 0	25 - 6	24 - 0	22 - 3
SP02	6:12	1	14	24 - 7	21 - 2	19 - 2	17 - 1	26 - 11	26 - 0	25 - 1	22 - 4	26 - 0	26 - 0	26 - 11	26 - 0
SP02	6:12	2n	4	5 - 1	4 - 6	4 - 2	3 - 10	6 - 4	5 - 7	5 - 2	4 - 9	7 - 4	6 - 6	6 - 0	5 - 6
SP02	6:12	2n	6	9 - 0	8 - 0	7 - 5	6 - 9	10 - 11	9 - 9	9 - 1	8 - 4	12 - 6	11 - 2	10 - 5	9 - 6
SP02	6:12	2n	8	12 - 5	11 - 1	10 - 4	9 - 3	14 - 10	13 - 5	12 - 7	11 - 6	16 - 10	15 - 2	14 - 2	13 - 1
SP02	6:12	2n	10	16 - 1	14 - 6	13 - 1	11 - 6	19 - 6	17 - 6	16 - 4	15 - 1	22 - 0	19 - 10	18 - 6	17 - 1
SP02	6:12	2n	12	20 - 0	17 - 7	15 - 10	13 - 11	23 - 11	21 - 8	20 - 4	18 - 8	26 - 11	24 - 3	22 - 10	21 - 3
SP02	6:12	2n	14	22 - 10	19 - 6	17 - 7	15 - 5	26 - 0	25 - 6	23 - 3	20 - 9	26 - 0	26 - 0	26 - 0	25 - 0
SP02	7:12	1	4	6 - 1	5 - 5	5 - 2	4 - 9	7 - 5	6 - 7	6 - 2	5 - 8	8 - 5	7 - 7	7 - 0	6 - 5
SP02	7:12	1	6	10 - 3	9 - 2	8 - 6	7 - 10	12 - 8	11 - 3	10 - 5	9 - 6	14 - 5	12 - 11	12 - 0	10 - 11
SP02	7:12	1	8	14 - 4	12 - 9	11 - 11	10 - 10	17 - 8	15 - 8	14 - 7	13 - 4	19 - 10	18 - 0	16 - 10	15 - 3
SP02	7:12	1	10	19 - 1	17 - 4	16 - 0	14 - 6	22 - 7	20 - 6	19 - 4	17 - 11	25 - 3	23 - 0	21 - 7	20 - 1
SP02	7:12	1	12	23 - 2	21 - 1	19 - 10	18 - 3	26 - 0	25 - 0	23 - 6	21 - 10	26 - 0	26 - 0	26 - 0	24 - 5
SP02	7:12	1	14	26 - 11	24 - 5	22 - 3	19 - 11	26 - 0	26 - 11	26 - 11	25 - 8	26 - 0	26 - 0	26 - 0	26 - 11
SP02	7:12	2n	4	5 - 7	4 - 11	4 - 7	4 - 4	6 - 9	6 - 0	5 - 8	5 - 2	7 - 8	6 - 10	6 - 5	5 - 11
SP02	7:12	2n	6	9 - 3	8 - 4	7 - 10	7 - 2	11 - 3	10 - 1	9 - 5	8 - 8	12 - 10	11 - 6	10 - 8	9 - 10
SP02	7:12	2n	8	12 - 9	11 - 5	10 - 8	9 - 9	15 - 5	13 - 10	12 - 11	11 - 11	17 - 6	15 - 8	14 - 8	13 - 6
SP02	7:12	2n	10	16 - 9	15 - 0	13 - 10	12 - 1	20 - 3	18 - 3	17 - 0	15 - 8	23 - 1	20 - 8	19 - 3	17 - 9
SP02	7:12	2n	12	20 - 10	18 - 9	16 - 10	14 - 8	25 - 4	22 - 9	21 - 2	19 - 6	26 - 0	25 - 9	24 - 2	22 - 2
SP02	7:12	2n	14	24 - 11	20 - 10	18 - 8	16 - 4	26 - 0	26 - 0	25 - 5	22 - 3	26 - 0	26 - 0	26 - 0	26 - 0

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE G-EXP. B, Kzt =1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-28

Sheet Number 28 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
SP02	8:12	1	4	6 - 1	5 - 5	5 - 2	4 - 9	7 - 5	6 - 7	6 - 2	5 - 8	8 - 5	7 - 7	7 - 0	6 - 5
SP02	8:12	1	6	10 - 3	9 - 2	8 - 6	7 - 10	12 - 8	11 - 3	10 - 5	9 - 6	14 - 5	12 - 11	12 - 0	10 - 11
SP02	8:12	1	8	14 - 4	12 - 9	11 - 11	10 - 10	17 - 8	15 - 8	14 - 7	13 - 4	19 - 10	18 - 0	16 - 10	15 - 3
SP02	8:12	1	10	19 - 1	17 - 4	16 - 0	14 - 6	22 - 7	20 - 6	19 - 4	17 - 11	25 - 3	23 - 0	21 - 7	20 - 1
SP02	8:12	1	12	23 - 2	21 - 1	19 - 10	18 - 3	26 - 11	25 - 0	23 - 6	21 - 10	26 - 0	26 - 0	26 - 0	24 - 5
SP02	8:12	1	14	26 - 0	24 - 5	22 - 3	19 - 11	26 - 0	26 - 0	26 - 0	25 - 8	26 - 0	26 - 0	26 - 0	26 - 0
SP02	8:12	2n	4	5 - 7	4 - 11	4 - 7	4 - 4	6 - 9	6 - 0	5 - 8	5 - 2	7 - 8	6 - 10	6 - 5	5 - 11
SP02	8:12	2n	6	9 - 3	8 - 4	7 - 10	7 - 2	11 - 3	10 - 1	9 - 5	8 - 8	12 - 10	11 - 6	10 - 8	9 - 10
SP02	8:12	2n	8	12 - 9	11 - 5	10 - 8	9 - 9	15 - 5	13 - 10	12 - 11	11 - 11	17 - 6	15 - 8	14 - 8	13 - 6
SP02	8:12	2n	10	16 - 9	15 - 0	13 - 10	12 - 1	20 - 3	18 - 3	17 - 0	15 - 8	23 - 1	20 - 8	19 - 3	17 - 9
SP02	8:12	2n	12	20 - 10	18 - 9	16 - 10	14 - 8	25 - 4	22 - 9	21 - 2	19 - 6	26 - 11	25 - 9	24 - 2	22 - 2
SP02	8:12	2n	14	24 - 11	20 - 10	18 - 8	16 - 4	26 - 0	26 - 0	25 - 5	22 - 3	26 - 0	26 - 0	26 - 0	26 - 11
SP02	9:12	1	4	6 - 1	5 - 5	5 - 2	4 - 9	7 - 5	6 - 7	6 - 2	5 - 8	8 - 5	7 - 7	7 - 0	6 - 5
SP02	9:12	1	6	10 - 3	9 - 2	8 - 6	7 - 10	12 - 8	11 - 3	10 - 5	9 - 6	14 - 5	12 - 11	12 - 0	10 - 11
SP02	9:12	1	8	14 - 4	12 - 9	11 - 11	10 - 10	17 - 8	15 - 8	14 - 7	13 - 4	19 - 10	18 - 0	16 - 10	15 - 3
SP02	9:12	1	10	19 - 1	17 - 4	16 - 0	14 - 6	22 - 7	20 - 6	19 - 4	17 - 11	25 - 3	23 - 0	21 - 7	20 - 1
SP02	9:12	1	12	23 - 2	21 - 1	19 - 10	18 - 3	26 - 11	25 - 0	23 - 6	21 - 10	26 - 11	26 - 0	26 - 11	24 - 5
SP02	9:12	1	14	26 - 11	24 - 5	22 - 3	19 - 11	26 - 11	26 - 0	26 - 0	25 - 8	26 - 0	26 - 11	26 - 0	26 - 0
SP02	9:12	2n	4	5 - 7	4 - 11	4 - 7	4 - 4	6 - 9	6 - 0	5 - 8	5 - 2	7 - 8	6 - 10	6 - 5	5 - 11
SP02	9:12	2n	6	9 - 3	8 - 4	7 - 10	7 - 2	11 - 3	10 - 1	9 - 5	8 - 8	12 - 10	11 - 6	10 - 8	9 - 10
SP02	9:12	2n	8	12 - 9	11 - 5	10 - 8	9 - 9	15 - 5	13 - 10	12 - 11	11 - 11	17 - 6	15 - 8	14 - 8	13 - 6
SP02	9:12	2n	10	16 - 9	15 - 0	13 - 10	12 - 1	20 - 3	18 - 3	17 - 0	15 - 8	23 - 1	20 - 8	19 - 3	17 - 9
SP02	9:12	2n	12	20 - 10	18 - 9	16 - 10	14 - 8	25 - 4	22 - 9	21 - 2	19 - 6	26 - 0	25 - 9	24 - 2	22 - 2
SP02	9:12	2n	14	24 - 11	20 - 10	18 - 8	16 - 4	26 - 0	26 - 0	25 - 5	22 - 3	26 - 0	26 - 0	26 - 0	26 - 0
SP02	10:12	1	4	6 - 1	5 - 5	5 - 2	4 - 9	7 - 5	6 - 7	6 - 2	5 - 8	8 - 5	7 - 7	7 - 0	6 - 5
SP02	10:12	1	6	10 - 3	9 - 2	8 - 6	7 - 10	12 - 8	11 - 3	10 - 5	9 - 6	14 - 5	12 - 11	12 - 0	10 - 11
SP02	10:12	1	8	14 - 4	12 - 9	11 - 11	10 - 10	17 - 8	15 - 8	14 - 7	13 - 4	19 - 10	18 - 0	16 - 10	15 - 3
SP02	10:12	1	10	19 - 1	17 - 4	16 - 0	14 - 6	22 - 7	20 - 6	19 - 4	17 - 11	25 - 3	23 - 0	21 - 7	20 - 1
SP02	10:12	1	12	23 - 2	21 - 1	19 - 10	18 - 3	26 - 11	25 - 0	23 - 6	21 - 10	26 - 0	26 - 0	26 - 0	24 - 5
SP02	10:12	1	14	26 - 0	24 - 5	22 - 3	19 - 11	26 - 0	26 - 0	26 - 0	25 - 8	26 - 0	26 - 0	26 - 0	26 - 11
SP02	10:12	2n	4	5 - 7	4 - 11	4 - 7	4 - 4	6 - 9	6 - 0	5 - 8	5 - 2	7 - 8	6 - 10	6 - 5	5 - 11
SP02	10:12	2n	6	9 - 3	8 - 4	7 - 10	7 - 2	11 - 3	10 - 1	9 - 5	8 - 8	12 - 10	11 - 6	10 - 8	9 - 10
SP02	10:12	2n	8	12 - 9	11 - 5	10 - 8	9 - 9	15 - 5	13 - 10	12 - 11	11 - 11	17 - 6	15 - 8	14 - 8	13 - 6
SP02	10:12	2n	10	16 - 9	15 - 0	13 - 10	12 - 1	20 - 3	18 - 3	17 - 0	15 - 8	23 - 1	20 - 8	19 - 3	17 - 9
SP02	10:12	2n	12	20 - 10	18 - 9	16 - 10	14 - 8	25 - 4	22 - 9	21 - 2	19 - 6	26 - 0	25 - 9	24 - 2	22 - 2
SP02	10:12	2n	14	24 - 11	20 - 10	18 - 8	16 - 4	26 - 0	26 - 0	25 - 5	22 - 3	26 - 0	26 - 0	26 - 11	26 - 0
SP02	11:12	1	4	6 - 1	5 - 5	5 - 2	4 - 9	7 - 5	6 - 7	6 - 2	5 - 8	8 - 5	7 - 7	7 - 0	6 - 5
SP02	11:12	1	6	10 - 3	9 - 2	8 - 6	7 - 10	12 - 8	11 - 3	10 - 5	9 - 6	14 - 5	12 - 11	12 - 0	10 - 11
SP02	11:12	1	8	14 - 4	12 - 9	11 - 11	10 - 10	17 - 8	15 - 8	14 - 7	13 - 4	19 - 10	18 - 0	16 - 10	15 - 3
SP02	11:12	1	10	19 - 1	17 - 4	16 - 0	14 - 6	22 - 7	20 - 6	19 - 4	17 - 11	25 - 3	23 - 0	21 - 7	20 - 1
SP02	11:12	1	12	23 - 2	21 - 1	19 - 10	18 - 3	26 - 0	25 - 0	23 - 6	21 - 10	26 - 0	26 - 0	26 - 11	24 - 5
SP02	11:12	1	14	26 - 0	24 - 5	22 - 3	19 - 11	26 - 0	26 - 0	26 - 0	25 - 8	26 - 0	26 - 0	26 - 0	26 - 11
SP02	11:12	2n	4	5 - 7	4 - 11	4 - 7	4 - 4	6 - 9	6 - 0	5 - 8	5 - 2	7 - 8	6 - 10	6 - 5	5 - 11
SP02	11:12	2n	6	9 - 3	8 - 4	7 - 10	7 - 2	11 - 3	10 - 1	9 - 5	8 - 8	12 - 10	11 - 6	10 - 8	9 - 10
SP02	11:12	2n	8	12 - 9	11 - 5	10 - 8	9 - 9	15 - 5	13 - 10	12 - 11	11 - 11	17 - 6	15 - 8	14 - 8	13 - 6
SP02	11:12	2n	10	16 - 9	15 - 0	13 - 10	12 - 1	20 - 3	18 - 3	17 - 0	15 - 8	23 - 1	20 - 8	19 - 3	17 - 9
SP02	11:12	2n	12	20 - 10	18 - 9	16 - 10	14 - 8	25 - 4	22 - 9	21 - 2	19 - 6	26 - 0	25 - 9	24 - 2	22 - 2
SP02	11:12	2n	14	24 - 11	20 - 10	18 - 8	16 - 4	26 - 0	26 - 11	25 - 5	22 - 3	26 - 0	26 - 0	26 - 11	26 - 0
SP02	12:12	1	4	6 - 1	5 - 5	5 - 2	4 - 9	7 - 5	6 - 7	6 - 2	5 - 8	8 - 5	7 - 7	7 - 0	6 - 5
SP02	12:12	1	6	10 - 3	9 - 2	8 - 6	7 - 10	12 - 8	11 - 3	10 - 5	9 - 6	14 - 5	12 - 11	12 - 0	10 - 11
SP02	12:12	1	8	14 - 4	12 - 9	11 - 11	10 - 10	17 - 8	15 - 8	14 - 7	13 - 4	19 - 10	18 - 0	16 - 10	15 - 3
SP02	12:12	1	10	19 - 1	17 - 4	16 - 0	14 - 6	22 - 7	20 - 6	19 - 4	17 - 11	25 - 3	23 - 0	21 - 7	20 - 1
SP02	12:12	1	12	23 - 2	21 - 1	19 - 10	18 - 3	26 - 0	25 - 0	23 - 6	21 - 10	26 - 0	26 - 11	26 - 0	24 - 5
SP02	12:12	1	14	26 - 0	24 - 5	22 - 3	19 - 11	26 - 0	26 - 0	26 - 11	25 - 8	26 - 0	26 - 0	26 - 0	26 - 11
SP02	12:12	2n	4	5 - 7	4 - 11	4 - 7	4 - 4	6 - 9	6 - 0	5 - 8	5 - 2	7 - 8	6 - 10	6 - 5	5 - 11
SP02	12:12	2n	6	9 - 3	8 - 4	7 - 10	7 - 2	11 - 3	10 - 1	9 - 5	8 - 8	12 - 10	11 - 6	10 - 8	9 - 10
SP02	12:12	2n	8	12 - 9	11 - 5	10 - 8	9 - 9	15 - 5	13 - 10	12 - 11	11 - 11	17 - 6	15 - 8	14 - 8	13 - 6
SP02	12:12	2n	10	16 - 9	15 - 0	13 - 10	12 - 1	20 - 3	18 - 3	17 - 0	15 - 8	23 - 1	20 - 8	19 - 3	17 - 9
SP02	12:12	2n	12	20 - 10	18 - 9	16 - 10	14 - 8	25 - 4	22 - 9	21 - 2	19 - 6	26 - 0	25 - 9	24 - 2	22 - 2
SP02	12:12	2n	14	24 - 11	20 - 10	18 - 8	16 - 4	26 - 0	26 - 0	25 - 5	22 - 3	26 - 0	26 - 0	26 - 11	26 - 0

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE H-EXP. B, Kzt = 1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-29

Sheet Number 29 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 2.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
DFL1	3:12	1	4	4 - 8	4 - 2	3 - 11	3 - 8	5 - 9	5 - 2	4 - 9	4 - 5	6 - 6	5 - 10	5 - 5	5 - 0
DFL1	3:12	1	6	7 - 11	7 - 1	6 - 7	5 - 11	9 - 9	8 - 8	8 - 0	7 - 5	11 - 4	9 - 11	9 - 2	8 - 5
DFL1	3:12	1	8	11 - 3	9 - 10	9 - 2	7 - 11	14 - 3	12 - 6	11 - 5	10 - 4	16 - 7	14 - 7	13 - 4	12 - 1
DFL1	3:12	1	10	15 - 9	13 - 9	12 - 8	10 - 5	19 - 3	17 - 5	16 - 0	14 - 6	21 - 7	19 - 6	18 - 4	16 - 11
DFL1	3:12	1	12	19 - 9	17 - 11	16 - 4	13 - 6	23 - 6	21 - 3	20 - 0	18 - 6	26 - 11	23 - 10	22 - 5	20 - 9
DFL1	3:12	1	14	23 - 4	20 - 7	18 - 8	16 - 1	26 - 0	25 - 2	23 - 8	21 - 9	26 - 0	26 - 0	26 - 11	24 - 7
DFL1	3:12	2n	4	4 - 0	3 - 7	3 - 4	2 - 11	4 - 11	4 - 5	4 - 1	3 - 9	5 - 7	5 - 0	4 - 8	4 - 4
DFL1	3:12	2n	6	6 - 11	6 - 0	5 - 3	4 - 7	8 - 7	7 - 7	7 - 1	6 - 5	9 - 10	8 - 9	8 - 1	7 - 5
DFL1	3:12	2n	8	9 - 9	8 - 5	7 - 5	6 - 4	12 - 1	10 - 8	9 - 11	9 - 0	13 - 10	12 - 4	11 - 5	10 - 5
DFL1	3:12	2n	10	13 - 3	11 - 1	9 - 9	8 - 4	16 - 2	14 - 6	13 - 5	12 - 0	18 - 6	16 - 6	15 - 5	14 - 1
DFL1	3:12	2n	12	16 - 6	13 - 8	12 - 1	10 - 3	20 - 4	18 - 2	16 - 11	14 - 8	23 - 3	20 - 8	19 - 4	17 - 9
DFL1	3:12	2n	14	18 - 11	15 - 9	14 - 0	12 - 1	24 - 9	21 - 9	19 - 5	16 - 11	26 - 0	25 - 3	23 - 5	21 - 5
DFL1	4:12	1	4	4 - 8	4 - 2	3 - 11	3 - 8	5 - 9	5 - 2	4 - 9	4 - 5	6 - 6	5 - 10	5 - 5	5 - 0
DFL1	4:12	1	6	7 - 11	7 - 1	6 - 7	5 - 11	9 - 9	8 - 8	8 - 0	7 - 5	11 - 4	9 - 11	9 - 2	8 - 5
DFL1	4:12	1	8	11 - 3	9 - 10	9 - 2	7 - 11	14 - 3	12 - 6	11 - 5	10 - 4	16 - 7	14 - 7	13 - 4	12 - 1
DFL1	4:12	1	10	15 - 9	13 - 9	12 - 8	10 - 5	19 - 3	17 - 5	16 - 0	14 - 6	21 - 7	19 - 6	18 - 4	16 - 11
DFL1	4:12	1	12	19 - 9	17 - 11	16 - 4	13 - 6	23 - 6	21 - 3	20 - 0	18 - 6	26 - 11	23 - 10	22 - 5	20 - 9
DFL1	4:12	1	14	23 - 4	20 - 7	18 - 8	16 - 1	26 - 0	25 - 2	23 - 8	21 - 9	26 - 0	26 - 0	26 - 11	24 - 7
DFL1	4:12	2n	4	4 - 0	3 - 7	3 - 4	2 - 11	4 - 11	4 - 5	4 - 1	3 - 9	5 - 7	5 - 0	4 - 8	4 - 4
DFL1	4:12	2n	6	6 - 11	6 - 0	5 - 3	4 - 7	8 - 7	7 - 7	7 - 1	6 - 5	9 - 10	8 - 9	8 - 1	7 - 5
DFL1	4:12	2n	8	9 - 9	8 - 5	7 - 5	6 - 4	12 - 1	10 - 8	9 - 11	9 - 0	13 - 10	12 - 4	11 - 5	10 - 5
DFL1	4:12	2n	10	13 - 3	11 - 1	9 - 9	8 - 4	16 - 2	14 - 6	13 - 5	12 - 0	18 - 6	16 - 6	15 - 5	14 - 1
DFL1	4:12	2n	12	16 - 6	13 - 8	12 - 1	10 - 3	20 - 4	18 - 2	16 - 11	14 - 8	23 - 3	20 - 8	19 - 4	17 - 9
DFL1	4:12	2n	14	18 - 11	15 - 9	14 - 0	12 - 1	24 - 9	21 - 9	19 - 5	16 - 11	26 - 0	25 - 3	23 - 5	21 - 5
DFL1	5:12	1	4	4 - 11	4 - 5	4 - 1	3 - 9	6 - 0	5 - 4	5 - 0	4 - 7	6 - 10	6 - 1	5 - 8	5 - 3
DFL1	5:12	1	6	8 - 3	7 - 5	6 - 11	6 - 4	9 - 11	8 - 11	8 - 4	7 - 8	11 - 3	10 - 1	9 - 6	8 - 9
DFL1	5:12	1	8	11 - 2	10 - 1	9 - 5	8 - 5	13 - 5	12 - 1	11 - 4	10 - 5	15 - 1	13 - 7	12 - 9	11 - 10
DFL1	5:12	1	10	14 - 6	13 - 1	12 - 0	10 - 7	17 - 3	15 - 8	14 - 8	13 - 7	19 - 5	17 - 7	16 - 6	15 - 3
DFL1	5:12	1	12	17 - 9	15 - 7	14 - 1	12 - 6	21 - 2	19 - 2	18 - 0	16 - 5	23 - 9	21 - 6	20 - 2	18 - 8
DFL1	5:12	1	14	20 - 4	17 - 6	15 - 10	14 - 1	25 - 0	22 - 8	20 - 10	18 - 6	26 - 0	25 - 5	23 - 11	22 - 2
DFL1	5:12	2n	4	4 - 1	3 - 8	3 - 5	3 - 0	5 - 1	4 - 6	4 - 2	3 - 11	5 - 11	5 - 2	4 - 10	4 - 5
DFL1	5:12	2n	6	7 - 4	6 - 6	5 - 8	4 - 11	9 - 0	8 - 1	7 - 6	6 - 9	10 - 3	9 - 2	8 - 7	7 - 10
DFL1	5:12	2n	8	10 - 2	9 - 1	8 - 1	6 - 11	12 - 5	11 - 1	10 - 4	9 - 6	14 - 0	12 - 8	11 - 10	10 - 10
DFL1	5:12	2n	10	13 - 5	11 - 9	10 - 5	9 - 1	16 - 2	14 - 7	13 - 8	12 - 6	18 - 4	16 - 6	15 - 5	14 - 2
DFL1	5:12	2n	12	16 - 5	13 - 11	12 - 7	10 - 11	20 - 1	18 - 1	16 - 10	14 - 9	22 - 7	20 - 6	19 - 2	17 - 8
DFL1	5:12	2n	14	18 - 8	15 - 9	14 - 3	12 - 7	23 - 10	21 - 3	19 - 1	16 - 10	26 - 11	24 - 2	22 - 9	21 - 2
DFL1	6:12	1	4	4 - 11	4 - 5	4 - 1	3 - 9	6 - 0	5 - 4	5 - 0	4 - 7	6 - 10	6 - 1	5 - 8	5 - 3
DFL1	6:12	1	6	8 - 3	7 - 5	6 - 11	6 - 4	9 - 11	8 - 11	8 - 4	7 - 8	11 - 3	10 - 1	9 - 6	8 - 9
DFL1	6:12	1	8	11 - 2	10 - 1	9 - 5	8 - 5	13 - 5	12 - 1	11 - 4	10 - 5	15 - 1	13 - 7	12 - 9	11 - 10
DFL1	6:12	1	10	14 - 6	13 - 1	12 - 0	10 - 7	17 - 3	15 - 8	14 - 8	13 - 7	19 - 5	17 - 7	16 - 6	15 - 3
DFL1	6:12	1	12	17 - 9	15 - 7	14 - 1	12 - 6	21 - 2	19 - 2	18 - 0	16 - 5	23 - 9	21 - 6	20 - 2	18 - 8
DFL1	6:12	1	14	20 - 4	17 - 6	15 - 10	14 - 1	25 - 0	22 - 8	20 - 10	18 - 6	26 - 0	25 - 5	23 - 11	22 - 2
DFL1	6:12	2n	4	4 - 1	3 - 8	3 - 5	3 - 0	5 - 1	4 - 6	4 - 2	3 - 11	5 - 11	5 - 2	4 - 10	4 - 5
DFL1	6:12	2n	6	7 - 4	6 - 6	5 - 8	4 - 11	9 - 0	8 - 1	7 - 6	6 - 9	10 - 3	9 - 2	8 - 7	7 - 10
DFL1	6:12	2n	8	10 - 2	9 - 1	8 - 1	6 - 11	12 - 5	11 - 1	10 - 4	9 - 6	14 - 0	12 - 8	11 - 10	10 - 10
DFL1	6:12	2n	10	13 - 5	11 - 9	10 - 5	9 - 1	16 - 2	14 - 7	13 - 8	12 - 6	18 - 4	16 - 6	15 - 5	14 - 2
DFL1	6:12	2n	12	16 - 5	13 - 11	12 - 7	10 - 11	20 - 1	18 - 1	16 - 10	14 - 9	22 - 7	20 - 6	19 - 2	17 - 8
DFL1	6:12	2n	14	18 - 8	15 - 9	14 - 3	12 - 7	23 - 10	21 - 3	19 - 1	16 - 10	26 - 0	24 - 2	22 - 9	21 - 2
DFL1	7:12	1	4	5 - 1	4 - 7	4 - 4	4 - 0	6 - 1	5 - 6	5 - 2	4 - 9	6 - 11	6 - 2	5 - 10	5 - 4
DFL1	7:12	1	6	8 - 5	7 - 7	7 - 0	6 - 5	10 - 3	9 - 2	8 - 7	7 - 11	11 - 10	10 - 6	9 - 9	8 - 11
DFL1	7:12	1	8	11 - 9	10 - 5	9 - 8	8 - 9	14 - 5	12 - 10	11 - 11	10 - 10	16 - 7	14 - 8	13 - 8	12 - 6
DFL1	7:12	1	10	15 - 9	14 - 0	13 - 0	11 - 4	19 - 1	17 - 4	16 - 0	14 - 7	21 - 5	19 - 5	18 - 3	16 - 10
DFL1	7:12	1	12	19 - 7	17 - 10	16 - 2	13 - 10	23 - 3	21 - 2	19 - 11	18 - 5	26 - 0	23 - 8	22 - 3	20 - 8
DFL1	7:12	1	14	23 - 1	20 - 4	18 - 7	16 - 2	26 - 0	24 - 11	23 - 5	21 - 5	26 - 0	26 - 0	26 - 11	24 - 4
DFL1	7:12	2n	4	4 - 7	4 - 1	3 - 10	3 - 7	5 - 7	5 - 0	4 - 8	4 - 4	6 - 4	5 - 8	5 - 3	4 - 11
DFL1	7:12	2n	6	7 - 9	6 - 11	6 - 5	5 - 8	9 - 4	8 - 4	7 - 10	7 - 2	10 - 7	9 - 6	8 - 10	8 - 2
DFL1	7:12	2n	8	10 - 6	9 - 5	8 - 7	7 - 7	12 - 9	11 - 5	10 - 8	9 - 10	14 - 6	13 - 0	12 - 2	11 - 2
DFL1	7:12	2n	10	13 - 10	12 - 4	11 - 0	9 - 7	16 - 10	15 - 1	14 - 1	13 - 0	19 - 1	17 - 2	16 - 0	14 - 8
DFL1	7:12	2n	12	17 - 4	14 - 8	13 - 2	11 - 6	20 - 11	18 - 10	17 - 7	15 - 7	23 - 10	21 - 4	19 - 11	18 - 4
DFL1	7:12	2n	14	19 - 11	16 - 9	15 - 0	13 - 2	25 - 3	22 - 8	20 - 5	17 - 11	26 - 0	25 - 8	24 - 1	22 - 1

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE A-EXP. B, Kzt = 2.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-30

Sheet Number 30 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 2.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
DFL1	8:12	1	4	5 - 1	4 - 7	4 - 4	4 - 0	6 - 1	5 - 6	5 - 2	4 - 9	6 - 11	6 - 2	5 - 10	5 - 4
DFL1	8:12	1	6	8 - 5	7 - 7	7 - 0	6 - 5	10 - 3	9 - 2	8 - 7	7 - 11	11 - 10	10 - 6	9 - 9	8 - 11
DFL1	8:12	1	8	11 - 9	10 - 5	9 - 8	8 - 9	14 - 5	12 - 10	11 - 11	10 - 10	16 - 7	14 - 8	13 - 8	12 - 6
DFL1	8:12	1	10	15 - 9	14 - 0	13 - 0	11 - 4	19 - 1	17 - 4	16 - 0	14 - 7	21 - 5	19 - 5	18 - 3	16 - 10
DFL1	8:12	1	12	19 - 7	17 - 10	16 - 2	13 - 10	23 - 3	21 - 2	19 - 11	18 - 5	26 - 11	23 - 8	22 - 3	20 - 8
DFL1	8:12	1	14	23 - 1	20 - 4	18 - 7	16 - 2	26 - 0	24 - 11	23 - 5	21 - 5	26 - 0	26 - 0	26 - 0	24 - 4
DFL1	8:12	2n	4	4 - 7	4 - 1	3 - 10	3 - 7	5 - 7	5 - 0	4 - 8	4 - 4	6 - 4	5 - 8	5 - 3	4 - 11
DFL1	8:12	2n	6	7 - 9	6 - 11	6 - 5	5 - 8	9 - 4	8 - 4	7 - 10	7 - 2	10 - 7	9 - 6	8 - 10	8 - 2
DFL1	8:12	2n	8	10 - 6	9 - 5	8 - 7	7 - 7	12 - 9	11 - 5	10 - 8	9 - 10	14 - 6	13 - 0	12 - 2	11 - 2
DFL1	8:12	2n	10	13 - 10	12 - 4	11 - 0	9 - 7	16 - 10	15 - 1	14 - 1	13 - 0	19 - 1	17 - 2	16 - 0	14 - 8
DFL1	8:12	2n	12	17 - 4	14 - 8	13 - 2	11 - 6	20 - 11	18 - 10	17 - 7	15 - 7	23 - 10	21 - 4	19 - 11	18 - 4
DFL1	8:12	2n	14	19 - 11	16 - 9	15 - 0	13 - 2	25 - 3	22 - 8	20 - 5	17 - 11	26 - 0	25 - 8	24 - 1	22 - 1
DFL1	9:12	1	4	5 - 1	4 - 7	4 - 4	4 - 0	6 - 1	5 - 6	5 - 2	4 - 9	6 - 11	6 - 2	5 - 10	5 - 4
DFL1	9:12	1	6	8 - 5	7 - 7	7 - 0	6 - 5	10 - 3	9 - 2	8 - 7	7 - 11	11 - 10	10 - 6	9 - 9	8 - 11
DFL1	9:12	1	8	11 - 9	10 - 5	9 - 8	8 - 9	14 - 5	12 - 10	11 - 11	10 - 10	16 - 7	14 - 8	13 - 8	12 - 6
DFL1	9:12	1	10	15 - 9	14 - 0	13 - 0	11 - 4	19 - 1	17 - 4	16 - 0	14 - 7	21 - 5	19 - 5	18 - 3	16 - 10
DFL1	9:12	1	12	19 - 7	17 - 10	16 - 2	13 - 10	23 - 3	21 - 2	19 - 11	18 - 5	26 - 11	23 - 8	22 - 3	20 - 8
DFL1	9:12	1	14	23 - 1	20 - 4	18 - 7	16 - 2	26 - 0	24 - 11	23 - 5	21 - 5	26 - 0	26 - 0	26 - 11	24 - 4
DFL1	9:12	2n	4	4 - 7	4 - 1	3 - 10	3 - 7	5 - 7	5 - 0	4 - 8	4 - 4	6 - 4	5 - 8	5 - 3	4 - 11
DFL1	9:12	2n	6	7 - 9	6 - 11	6 - 5	5 - 8	9 - 4	8 - 4	7 - 10	7 - 2	10 - 7	9 - 6	8 - 10	8 - 2
DFL1	9:12	2n	8	10 - 6	9 - 5	8 - 7	7 - 7	12 - 9	11 - 5	10 - 8	9 - 10	14 - 6	13 - 0	12 - 2	11 - 2
DFL1	9:12	2n	10	13 - 10	12 - 4	11 - 0	9 - 7	16 - 10	15 - 1	14 - 1	13 - 0	19 - 1	17 - 2	16 - 0	14 - 8
DFL1	9:12	2n	12	17 - 4	14 - 8	13 - 2	11 - 6	20 - 11	18 - 10	17 - 7	15 - 7	23 - 10	21 - 4	19 - 11	18 - 4
DFL1	9:12	2n	14	19 - 11	16 - 9	15 - 0	13 - 2	25 - 3	22 - 8	20 - 5	17 - 11	26 - 0	25 - 8	24 - 1	22 - 1
DFL1	10:12	1	4	5 - 1	4 - 7	4 - 4	4 - 0	6 - 1	5 - 6	5 - 2	4 - 9	6 - 11	6 - 2	5 - 10	5 - 4
DFL1	10:12	1	6	8 - 5	7 - 7	7 - 0	6 - 5	10 - 3	9 - 2	8 - 7	7 - 11	11 - 10	10 - 6	9 - 9	8 - 11
DFL1	10:12	1	8	11 - 9	10 - 5	9 - 8	8 - 9	14 - 5	12 - 10	11 - 11	10 - 10	16 - 7	14 - 8	13 - 8	12 - 6
DFL1	10:12	1	10	15 - 9	14 - 0	13 - 0	11 - 4	19 - 1	17 - 4	16 - 0	14 - 7	21 - 5	19 - 5	18 - 3	16 - 10
DFL1	10:12	1	12	19 - 7	17 - 10	16 - 2	13 - 10	23 - 3	21 - 2	19 - 11	18 - 5	26 - 0	23 - 8	22 - 3	20 - 8
DFL1	10:12	1	14	23 - 1	20 - 4	18 - 7	16 - 2	26 - 0	24 - 11	23 - 5	21 - 5	26 - 0	26 - 0	26 - 11	24 - 4
DFL1	10:12	2n	4	4 - 7	4 - 1	3 - 10	3 - 7	5 - 7	5 - 0	4 - 8	4 - 4	6 - 4	5 - 8	5 - 3	4 - 11
DFL1	10:12	2n	6	7 - 9	6 - 11	6 - 5	5 - 8	9 - 4	8 - 4	7 - 10	7 - 2	10 - 7	9 - 6	8 - 10	8 - 2
DFL1	10:12	2n	8	10 - 6	9 - 5	8 - 7	7 - 7	12 - 9	11 - 5	10 - 8	9 - 10	14 - 6	13 - 0	12 - 2	11 - 2
DFL1	10:12	2n	10	13 - 10	12 - 4	11 - 0	9 - 7	16 - 10	15 - 1	14 - 1	13 - 0	19 - 1	17 - 2	16 - 0	14 - 8
DFL1	10:12	2n	12	17 - 4	14 - 8	13 - 2	11 - 6	20 - 11	18 - 10	17 - 7	15 - 7	23 - 10	21 - 4	19 - 11	18 - 4
DFL1	10:12	2n	14	19 - 11	16 - 9	15 - 0	13 - 2	25 - 3	22 - 8	20 - 5	17 - 11	26 - 11	25 - 8	24 - 1	22 - 1
DFL1	11:12	1	4	5 - 1	4 - 7	4 - 4	4 - 0	6 - 1	5 - 6	5 - 2	4 - 9	6 - 11	6 - 2	5 - 10	5 - 4
DFL1	11:12	1	6	8 - 5	7 - 7	7 - 0	6 - 5	10 - 3	9 - 2	8 - 7	7 - 11	11 - 10	10 - 6	9 - 9	8 - 11
DFL1	11:12	1	8	11 - 9	10 - 5	9 - 8	8 - 9	14 - 5	12 - 10	11 - 11	10 - 10	16 - 7	14 - 8	13 - 8	12 - 6
DFL1	11:12	1	10	15 - 9	14 - 0	13 - 0	11 - 4	19 - 1	17 - 4	16 - 0	14 - 7	21 - 5	19 - 5	18 - 3	16 - 10
DFL1	11:12	1	12	19 - 7	17 - 10	16 - 2	13 - 10	23 - 3	21 - 2	19 - 11	18 - 5	26 - 11	23 - 8	22 - 3	20 - 8
DFL1	11:12	1	14	23 - 1	20 - 4	18 - 7	16 - 2	26 - 0	24 - 11	23 - 5	21 - 5	26 - 0	26 - 11	26 - 0	24 - 4
DFL1	11:12	2n	4	4 - 7	4 - 1	3 - 10	3 - 7	5 - 7	5 - 0	4 - 8	4 - 4	6 - 4	5 - 8	5 - 3	4 - 11
DFL1	11:12	2n	6	7 - 9	6 - 11	6 - 5	5 - 8	9 - 4	8 - 4	7 - 10	7 - 2	10 - 7	9 - 6	8 - 10	8 - 2
DFL1	11:12	2n	8	10 - 6	9 - 5	8 - 7	7 - 7	12 - 9	11 - 5	10 - 8	9 - 10	14 - 6	13 - 0	12 - 2	11 - 2
DFL1	11:12	2n	10	13 - 10	12 - 4	11 - 0	9 - 7	16 - 10	15 - 1	14 - 1	13 - 0	19 - 1	17 - 2	16 - 0	14 - 8
DFL1	11:12	2n	12	17 - 4	14 - 8	13 - 2	11 - 6	20 - 11	18 - 10	17 - 7	15 - 7	23 - 10	21 - 4	19 - 11	18 - 4
DFL1	11:12	2n	14	19 - 11	16 - 9	15 - 0	13 - 2	25 - 3	22 - 8	20 - 5	17 - 11	26 - 0	25 - 8	24 - 1	22 - 1
DFL1	12:12	1	4	5 - 1	4 - 7	4 - 4	4 - 0	6 - 1	5 - 6	5 - 2	4 - 9	6 - 11	6 - 2	5 - 10	5 - 4
DFL1	12:12	1	6	8 - 5	7 - 7	7 - 0	6 - 5	10 - 3	9 - 2	8 - 7	7 - 11	11 - 10	10 - 6	9 - 9	8 - 11
DFL1	12:12	1	8	11 - 9	10 - 5	9 - 8	8 - 9	14 - 5	12 - 10	11 - 11	10 - 10	16 - 7	14 - 8	13 - 8	12 - 6
DFL1	12:12	1	10	15 - 9	14 - 0	13 - 0	11 - 4	19 - 1	17 - 4	16 - 0	14 - 7	21 - 5	19 - 5	18 - 3	16 - 10
DFL1	12:12	1	12	19 - 7	17 - 10	16 - 2	13 - 10	23 - 3	21 - 2	19 - 11	18 - 5	26 - 11	23 - 8	22 - 3	20 - 8
DFL1	12:12	1	14	23 - 1	20 - 4	18 - 7	16 - 2	26 - 0	24 - 11	23 - 5	21 - 5	26 - 0	26 - 0	26 - 0	24 - 4
DFL1	12:12	2n	4	4 - 7	4 - 1	3 - 10	3 - 7	5 - 7	5 - 0	4 - 8	4 - 4	6 - 4	5 - 8	5 - 3	4 - 11
DFL1	12:12	2n	6	7 - 9	6 - 11	6 - 5	5 - 8	9 - 4	8 - 4	7 - 10	7 - 2	10 - 7	9 - 6	8 - 10	8 - 2
DFL1	12:12	2n	8	10 - 6	9 - 5	8 - 7	7 - 7	12 - 9	11 - 5	10 - 8	9 - 10	14 - 6	13 - 0	12 - 2	11 - 2
DFL1	12:12	2n	10	13 - 10	12 - 4	11 - 0	9 - 7	16 - 10	15 - 1	14 - 1	13 - 0	19 - 1	17 - 2	16 - 0	14 - 8
DFL1	12:12	2n	12	17 - 4	14 - 8	13 - 2	11 - 6	20 - 11	18 - 10	17 - 7	15 - 7	23 - 10	21 - 4	19 - 11	18 - 4
DFL1	12:12	2n	14	19 - 11	16 - 9	15 - 0	13 - 2	25 - 3	22 - 8	20 - 5	17 - 11	26 - 0	25 - 8	24 - 1	22 - 1

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE B-EXP. B, Kzt = 2.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-31

Sheet Number 31 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 2.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
DFL2	3:12	1	4	4 - 7	4 - 1	3 - 10	3 - 6	5 - 7	5 - 0	4 - 8	4 - 4	6 - 4	5 - 8	5 - 4	4 - 11
DFL2	3:12	1	6	7 - 9	6 - 11	6 - 4	5 - 6	9 - 6	8 - 5	7 - 10	7 - 3	11 - 0	9 - 8	9 - 0	8 - 2
DFL2	3:12	1	8	10 - 11	9 - 7	8 - 6	7 - 5	13 - 10	12 - 2	11 - 1	10 - 1	16 - 2	14 - 2	13 - 0	11 - 9
DFL2	3:12	1	10	15 - 4	13 - 5	11 - 7	9 - 8	18 - 10	17 - 0	15 - 7	14 - 1	21 - 1	19 - 2	18 - 0	16 - 5
DFL2	3:12	1	12	19 - 4	17 - 5	14 - 11	12 - 5	23 - 0	20 - 10	19 - 7	18 - 2	25 - 10	23 - 5	22 - 0	20 - 4
DFL2	3:12	1	14	22 - 8	19 - 5	17 - 8	14 - 8	26 - 0	24 - 8	23 - 1	20 - 7	26 - 0	26 - 0	26 - 0	24 - 1
DFL2	3:12	2n	4	3 - 11	3 - 5	3 - 1	2 - 9	4 - 9	4 - 3	4 - 0	3 - 8	5 - 6	4 - 11	4 - 7	4 - 2
DFL2	3:12	2n	6	6 - 9	5 - 7	4 - 11	4 - 3	8 - 4	7 - 5	6 - 10	6 - 0	9 - 7	8 - 6	7 - 11	7 - 2
DFL2	3:12	2n	8	9 - 6	7 - 10	6 - 10	5 - 10	11 - 9	10 - 5	9 - 8	8 - 5	13 - 6	12 - 1	11 - 2	10 - 2
DFL2	3:12	2n	10	12 - 8	10 - 4	9 - 1	7 - 10	15 - 10	14 - 1	13 - 0	11 - 1	18 - 1	16 - 2	15 - 0	13 - 9
DFL2	3:12	2n	12	15 - 5	12 - 9	11 - 2	9 - 6	19 - 10	17 - 9	15 - 10	13 - 8	22 - 8	20 - 3	18 - 10	17 - 4
DFL2	3:12	2n	14	17 - 9	14 - 8	13 - 0	11 - 2	24 - 2	20 - 4	18 - 2	15 - 9	26 - 0	24 - 8	22 - 10	20 - 10
DFL2	4:12	1	4	4 - 7	4 - 1	3 - 10	3 - 6	5 - 7	5 - 0	4 - 8	4 - 4	6 - 4	5 - 8	5 - 4	4 - 11
DFL2	4:12	1	6	7 - 9	6 - 11	6 - 4	5 - 6	9 - 6	8 - 5	7 - 10	7 - 3	11 - 0	9 - 8	9 - 0	8 - 2
DFL2	4:12	1	8	10 - 11	9 - 7	8 - 6	7 - 5	13 - 10	12 - 2	11 - 1	10 - 1	16 - 2	14 - 2	13 - 0	11 - 9
DFL2	4:12	1	10	15 - 4	13 - 5	11 - 7	9 - 8	18 - 10	17 - 0	15 - 7	14 - 1	21 - 1	19 - 2	18 - 0	16 - 5
DFL2	4:12	1	12	19 - 4	17 - 5	14 - 11	12 - 5	23 - 0	20 - 10	19 - 7	18 - 2	25 - 10	23 - 5	22 - 0	20 - 4
DFL2	4:12	1	14	22 - 8	19 - 5	17 - 8	14 - 8	26 - 0	24 - 8	23 - 1	20 - 7	26 - 0	26 - 11	26 - 0	24 - 1
DFL2	4:12	2n	4	3 - 11	3 - 5	3 - 1	2 - 9	4 - 9	4 - 3	4 - 0	3 - 8	5 - 6	4 - 11	4 - 7	4 - 2
DFL2	4:12	2n	6	6 - 9	5 - 7	4 - 11	4 - 3	8 - 4	7 - 5	6 - 10	6 - 0	9 - 7	8 - 6	7 - 11	7 - 2
DFL2	4:12	2n	8	9 - 6	7 - 10	6 - 10	5 - 10	11 - 9	10 - 5	9 - 8	8 - 5	13 - 6	12 - 1	11 - 2	10 - 2
DFL2	4:12	2n	10	12 - 8	10 - 4	9 - 1	7 - 10	15 - 10	14 - 1	13 - 0	11 - 1	18 - 1	16 - 2	15 - 0	13 - 9
DFL2	4:12	2n	12	15 - 5	12 - 9	11 - 2	9 - 6	19 - 10	17 - 9	15 - 10	13 - 8	22 - 8	20 - 3	18 - 10	17 - 4
DFL2	4:12	2n	14	17 - 9	14 - 8	13 - 0	11 - 2	24 - 2	20 - 4	18 - 2	15 - 9	26 - 0	24 - 8	22 - 10	20 - 10
DFL2	5:12	1	4	4 - 10	4 - 4	4 - 0	3 - 8	5 - 10	5 - 3	4 - 11	4 - 6	6 - 8	5 - 11	5 - 7	5 - 1
DFL2	5:12	1	6	8 - 1	7 - 3	6 - 9	5 - 11	9 - 9	8 - 9	8 - 2	7 - 6	11 - 0	9 - 11	9 - 3	8 - 6
DFL2	5:12	1	8	10 - 11	9 - 10	9 - 0	7 - 11	13 - 1	11 - 10	11 - 1	10 - 3	14 - 9	13 - 4	12 - 6	11 - 6
DFL2	5:12	1	10	14 - 2	12 - 7	11 - 4	10 - 0	16 - 11	15 - 4	14 - 4	13 - 3	19 - 0	17 - 3	16 - 2	14 - 11
DFL2	5:12	1	12	17 - 2	14 - 8	13 - 4	11 - 10	20 - 9	18 - 9	17 - 6	15 - 7	23 - 3	21 - 1	19 - 9	18 - 4
DFL2	5:12	1	14	19 - 3	16 - 6	15 - 0	13 - 4	24 - 6	21 - 8	19 - 8	17 - 6	26 - 0	24 - 11	23 - 5	21 - 8
DFL2	5:12	2n	4	4 - 0	3 - 6	3 - 2	2 - 10	5 - 0	4 - 5	4 - 1	3 - 10	5 - 9	5 - 1	4 - 8	4 - 4
DFL2	5:12	2n	6	7 - 2	6 - 1	5 - 3	4 - 7	8 - 9	7 - 10	7 - 3	6 - 7	10 - 0	8 - 11	8 - 4	7 - 8
DFL2	5:12	2n	8	9 - 11	8 - 6	7 - 7	6 - 5	12 - 2	10 - 10	10 - 1	9 - 1	13 - 8	12 - 5	11 - 6	10 - 7
DFL2	5:12	2n	10	13 - 0	10 - 11	9 - 9	8 - 6	15 - 10	14 - 3	13 - 4	11 - 9	17 - 11	16 - 1	15 - 1	13 - 11
DFL2	5:12	2n	12	15 - 5	13 - 1	11 - 9	10 - 3	19 - 8	17 - 7	15 - 9	13 - 11	22 - 2	20 - 0	18 - 9	17 - 3
DFL2	5:12	2n	14	17 - 7	14 - 10	13 - 5	11 - 9	23 - 3	20 - 0	18 - 0	15 - 10	26 - 0	23 - 9	22 - 4	20 - 5
DFL2	6:12	1	4	4 - 10	4 - 4	4 - 0	3 - 8	5 - 10	5 - 3	4 - 11	4 - 6	6 - 8	5 - 11	5 - 7	5 - 1
DFL2	6:12	1	6	8 - 1	7 - 3	6 - 9	5 - 11	9 - 9	8 - 9	8 - 2	7 - 6	11 - 0	9 - 11	9 - 3	8 - 6
DFL2	6:12	1	8	10 - 11	9 - 10	9 - 0	7 - 11	13 - 1	11 - 10	11 - 1	10 - 3	14 - 9	13 - 4	12 - 6	11 - 6
DFL2	6:12	1	10	14 - 2	12 - 7	11 - 4	10 - 0	16 - 11	15 - 4	14 - 4	13 - 3	19 - 0	17 - 3	16 - 2	14 - 11
DFL2	6:12	1	12	17 - 2	14 - 8	13 - 4	11 - 10	20 - 9	18 - 9	17 - 6	15 - 7	23 - 3	21 - 1	19 - 9	18 - 4
DFL2	6:12	1	14	19 - 3	16 - 6	15 - 0	13 - 4	24 - 6	21 - 8	19 - 8	17 - 6	26 - 0	24 - 11	23 - 5	21 - 8
DFL2	6:12	2n	4	4 - 0	3 - 6	3 - 2	2 - 10	5 - 0	4 - 5	4 - 1	3 - 10	5 - 9	5 - 1	4 - 8	4 - 4
DFL2	6:12	2n	6	7 - 2	6 - 1	5 - 3	4 - 7	8 - 9	7 - 10	7 - 3	6 - 7	10 - 0	8 - 11	8 - 4	7 - 8
DFL2	6:12	2n	8	9 - 11	8 - 6	7 - 7	6 - 5	12 - 2	10 - 10	10 - 1	9 - 1	13 - 8	12 - 5	11 - 6	10 - 7
DFL2	6:12	2n	10	13 - 0	10 - 11	9 - 9	8 - 6	15 - 10	14 - 3	13 - 4	11 - 9	17 - 11	16 - 1	15 - 1	13 - 11
DFL2	6:12	2n	12	15 - 5	13 - 1	11 - 9	10 - 3	19 - 8	17 - 7	15 - 9	13 - 11	22 - 2	20 - 0	18 - 9	17 - 3
DFL2	6:12	2n	14	17 - 7	14 - 10	13 - 5	11 - 9	23 - 3	20 - 0	18 - 0	15 - 10	26 - 0	23 - 9	22 - 4	20 - 5
DFL2	7:12	1	4	5 - 0	4 - 6	4 - 3	3 - 11	5 - 11	5 - 4	5 - 1	4 - 8	6 - 9	6 - 1	5 - 8	5 - 3
DFL2	7:12	1	6	8 - 3	7 - 5	6 - 10	6 - 1	10 - 0	9 - 0	8 - 5	7 - 9	11 - 6	10 - 3	9 - 6	8 - 9
DFL2	7:12	1	8	11 - 5	10 - 2	9 - 4	8 - 2	14 - 0	12 - 6	11 - 7	10 - 7	16 - 2	14 - 4	13 - 4	12 - 3
DFL2	7:12	1	10	15 - 4	13 - 8	12 - 4	10 - 6	18 - 9	16 - 11	15 - 7	14 - 3	21 - 0	19 - 1	17 - 11	16 - 5
DFL2	7:12	1	12	19 - 3	17 - 3	15 - 0	12 - 11	22 - 10	20 - 8	19 - 6	18 - 1	25 - 6	23 - 2	21 - 10	20 - 3
DFL2	7:12	1	14	22 - 3	19 - 3	17 - 7	15 - 0	26 - 0	24 - 5	22 - 9	20 - 4	26 - 0	26 - 0	25 - 8	23 - 10
DFL2	7:12	2n	4	4 - 5	4 - 0	3 - 9	3 - 4	5 - 5	4 - 10	4 - 6	4 - 3	6 - 2	5 - 7	5 - 2	4 - 9
DFL2	7:12	2n	6	7 - 6	6 - 9	6 - 0	5 - 4	9 - 1	8 - 2	7 - 8	7 - 0	10 - 4	9 - 3	8 - 8	8 - 0
DFL2	7:12	2n	8	10 - 3	9 - 0	8 - 1	7 - 1	12 - 6	11 - 2	10 - 5	9 - 7	14 - 2	12 - 9	11 - 11	10 - 11
DFL2	7:12	2n	10	13 - 7	11 - 6	10 - 3	9 - 0	16 - 5	14 - 9	13 - 9	12 - 4	18 - 8	16 - 9	15 - 7	14 - 4
DFL2	7:12	2n	12	16 - 5	13 - 9	12 - 5	10 - 9	20 - 6	18 - 5	16 - 10	14 - 8	23 - 4	20 - 10	19 - 6	17 - 11
DFL2	7:12	2n	14	18 - 8	15 - 8	14 - 1	12 - 4	24 - 9	21 - 5	19 - 2	16 - 9	26 - 0	25 - 2	23 - 6	21 - 7

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE C-EXP. B, Kzt = 2.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-32

Sheet Number 32 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 2.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
DFL2	8:12	1	4	5 - 0	4 - 6	4 - 3	3 - 11	5 - 11	5 - 4	5 - 1	4 - 8	6 - 9	6 - 1	5 - 8	5 - 3
DFL2	8:12	1	6	8 - 3	7 - 5	6 - 10	6 - 1	10 - 0	9 - 0	8 - 5	7 - 9	11 - 6	10 - 3	9 - 6	8 - 9
DFL2	8:12	1	8	11 - 5	10 - 2	9 - 4	8 - 2	14 - 0	12 - 6	11 - 7	10 - 7	16 - 2	14 - 4	13 - 4	12 - 3
DFL2	8:12	1	10	15 - 4	13 - 8	12 - 4	10 - 6	18 - 9	16 - 11	15 - 7	14 - 3	21 - 0	19 - 1	17 - 11	16 - 5
DFL2	8:12	1	12	19 - 3	17 - 3	15 - 0	12 - 11	22 - 10	20 - 8	19 - 6	18 - 1	25 - 6	23 - 2	21 - 10	20 - 3
DFL2	8:12	1	14	22 - 3	19 - 3	17 - 7	15 - 0	26 - 0	24 - 5	22 - 9	20 - 4	26 - 11	26 - 0	25 - 8	23 - 10
DFL2	8:12	2n	4	4 - 5	4 - 0	3 - 9	3 - 4	5 - 5	4 - 10	4 - 6	4 - 3	6 - 2	5 - 7	5 - 2	4 - 9
DFL2	8:12	2n	6	7 - 6	6 - 9	6 - 0	5 - 4	9 - 1	8 - 2	7 - 8	7 - 0	10 - 4	9 - 3	8 - 8	8 - 0
DFL2	8:12	2n	8	10 - 3	9 - 0	8 - 1	7 - 1	12 - 6	11 - 2	10 - 5	9 - 7	14 - 2	12 - 9	11 - 11	10 - 11
DFL2	8:12	2n	10	13 - 7	11 - 6	10 - 3	9 - 0	16 - 5	14 - 9	13 - 9	12 - 4	18 - 8	16 - 9	15 - 7	14 - 4
DFL2	8:12	2n	12	16 - 5	13 - 9	12 - 5	10 - 9	20 - 6	18 - 5	16 - 10	14 - 8	23 - 4	20 - 10	19 - 6	17 - 11
DFL2	8:12	2n	14	18 - 8	15 - 8	14 - 1	12 - 4	24 - 9	21 - 5	19 - 2	16 - 9	26 - 0	25 - 2	23 - 6	21 - 7
DFL2	9:12	1	4	5 - 0	4 - 6	4 - 3	3 - 11	5 - 11	5 - 4	5 - 1	4 - 8	6 - 9	6 - 1	5 - 8	5 - 3
DFL2	9:12	1	6	8 - 3	7 - 5	6 - 10	6 - 1	10 - 0	9 - 0	8 - 5	7 - 9	11 - 6	10 - 3	9 - 6	8 - 9
DFL2	9:12	1	8	11 - 5	10 - 2	9 - 4	8 - 2	14 - 0	12 - 6	11 - 7	10 - 7	16 - 2	14 - 4	13 - 4	12 - 3
DFL2	9:12	1	10	15 - 4	13 - 8	12 - 4	10 - 6	18 - 9	16 - 11	15 - 7	14 - 3	21 - 0	19 - 1	17 - 11	16 - 5
DFL2	9:12	1	12	19 - 3	17 - 3	15 - 0	12 - 11	22 - 10	20 - 8	19 - 6	18 - 1	25 - 6	23 - 2	21 - 10	20 - 3
DFL2	9:12	1	14	22 - 3	19 - 3	17 - 7	15 - 0	26 - 0	24 - 5	22 - 9	20 - 4	26 - 0	26 - 0	25 - 8	23 - 10
DFL2	9:12	2n	4	4 - 5	4 - 0	3 - 9	3 - 4	5 - 5	4 - 10	4 - 6	4 - 3	6 - 2	5 - 7	5 - 2	4 - 9
DFL2	9:12	2n	6	7 - 6	6 - 9	6 - 0	5 - 4	9 - 1	8 - 2	7 - 8	7 - 0	10 - 4	9 - 3	8 - 8	8 - 0
DFL2	9:12	2n	8	10 - 3	9 - 0	8 - 1	7 - 1	12 - 6	11 - 2	10 - 5	9 - 7	14 - 2	12 - 9	11 - 11	10 - 11
DFL2	9:12	2n	10	13 - 7	11 - 6	10 - 3	9 - 0	16 - 5	14 - 9	13 - 9	12 - 4	18 - 8	16 - 9	15 - 7	14 - 4
DFL2	9:12	2n	12	16 - 5	13 - 9	12 - 5	10 - 9	20 - 6	18 - 5	16 - 10	14 - 8	23 - 4	20 - 10	19 - 6	17 - 11
DFL2	9:12	2n	14	18 - 8	15 - 8	14 - 1	12 - 4	24 - 9	21 - 5	19 - 2	16 - 9	26 - 0	25 - 2	23 - 6	21 - 7
DFL2	10:12	1	4	5 - 0	4 - 6	4 - 3	3 - 11	5 - 11	5 - 4	5 - 1	4 - 8	6 - 9	6 - 1	5 - 8	5 - 3
DFL2	10:12	1	6	8 - 3	7 - 5	6 - 10	6 - 1	10 - 0	9 - 0	8 - 5	7 - 9	11 - 6	10 - 3	9 - 6	8 - 9
DFL2	10:12	1	8	11 - 5	10 - 2	9 - 4	8 - 2	14 - 0	12 - 6	11 - 7	10 - 7	16 - 2	14 - 4	13 - 4	12 - 3
DFL2	10:12	1	10	15 - 4	13 - 8	12 - 4	10 - 6	18 - 9	16 - 11	15 - 7	14 - 3	21 - 0	19 - 1	17 - 11	16 - 5
DFL2	10:12	1	12	19 - 3	17 - 3	15 - 0	12 - 11	22 - 10	20 - 8	19 - 6	18 - 1	25 - 6	23 - 2	21 - 10	20 - 3
DFL2	10:12	1	14	22 - 3	19 - 3	17 - 7	15 - 0	26 - 0	24 - 5	22 - 9	20 - 4	26 - 0	26 - 0	25 - 8	23 - 10
DFL2	10:12	2n	4	4 - 5	4 - 0	3 - 9	3 - 4	5 - 5	4 - 10	4 - 6	4 - 3	6 - 2	5 - 7	5 - 2	4 - 9
DFL2	10:12	2n	6	7 - 6	6 - 9	6 - 0	5 - 4	9 - 1	8 - 2	7 - 8	7 - 0	10 - 4	9 - 3	8 - 8	8 - 0
DFL2	10:12	2n	8	10 - 3	9 - 0	8 - 1	7 - 1	12 - 6	11 - 2	10 - 5	9 - 7	14 - 2	12 - 9	11 - 11	10 - 11
DFL2	10:12	2n	10	13 - 7	11 - 6	10 - 3	9 - 0	16 - 5	14 - 9	13 - 9	12 - 4	18 - 8	16 - 9	15 - 7	14 - 4
DFL2	10:12	2n	12	16 - 5	13 - 9	12 - 5	10 - 9	20 - 6	18 - 5	16 - 10	14 - 8	23 - 4	20 - 10	19 - 6	17 - 11
DFL2	10:12	2n	14	18 - 8	15 - 8	14 - 1	12 - 4	24 - 9	21 - 5	19 - 2	16 - 9	26 - 0	25 - 2	23 - 6	21 - 7
DFL2	11:12	1	4	5 - 0	4 - 6	4 - 3	3 - 11	5 - 11	5 - 4	5 - 1	4 - 8	6 - 9	6 - 1	5 - 8	5 - 3
DFL2	11:12	1	6	8 - 3	7 - 5	6 - 10	6 - 1	10 - 0	9 - 0	8 - 5	7 - 9	11 - 6	10 - 3	9 - 6	8 - 9
DFL2	11:12	1	8	11 - 5	10 - 2	9 - 4	8 - 2	14 - 0	12 - 6	11 - 7	10 - 7	16 - 2	14 - 4	13 - 4	12 - 3
DFL2	11:12	1	10	15 - 4	13 - 8	12 - 4	10 - 6	18 - 9	16 - 11	15 - 7	14 - 3	21 - 0	19 - 1	17 - 11	16 - 5
DFL2	11:12	1	12	19 - 3	17 - 3	15 - 0	12 - 11	22 - 10	20 - 8	19 - 6	18 - 1	25 - 6	23 - 2	21 - 10	20 - 3
DFL2	11:12	1	14	22 - 3	19 - 3	17 - 7	15 - 0	26 - 0	24 - 5	22 - 9	20 - 4	26 - 0	26 - 0	25 - 8	23 - 10
DFL2	11:12	2n	4	4 - 5	4 - 0	3 - 9	3 - 4	5 - 5	4 - 10	4 - 6	4 - 3	6 - 2	5 - 7	5 - 2	4 - 9
DFL2	11:12	2n	6	7 - 6	6 - 9	6 - 0	5 - 4	9 - 1	8 - 2	7 - 8	7 - 0	10 - 4	9 - 3	8 - 8	8 - 0
DFL2	11:12	2n	8	10 - 3	9 - 0	8 - 1	7 - 1	12 - 6	11 - 2	10 - 5	9 - 7	14 - 2	12 - 9	11 - 11	10 - 11
DFL2	11:12	2n	10	13 - 7	11 - 6	10 - 3	9 - 0	16 - 5	14 - 9	13 - 9	12 - 4	18 - 8	16 - 9	15 - 7	14 - 4
DFL2	11:12	2n	12	16 - 5	13 - 9	12 - 5	10 - 9	20 - 6	18 - 5	16 - 10	14 - 8	23 - 4	20 - 10	19 - 6	17 - 11
DFL2	11:12	2n	14	18 - 8	15 - 8	14 - 1	12 - 4	24 - 9	21 - 5	19 - 2	16 - 9	26 - 0	25 - 2	23 - 6	21 - 7
DFL2	12:12	1	4	5 - 0	4 - 6	4 - 3	3 - 11	5 - 11	5 - 4	5 - 1	4 - 8	6 - 9	6 - 1	5 - 8	5 - 3
DFL2	12:12	1	6	8 - 3	7 - 5	6 - 10	6 - 1	10 - 0	9 - 0	8 - 5	7 - 9	11 - 6	10 - 3	9 - 6	8 - 9
DFL2	12:12	1	8	11 - 5	10 - 2	9 - 4	8 - 2	14 - 0	12 - 6	11 - 7	10 - 7	16 - 2	14 - 4	13 - 4	12 - 3
DFL2	12:12	1	10	15 - 4	13 - 8	12 - 4	10 - 6	18 - 9	16 - 11	15 - 7	14 - 3	21 - 0	19 - 1	17 - 11	16 - 5
DFL2	12:12	1	12	19 - 3	17 - 3	15 - 0	12 - 11	22 - 10	20 - 8	19 - 6	18 - 1	25 - 6	23 - 2	21 - 10	20 - 3
DFL2	12:12	1	14	22 - 3	19 - 3	17 - 7	15 - 0	26 - 0	24 - 5	22 - 9	20 - 4	26 - 0	26 - 0	25 - 8	23 - 10
DFL2	12:12	2n	4	4 - 5	4 - 0	3 - 9	3 - 4	5 - 5	4 - 10	4 - 6	4 - 3	6 - 2	5 - 7	5 - 2	4 - 9
DFL2	12:12	2n	6	7 - 6	6 - 9	6 - 0	5 - 4	9 - 1	8 - 2	7 - 8	7 - 0	10 - 4	9 - 3	8 - 8	8 - 0
DFL2	12:12	2n	8	10 - 3	9 - 0	8 - 1	7 - 1	12 - 6	11 - 2	10 - 5	9 - 7	14 - 2	12 - 9	11 - 11	10 - 11
DFL2	12:12	2n	10	13 - 7	11 - 6	10 - 3	9 - 0	16 - 5	14 - 9	13 - 9	12 - 4	18 - 8	16 - 9	15 - 7	14 - 4
DFL2	12:12	2n	12	16 - 5	13 - 9	12 - 5	10 - 9	20 - 6	18 - 5	16 - 10	14 - 8	23 - 4	20 - 10	19 - 6	17 - 11
DFL2	12:12	2n	14	18 - 8	15 - 8	14 - 1	12 - 4	24 - 9	21 - 5	19 - 2	16 - 9	26 - 0	25 - 2	23 - 6	21 - 7

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE D-EXP. B, Kzt = 2.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-33

Sheet Number 33 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 2.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
SP01	3:12	1	4	4 - 7	4 - 1	3 - 10	3 - 7	5 - 7	5 - 0	4 - 8	4 - 4	6 - 4	5 - 8	5 - 4	4 - 11
SP01	3:12	1	6	7 - 9	6 - 11	6 - 6	5 - 11	9 - 6	8 - 5	7 - 10	7 - 3	11 - 0	9 - 8	9 - 0	8 - 2
SP01	3:12	1	8	10 - 11	9 - 7	8 - 11	8 - 1	13 - 10	12 - 2	11 - 1	10 - 1	16 - 2	14 - 2	13 - 0	11 - 9
SP01	3:12	1	10	15 - 4	13 - 5	12 - 3	10 - 1	18 - 10	17 - 0	15 - 7	14 - 1	21 - 1	19 - 2	18 - 0	16 - 5
SP01	3:12	1	12	19 - 4	17 - 6	16 - 2	13 - 6	23 - 0	20 - 10	19 - 7	18 - 2	25 - 10	23 - 5	22 - 0	20 - 4
SP01	3:12	1	14	22 - 10	19 - 10	18 - 0	15 - 2	26 - 0	24 - 8	23 - 2	21 - 0	26 - 0	26 - 0	26 - 0	24 - 1
SP01	3:12	2n	4	3 - 11	3 - 6	3 - 4	2 - 11	4 - 9	4 - 3	4 - 0	3 - 8	5 - 6	4 - 11	4 - 7	4 - 2
SP01	3:12	2n	6	6 - 9	6 - 0	5 - 5	4 - 8	8 - 4	7 - 5	6 - 10	6 - 3	9 - 7	8 - 6	7 - 11	7 - 2
SP01	3:12	2n	8	9 - 6	8 - 5	7 - 7	6 - 6	11 - 9	10 - 5	9 - 8	8 - 10	13 - 6	12 - 1	11 - 2	10 - 2
SP01	3:12	2n	10	12 - 11	10 - 9	9 - 5	8 - 1	15 - 10	14 - 1	13 - 1	11 - 7	18 - 1	16 - 2	15 - 0	13 - 9
SP01	3:12	2n	12	16 - 4	13 - 8	12 - 1	10 - 3	19 - 10	17 - 10	16 - 7	14 - 8	22 - 8	20 - 3	18 - 10	17 - 4
SP01	3:12	2n	14	18 - 2	15 - 1	13 - 4	11 - 6	24 - 2	20 - 10	18 - 7	16 - 2	26 - 0	24 - 8	22 - 10	20 - 11
SP01	4:12	1	4	4 - 7	4 - 1	3 - 10	3 - 7	5 - 7	5 - 0	4 - 8	4 - 4	6 - 4	5 - 8	5 - 4	4 - 11
SP01	4:12	1	6	7 - 9	6 - 11	6 - 6	5 - 11	9 - 6	8 - 5	7 - 10	7 - 3	11 - 0	9 - 8	9 - 0	8 - 2
SP01	4:12	1	8	10 - 11	9 - 7	8 - 11	8 - 1	13 - 10	12 - 2	11 - 1	10 - 1	16 - 2	14 - 2	13 - 0	11 - 9
SP01	4:12	1	10	15 - 4	13 - 5	12 - 3	10 - 1	18 - 10	17 - 0	15 - 7	14 - 1	21 - 1	19 - 2	18 - 0	16 - 5
SP01	4:12	1	12	19 - 4	17 - 6	16 - 2	13 - 6	23 - 0	20 - 10	19 - 7	18 - 2	25 - 10	23 - 5	22 - 0	20 - 4
SP01	4:12	1	14	22 - 10	19 - 10	18 - 0	15 - 2	26 - 0	24 - 8	23 - 2	21 - 0	26 - 11	26 - 0	26 - 0	24 - 1
SP01	4:12	2n	4	3 - 11	3 - 6	3 - 4	2 - 11	4 - 9	4 - 3	4 - 0	3 - 8	5 - 6	4 - 11	4 - 7	4 - 2
SP01	4:12	2n	6	6 - 9	6 - 0	5 - 5	4 - 8	8 - 4	7 - 5	6 - 10	6 - 3	9 - 7	8 - 6	7 - 11	7 - 2
SP01	4:12	2n	8	9 - 6	8 - 5	7 - 7	6 - 6	11 - 9	10 - 5	9 - 8	8 - 10	13 - 6	12 - 1	11 - 2	10 - 2
SP01	4:12	2n	10	12 - 11	10 - 9	9 - 5	8 - 1	15 - 10	14 - 1	13 - 1	11 - 7	18 - 1	16 - 2	15 - 0	13 - 9
SP01	4:12	2n	12	16 - 4	13 - 8	12 - 1	10 - 3	19 - 10	17 - 10	16 - 7	14 - 8	22 - 8	20 - 3	18 - 10	17 - 4
SP01	4:12	2n	14	18 - 2	15 - 1	13 - 4	11 - 6	24 - 2	20 - 10	18 - 7	16 - 2	26 - 0	24 - 8	22 - 10	20 - 11
SP01	5:12	1	4	4 - 10	4 - 4	4 - 0	3 - 8	5 - 10	5 - 3	4 - 11	4 - 6	6 - 8	5 - 11	5 - 7	5 - 1
SP01	5:12	1	6	8 - 1	7 - 3	6 - 9	6 - 2	9 - 9	8 - 9	8 - 2	7 - 6	11 - 0	9 - 11	9 - 3	8 - 6
SP01	5:12	1	8	10 - 11	9 - 10	9 - 2	8 - 6	13 - 1	11 - 10	11 - 1	10 - 3	14 - 9	13 - 4	12 - 6	11 - 6
SP01	5:12	1	10	14 - 2	12 - 10	11 - 9	10 - 4	16 - 11	15 - 4	14 - 4	13 - 3	19 - 0	17 - 3	16 - 2	14 - 11
SP01	5:12	1	12	17 - 4	15 - 7	14 - 1	12 - 6	20 - 9	18 - 9	17 - 7	16 - 4	23 - 3	21 - 1	19 - 9	18 - 4
SP01	5:12	1	14	19 - 7	16 - 10	15 - 3	13 - 7	24 - 6	22 - 1	20 - 1	17 - 10	26 - 0	24 - 11	23 - 5	21 - 8
SP01	5:12	2n	4	4 - 0	3 - 7	3 - 4	3 - 0	5 - 0	4 - 5	4 - 1	3 - 10	5 - 9	5 - 1	4 - 8	4 - 4
SP01	5:12	2n	6	7 - 2	6 - 4	5 - 10	5 - 0	8 - 9	7 - 10	7 - 3	6 - 7	10 - 0	8 - 11	8 - 4	7 - 8
SP01	5:12	2n	8	9 - 11	8 - 11	8 - 3	7 - 2	12 - 2	10 - 10	10 - 1	9 - 3	13 - 8	12 - 5	11 - 6	10 - 7
SP01	5:12	2n	10	13 - 2	11 - 4	10 - 1	8 - 10	15 - 10	14 - 3	13 - 4	12 - 2	17 - 11	16 - 1	15 - 1	13 - 11
SP01	5:12	2n	12	16 - 3	13 - 11	12 - 7	10 - 11	19 - 8	17 - 8	16 - 6	14 - 9	22 - 2	20 - 0	18 - 9	17 - 3
SP01	5:12	2n	14	17 - 11	15 - 2	13 - 8	12 - 1	23 - 4	20 - 5	18 - 4	16 - 2	26 - 0	23 - 9	22 - 4	20 - 8
SP01	6:12	1	4	4 - 10	4 - 4	4 - 0	3 - 8	5 - 10	5 - 3	4 - 11	4 - 6	6 - 8	5 - 11	5 - 7	5 - 1
SP01	6:12	1	6	8 - 1	7 - 3	6 - 9	6 - 2	9 - 9	8 - 9	8 - 2	7 - 6	11 - 0	9 - 11	9 - 3	8 - 6
SP01	6:12	1	8	10 - 11	9 - 10	9 - 2	8 - 6	13 - 1	11 - 10	11 - 1	10 - 3	14 - 9	13 - 4	12 - 6	11 - 6
SP01	6:12	1	10	14 - 2	12 - 10	11 - 9	10 - 4	16 - 11	15 - 4	14 - 4	13 - 3	19 - 0	17 - 3	16 - 2	14 - 11
SP01	6:12	1	12	17 - 4	15 - 7	14 - 1	12 - 6	20 - 9	18 - 9	17 - 7	16 - 4	23 - 3	21 - 1	19 - 9	18 - 4
SP01	6:12	1	14	19 - 7	16 - 10	15 - 3	13 - 7	24 - 6	22 - 1	20 - 1	17 - 10	26 - 0	24 - 11	23 - 5	21 - 8
SP01	6:12	2n	4	4 - 0	3 - 7	3 - 4	3 - 0	5 - 0	4 - 5	4 - 1	3 - 10	5 - 9	5 - 1	4 - 8	4 - 4
SP01	6:12	2n	6	7 - 2	6 - 4	5 - 10	5 - 0	8 - 9	7 - 10	7 - 3	6 - 7	10 - 0	8 - 11	8 - 4	7 - 8
SP01	6:12	2n	8	9 - 11	8 - 11	8 - 3	7 - 2	12 - 2	10 - 10	10 - 1	9 - 3	13 - 8	12 - 5	11 - 6	10 - 7
SP01	6:12	2n	10	13 - 2	11 - 4	10 - 1	8 - 10	15 - 10	14 - 3	13 - 4	12 - 2	17 - 11	16 - 1	15 - 1	13 - 11
SP01	6:12	2n	12	16 - 3	13 - 11	12 - 7	10 - 11	19 - 8	17 - 8	16 - 6	14 - 9	22 - 2	20 - 0	18 - 9	17 - 3
SP01	6:12	2n	14	17 - 11	15 - 2	13 - 8	12 - 1	23 - 4	20 - 5	18 - 4	16 - 2	26 - 0	23 - 9	22 - 4	20 - 8
SP01	7:12	1	4	5 - 0	4 - 6	4 - 3	3 - 11	5 - 11	5 - 4	5 - 1	4 - 8	6 - 9	6 - 1	5 - 8	5 - 3
SP01	7:12	1	6	8 - 3	7 - 5	6 - 10	6 - 4	10 - 0	9 - 0	8 - 5	7 - 9	11 - 6	10 - 3	9 - 6	8 - 9
SP01	7:12	1	8	11 - 5	10 - 2	9 - 5	8 - 8	14 - 0	12 - 6	11 - 7	10 - 7	16 - 2	14 - 4	13 - 4	12 - 3
SP01	7:12	1	10	15 - 4	13 - 8	12 - 9	10 - 11	18 - 9	16 - 11	15 - 7	14 - 3	21 - 0	19 - 1	17 - 11	16 - 5
SP01	7:12	1	12	19 - 3	17 - 5	16 - 2	13 - 10	22 - 10	20 - 8	19 - 6	18 - 1	25 - 6	23 - 2	21 - 10	20 - 3
SP01	7:12	1	14	22 - 8	19 - 8	17 - 11	15 - 4	26 - 0	24 - 5	22 - 11	20 - 9	26 - 0	26 - 0	25 - 8	23 - 10
SP01	7:12	2n	4	4 - 5	4 - 0	3 - 9	3 - 6	5 - 5	4 - 10	4 - 6	4 - 3	6 - 2	5 - 7	5 - 2	4 - 9
SP01	7:12	2n	6	7 - 6	6 - 9	6 - 3	5 - 9	9 - 1	8 - 2	7 - 8	7 - 0	10 - 4	9 - 3	8 - 8	8 - 0
SP01	7:12	2n	8	10 - 3	9 - 2	8 - 7	7 - 9	12 - 6	11 - 2	10 - 5	9 - 7	14 - 2	12 - 9	11 - 11	10 - 11
SP01	7:12	2n	10	13 - 7	12 - 0	10 - 8	9 - 4	16 - 5	14 - 9	13 - 9	12 - 8	18 - 8	16 - 9	15 - 7	14 - 4
SP01	7:12	2n	12	16 - 11	14 - 8	13 - 2	11 - 6	20 - 6	18 - 5	17 - 3	15 - 8	23 - 4	20 - 10	19 - 6	17 - 11
SP01	7:12	2n	14	19 - 1	16 - 1	14 - 4	12 - 8	24 - 9	21 - 11	19 - 7	17 - 2	26 - 0	25 - 2	23 - 6	21 - 7

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE E-EXP. B, Kzt = 2.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-34

Sheet Number 34 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 2.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
SP01	8:12	1	4	5 - 0	4 - 6	4 - 3	3 - 11	5 - 11	5 - 4	5 - 1	4 - 8	6 - 9	6 - 1	5 - 8	5 - 3
SP01	8:12	1	6	8 - 3	7 - 5	6 - 10	6 - 4	10 - 0	9 - 0	8 - 5	7 - 9	11 - 6	10 - 3	9 - 6	8 - 9
SP01	8:12	1	8	11 - 5	10 - 2	9 - 5	8 - 8	14 - 0	12 - 6	11 - 7	10 - 7	16 - 2	14 - 4	13 - 4	12 - 3
SP01	8:12	1	10	15 - 4	13 - 8	12 - 9	10 - 11	18 - 9	16 - 11	15 - 7	14 - 3	21 - 0	19 - 1	17 - 11	16 - 5
SP01	8:12	1	12	19 - 3	17 - 5	16 - 2	13 - 10	22 - 10	20 - 8	19 - 6	18 - 1	25 - 6	23 - 2	21 - 10	20 - 3
SP01	8:12	1	14	22 - 8	19 - 8	17 - 11	15 - 4	26 - 0	24 - 5	22 - 11	20 - 9	26 - 0	26 - 0	25 - 8	23 - 10
SP01	8:12	2n	4	4 - 5	4 - 0	3 - 9	3 - 6	5 - 5	4 - 10	4 - 6	4 - 3	6 - 2	5 - 7	5 - 2	4 - 9
SP01	8:12	2n	6	7 - 6	6 - 9	6 - 3	5 - 9	9 - 1	8 - 2	7 - 8	7 - 0	10 - 4	9 - 3	8 - 8	8 - 0
SP01	8:12	2n	8	10 - 3	9 - 2	8 - 7	7 - 9	12 - 6	11 - 2	10 - 5	9 - 7	14 - 2	12 - 9	11 - 11	10 - 11
SP01	8:12	2n	10	13 - 7	12 - 0	10 - 8	9 - 4	16 - 5	14 - 9	13 - 9	12 - 8	18 - 8	16 - 9	15 - 7	14 - 4
SP01	8:12	2n	12	16 - 11	14 - 8	13 - 2	11 - 6	20 - 6	18 - 5	17 - 3	15 - 8	23 - 4	20 - 10	19 - 6	17 - 11
SP01	8:12	2n	14	19 - 1	16 - 1	14 - 4	12 - 8	24 - 9	21 - 11	19 - 7	17 - 2	26 - 0	25 - 2	23 - 6	21 - 7
SP01	9:12	1	4	5 - 0	4 - 6	4 - 3	3 - 11	5 - 11	5 - 4	5 - 1	4 - 8	6 - 9	6 - 1	5 - 8	5 - 3
SP01	9:12	1	6	8 - 3	7 - 5	6 - 10	6 - 4	10 - 0	9 - 0	8 - 5	7 - 9	11 - 6	10 - 3	9 - 6	8 - 9
SP01	9:12	1	8	11 - 5	10 - 2	9 - 5	8 - 8	14 - 0	12 - 6	11 - 7	10 - 7	16 - 2	14 - 4	13 - 4	12 - 3
SP01	9:12	1	10	15 - 4	13 - 8	12 - 9	10 - 11	18 - 9	16 - 11	15 - 7	14 - 3	21 - 0	19 - 1	17 - 11	16 - 5
SP01	9:12	1	12	19 - 3	17 - 5	16 - 2	13 - 10	22 - 10	20 - 8	19 - 6	18 - 1	25 - 6	23 - 2	21 - 10	20 - 3
SP01	9:12	1	14	22 - 8	19 - 8	17 - 11	15 - 4	26 - 0	24 - 5	22 - 11	20 - 9	26 - 0	26 - 11	25 - 8	23 - 10
SP01	9:12	2n	4	4 - 5	4 - 0	3 - 9	3 - 6	5 - 5	4 - 10	4 - 6	4 - 3	6 - 2	5 - 7	5 - 2	4 - 9
SP01	9:12	2n	6	7 - 6	6 - 9	6 - 3	5 - 9	9 - 1	8 - 2	7 - 8	7 - 0	10 - 4	9 - 3	8 - 8	8 - 0
SP01	9:12	2n	8	10 - 3	9 - 2	8 - 7	7 - 9	12 - 6	11 - 2	10 - 5	9 - 7	14 - 2	12 - 9	11 - 11	10 - 11
SP01	9:12	2n	10	13 - 7	12 - 0	10 - 8	9 - 4	16 - 5	14 - 9	13 - 9	12 - 8	18 - 8	16 - 9	15 - 7	14 - 4
SP01	9:12	2n	12	16 - 11	14 - 8	13 - 2	11 - 6	20 - 6	18 - 5	17 - 3	15 - 8	23 - 4	20 - 10	19 - 6	17 - 11
SP01	9:12	2n	14	19 - 1	16 - 1	14 - 4	12 - 8	24 - 9	21 - 11	19 - 7	17 - 2	26 - 0	25 - 2	23 - 6	21 - 7
SP01	10:12	1	4	5 - 0	4 - 6	4 - 3	3 - 11	5 - 11	5 - 4	5 - 1	4 - 8	6 - 9	6 - 1	5 - 8	5 - 3
SP01	10:12	1	6	8 - 3	7 - 5	6 - 10	6 - 4	10 - 0	9 - 0	8 - 5	7 - 9	11 - 6	10 - 3	9 - 6	8 - 9
SP01	10:12	1	8	11 - 5	10 - 2	9 - 5	8 - 8	14 - 0	12 - 6	11 - 7	10 - 7	16 - 2	14 - 4	13 - 4	12 - 3
SP01	10:12	1	10	15 - 4	13 - 8	12 - 9	10 - 11	18 - 9	16 - 11	15 - 7	14 - 3	21 - 0	19 - 1	17 - 11	16 - 5
SP01	10:12	1	12	19 - 3	17 - 5	16 - 2	13 - 10	22 - 10	20 - 8	19 - 6	18 - 1	25 - 6	23 - 2	21 - 10	20 - 3
SP01	10:12	1	14	22 - 8	19 - 8	17 - 11	15 - 4	26 - 11	24 - 5	22 - 11	20 - 9	26 - 11	26 - 0	25 - 8	23 - 10
SP01	10:12	2n	4	4 - 5	4 - 0	3 - 9	3 - 6	5 - 5	4 - 10	4 - 6	4 - 3	6 - 2	5 - 7	5 - 2	4 - 9
SP01	10:12	2n	6	7 - 6	6 - 9	6 - 3	5 - 9	9 - 1	8 - 2	7 - 8	7 - 0	10 - 4	9 - 3	8 - 8	8 - 0
SP01	10:12	2n	8	10 - 3	9 - 2	8 - 7	7 - 9	12 - 6	11 - 2	10 - 5	9 - 7	14 - 2	12 - 9	11 - 11	10 - 11
SP01	10:12	2n	10	13 - 7	12 - 0	10 - 8	9 - 4	16 - 5	14 - 9	13 - 9	12 - 8	18 - 8	16 - 9	15 - 7	14 - 4
SP01	10:12	2n	12	16 - 11	14 - 8	13 - 2	11 - 6	20 - 6	18 - 5	17 - 3	15 - 8	23 - 4	20 - 10	19 - 6	17 - 11
SP01	10:12	2n	14	19 - 1	16 - 1	14 - 4	12 - 8	24 - 9	21 - 11	19 - 7	17 - 2	26 - 0	25 - 2	23 - 6	21 - 7
SP01	11:12	1	4	5 - 0	4 - 6	4 - 3	3 - 11	5 - 11	5 - 4	5 - 1	4 - 8	6 - 9	6 - 1	5 - 8	5 - 3
SP01	11:12	1	6	8 - 3	7 - 5	6 - 10	6 - 4	10 - 0	9 - 0	8 - 5	7 - 9	11 - 6	10 - 3	9 - 6	8 - 9
SP01	11:12	1	8	11 - 5	10 - 2	9 - 5	8 - 8	14 - 0	12 - 6	11 - 7	10 - 7	16 - 2	14 - 4	13 - 4	12 - 3
SP01	11:12	1	10	15 - 4	13 - 8	12 - 9	10 - 11	18 - 9	16 - 11	15 - 7	14 - 3	21 - 0	19 - 1	17 - 11	16 - 5
SP01	11:12	1	12	19 - 3	17 - 5	16 - 2	13 - 10	22 - 10	20 - 8	19 - 6	18 - 1	25 - 6	23 - 2	21 - 10	20 - 3
SP01	11:12	1	14	22 - 8	19 - 8	17 - 11	15 - 4	26 - 0	24 - 5	22 - 11	20 - 9	26 - 0	26 - 0	25 - 8	23 - 10
SP01	11:12	2n	4	4 - 5	4 - 0	3 - 9	3 - 6	5 - 5	4 - 10	4 - 6	4 - 3	6 - 2	5 - 7	5 - 2	4 - 9
SP01	11:12	2n	6	7 - 6	6 - 9	6 - 3	5 - 9	9 - 1	8 - 2	7 - 8	7 - 0	10 - 4	9 - 3	8 - 8	8 - 0
SP01	11:12	2n	8	10 - 3	9 - 2	8 - 7	7 - 9	12 - 6	11 - 2	10 - 5	9 - 7	14 - 2	12 - 9	11 - 11	10 - 11
SP01	11:12	2n	10	13 - 7	12 - 0	10 - 8	9 - 4	16 - 5	14 - 9	13 - 9	12 - 8	18 - 8	16 - 9	15 - 7	14 - 4
SP01	11:12	2n	12	16 - 11	14 - 8	13 - 2	11 - 6	20 - 6	18 - 5	17 - 3	15 - 8	23 - 4	20 - 10	19 - 6	17 - 11
SP01	11:12	2n	14	19 - 1	16 - 1	14 - 4	12 - 8	24 - 9	21 - 11	19 - 7	17 - 2	26 - 0	25 - 2	23 - 6	21 - 7
SP01	12:12	1	4	5 - 0	4 - 6	4 - 3	3 - 11	5 - 11	5 - 4	5 - 1	4 - 8	6 - 9	6 - 1	5 - 8	5 - 3
SP01	12:12	1	6	8 - 3	7 - 5	6 - 10	6 - 4	10 - 0	9 - 0	8 - 5	7 - 9	11 - 6	10 - 3	9 - 6	8 - 9
SP01	12:12	1	8	11 - 5	10 - 2	9 - 5	8 - 8	14 - 0	12 - 6	11 - 7	10 - 7	16 - 2	14 - 4	13 - 4	12 - 3
SP01	12:12	1	10	15 - 4	13 - 8	12 - 9	10 - 11	18 - 9	16 - 11	15 - 7	14 - 3	21 - 0	19 - 1	17 - 11	16 - 5
SP01	12:12	1	12	19 - 3	17 - 5	16 - 2	13 - 10	22 - 10	20 - 8	19 - 6	18 - 1	25 - 6	23 - 2	21 - 10	20 - 3
SP01	12:12	1	14	22 - 8	19 - 8	17 - 11	15 - 4	26 - 0	24 - 5	22 - 11	20 - 9	26 - 11	26 - 11	25 - 8	23 - 10
SP01	12:12	2n	4	4 - 5	4 - 0	3 - 9	3 - 6	5 - 5	4 - 10	4 - 6	4 - 3	6 - 2	5 - 7	5 - 2	4 - 9
SP01	12:12	2n	6	7 - 6	6 - 9	6 - 3	5 - 9	9 - 1	8 - 2	7 - 8	7 - 0	10 - 4	9 - 3	8 - 8	8 - 0
SP01	12:12	2n	8	10 - 3	9 - 2	8 - 7	7 - 9	12 - 6	11 - 2	10 - 5	9 - 7	14 - 2	12 - 9	11 - 11	10 - 11
SP01	12:12	2n	10	13 - 7	12 - 0	10 - 8	9 - 4	16 - 5	14 - 9	13 - 9	12 - 8	18 - 8	16 - 9	15 - 7	14 - 4
SP01	12:12	2n	12	16 - 11	14 - 8	13 - 2	11 - 6	20 - 6	18 - 5	17 - 3	15 - 8	23 - 4	20 - 10	19 - 6	17 - 11
SP01	12:12	2n	14	19 - 1	16 - 1	14 - 4	12 - 8	24 - 9	21 - 11	19 - 7	17 - 2	26 - 0	25 - 2	23 - 6	21 - 7

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE F-EXP. B, Kzt = 2.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-35

Sheet Number 35 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 2.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
SP02	3:12	1	4	4 - 4	3 - 10	3 - 6	3 - 1	5 - 4	4 - 9	4 - 5	4 - 1	6 - 1	5 - 5	5 - 1	4 - 8
SP02	3:12	1	6	7 - 4	6 - 5	5 - 9	5 - 0	9 - 0	8 - 0	7 - 5	6 - 10	10 - 4	9 - 2	8 - 6	7 - 9
SP02	3:12	1	8	10 - 3	8 - 8	7 - 8	6 - 9	13 - 0	11 - 4	10 - 5	9 - 4	15 - 2	13 - 3	12 - 3	11 - 0
SP02	3:12	1	10	14 - 5	11 - 3	9 - 9	8 - 4	18 - 0	15 - 11	14 - 8	12 - 5	20 - 2	18 - 3	17 - 2	15 - 6
SP02	3:12	1	12	18 - 5	14 - 10	12 - 9	10 - 6	22 - 0	19 - 11	18 - 9	16 - 3	24 - 8	22 - 4	21 - 0	19 - 5
SP02	3:12	1	14	20 - 0	17 - 2	14 - 7	12 - 2	26 - 0	22 - 6	20 - 6	18 - 2	26 - 0	26 - 0	24 - 10	22 - 11
SP02	3:12	2n	4	3 - 7	3 - 1	2 - 10	2 - 6	4 - 6	4 - 1	3 - 8	3 - 3	5 - 2	4 - 8	4 - 4	4 - 0
SP02	3:12	2n	6	6 - 1	5 - 0	4 - 5	3 - 11	7 - 11	7 - 0	6 - 3	5 - 5	9 - 1	8 - 1	7 - 6	6 - 10
SP02	3:12	2n	8	8 - 7	7 - 0	6 - 1	5 - 3	11 - 2	9 - 10	8 - 10	7 - 7	12 - 10	11 - 4	10 - 6	9 - 7
SP02	3:12	2n	10	10 - 10	8 - 11	7 - 10	6 - 8	15 - 0	12 - 9	11 - 2	9 - 7	17 - 2	15 - 4	14 - 3	13 - 0
SP02	3:12	2n	12	13 - 8	11 - 2	9 - 10	8 - 5	18 - 10	15 - 9	14 - 0	12 - 1	21 - 6	19 - 3	17 - 11	16 - 1
SP02	3:12	2n	14	15 - 4	12 - 8	11 - 1	9 - 6	21 - 1	17 - 8	15 - 8	13 - 6	26 - 11	23 - 3	20 - 7	18 - 0
SP02	4:12	1	4	4 - 4	3 - 10	3 - 6	3 - 1	5 - 4	4 - 9	4 - 5	4 - 1	6 - 1	5 - 5	5 - 1	4 - 8
SP02	4:12	1	6	7 - 4	6 - 5	5 - 9	5 - 0	9 - 0	8 - 0	7 - 5	6 - 10	10 - 4	9 - 2	8 - 6	7 - 9
SP02	4:12	1	8	10 - 3	8 - 8	7 - 8	6 - 9	13 - 0	11 - 4	10 - 5	9 - 4	15 - 2	13 - 3	12 - 3	11 - 0
SP02	4:12	1	10	14 - 5	11 - 3	9 - 9	8 - 4	18 - 0	15 - 11	14 - 8	12 - 5	20 - 2	18 - 3	17 - 2	15 - 6
SP02	4:12	1	12	18 - 5	14 - 10	12 - 9	10 - 6	22 - 0	19 - 11	18 - 9	16 - 3	24 - 8	22 - 4	21 - 0	19 - 5
SP02	4:12	1	14	20 - 0	17 - 2	14 - 7	12 - 2	26 - 0	22 - 6	20 - 6	18 - 2	26 - 0	26 - 0	24 - 10	22 - 11
SP02	4:12	2n	4	3 - 7	3 - 1	2 - 10	2 - 6	4 - 6	4 - 1	3 - 8	3 - 3	5 - 2	4 - 8	4 - 4	4 - 0
SP02	4:12	2n	6	6 - 1	5 - 0	4 - 5	3 - 11	7 - 11	7 - 0	6 - 3	5 - 5	9 - 1	8 - 1	7 - 6	6 - 10
SP02	4:12	2n	8	8 - 7	7 - 0	6 - 1	5 - 3	11 - 2	9 - 10	8 - 10	7 - 7	12 - 10	11 - 4	10 - 6	9 - 7
SP02	4:12	2n	10	10 - 10	8 - 11	7 - 10	6 - 8	15 - 0	12 - 9	11 - 2	9 - 7	17 - 2	15 - 4	14 - 3	13 - 0
SP02	4:12	2n	12	13 - 8	11 - 2	9 - 10	8 - 5	18 - 10	15 - 9	14 - 0	12 - 1	21 - 6	19 - 3	17 - 11	16 - 1
SP02	4:12	2n	14	15 - 4	12 - 8	11 - 1	9 - 6	21 - 1	17 - 8	15 - 8	13 - 6	26 - 0	23 - 3	20 - 7	18 - 0
SP02	5:12	1	4	4 - 7	4 - 1	3 - 9	3 - 4	5 - 7	5 - 0	4 - 8	4 - 3	6 - 4	5 - 8	5 - 3	4 - 10
SP02	5:12	1	6	7 - 8	6 - 11	6 - 2	5 - 4	9 - 3	8 - 4	7 - 9	7 - 2	10 - 6	9 - 5	8 - 10	8 - 1
SP02	5:12	1	8	10 - 5	9 - 2	8 - 3	7 - 3	12 - 6	11 - 3	10 - 7	9 - 9	14 - 1	12 - 9	11 - 11	11 - 0
SP02	5:12	1	10	13 - 1	11 - 2	10 - 1	8 - 10	16 - 2	14 - 7	13 - 4	11 - 10	18 - 2	16 - 5	15 - 5	14 - 3
SP02	5:12	1	12	15 - 6	13 - 4	12 - 1	10 - 8	19 - 9	17 - 6	15 - 11	14 - 1	22 - 3	20 - 1	18 - 11	17 - 6
SP02	5:12	1	14	17 - 0	14 - 7	13 - 3	11 - 9	22 - 4	19 - 2	17 - 5	15 - 5	26 - 0	23 - 10	21 - 11	19 - 6
SP02	5:12	2n	4	3 - 8	3 - 1	2 - 10	2 - 7	4 - 8	4 - 2	3 - 10	3 - 5	5 - 5	4 - 9	4 - 5	4 - 1
SP02	5:12	2n	6	6 - 8	5 - 4	4 - 8	4 - 1	8 - 4	7 - 5	6 - 10	5 - 10	9 - 6	8 - 6	7 - 11	7 - 3
SP02	5:12	2n	8	9 - 3	7 - 9	6 - 9	5 - 8	11 - 6	10 - 4	9 - 6	8 - 3	13 - 1	11 - 9	10 - 11	10 - 0
SP02	5:12	2n	10	11 - 6	9 - 7	8 - 7	7 - 4	15 - 1	13 - 1	11 - 10	10 - 3	17 - 1	15 - 4	14 - 4	13 - 3
SP02	5:12	2n	12	13 - 11	11 - 9	10 - 6	9 - 1	18 - 8	15 - 9	14 - 3	12 - 7	21 - 2	19 - 1	17 - 10	16 - 0
SP02	5:12	2n	14	15 - 5	13 - 1	11 - 9	10 - 2	20 - 9	17 - 7	15 - 9	13 - 10	25 - 0	22 - 4	20 - 3	17 - 10
SP02	6:12	1	4	4 - 7	4 - 1	3 - 9	3 - 4	5 - 7	5 - 0	4 - 8	4 - 3	6 - 4	5 - 8	5 - 3	4 - 10
SP02	6:12	1	6	7 - 8	6 - 11	6 - 2	5 - 4	9 - 3	8 - 4	7 - 9	7 - 2	10 - 6	9 - 5	8 - 10	8 - 1
SP02	6:12	1	8	10 - 5	9 - 2	8 - 3	7 - 3	12 - 6	11 - 3	10 - 7	9 - 9	14 - 1	12 - 9	11 - 11	11 - 0
SP02	6:12	1	10	13 - 1	11 - 2	10 - 1	8 - 10	16 - 2	14 - 7	13 - 4	11 - 10	18 - 2	16 - 5	15 - 5	14 - 3
SP02	6:12	1	12	15 - 6	13 - 4	12 - 1	10 - 8	19 - 9	17 - 6	15 - 11	14 - 1	22 - 3	20 - 1	18 - 11	17 - 6
SP02	6:12	1	14	17 - 0	14 - 7	13 - 3	11 - 9	22 - 4	19 - 2	17 - 5	15 - 5	26 - 0	23 - 10	21 - 11	19 - 6
SP02	6:12	2n	4	3 - 8	3 - 1	2 - 10	2 - 7	4 - 8	4 - 2	3 - 10	3 - 5	5 - 5	4 - 9	4 - 5	4 - 1
SP02	6:12	2n	6	6 - 8	5 - 4	4 - 8	4 - 1	8 - 4	7 - 5	6 - 10	5 - 10	9 - 6	8 - 6	7 - 11	7 - 3
SP02	6:12	2n	8	9 - 3	7 - 9	6 - 9	5 - 8	11 - 6	10 - 4	9 - 6	8 - 3	13 - 1	11 - 9	10 - 11	10 - 0
SP02	6:12	2n	10	11 - 6	9 - 7	8 - 7	7 - 4	15 - 1	13 - 1	11 - 10	10 - 3	17 - 1	15 - 4	14 - 4	13 - 3
SP02	6:12	2n	12	13 - 11	11 - 9	10 - 6	9 - 1	18 - 8	15 - 9	14 - 3	12 - 7	21 - 2	19 - 1	17 - 10	16 - 0
SP02	6:12	2n	14	15 - 5	13 - 1	11 - 9	10 - 2	20 - 9	17 - 7	15 - 9	13 - 10	25 - 0	22 - 4	20 - 3	17 - 10
SP02	7:12	1	4	4 - 9	4 - 4	4 - 1	3 - 8	5 - 8	5 - 2	4 - 10	4 - 6	6 - 5	5 - 9	5 - 5	5 - 0
SP02	7:12	1	6	7 - 10	7 - 0	6 - 4	5 - 7	9 - 6	8 - 6	8 - 0	7 - 4	10 - 11	9 - 8	9 - 0	8 - 4
SP02	7:12	1	8	10 - 10	9 - 6	8 - 6	7 - 5	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
SP02	7:12	1	10	14 - 6	12 - 1	10 - 7	9 - 2	17 - 11	15 - 11	14 - 9	12 - 11	20 - 1	18 - 3	17 - 1	15 - 6
SP02	7:12	1	12	18 - 2	15 - 0	13 - 3	11 - 5	21 - 10	19 - 10	18 - 7	16 - 2	24 - 5	22 - 2	20 - 10	19 - 4
SP02	7:12	1	14	19 - 11	17 - 2	14 - 11	12 - 11	25 - 8	22 - 3	20 - 3	18 - 2	26 - 0	26 - 0	24 - 7	22 - 6
SP02	7:12	2n	4	4 - 3	3 - 8	3 - 4	3 - 0	5 - 2	4 - 7	4 - 4	4 - 0	5 - 11	5 - 3	4 - 11	4 - 7
SP02	7:12	2n	6	7 - 2	6 - 2	5 - 6	4 - 10	8 - 8	7 - 10	7 - 3	6 - 7	9 - 10	8 - 10	8 - 3	7 - 7
SP02	7:12	2n	8	9 - 9	8 - 3	7 - 5	6 - 5	11 - 11	10 - 7	9 - 11	8 - 9	13 - 6	12 - 1	11 - 3	10 - 4
SP02	7:12	2n	10	12 - 1	10 - 1	9 - 1	7 - 11	15 - 7	13 - 9	12 - 5	10 - 9	17 - 9	15 - 11	14 - 10	13 - 8
SP02	7:12	2n	12	14 - 8	12 - 5	11 - 0	9 - 7	19 - 6	16 - 10	15 - 0	13 - 2	22 - 1	19 - 10	18 - 6	17 - 1
SP02	7:12	2n	14	16 - 3	13 - 8	12 - 4	10 - 9	22 - 2	18 - 8	16 - 9	14 - 7	26 - 0	24 - 0	21 - 8	18 - 11

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE G-EXP. B, Kzt = 2.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-36

Sheet Number 36 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure B, K_{zt} = 2.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
SP02	8:12	1	4	4 - 9	4 - 4	4 - 1	3 - 8	5 - 8	5 - 2	4 - 10	4 - 6	6 - 5	5 - 9	5 - 5	5 - 0
SP02	8:12	1	6	7 - 10	7 - 0	6 - 4	5 - 7	9 - 6	8 - 6	8 - 0	7 - 4	10 - 11	9 - 8	9 - 0	8 - 4
SP02	8:12	1	8	10 - 10	9 - 6	8 - 6	7 - 5	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
SP02	8:12	1	10	14 - 6	12 - 1	10 - 7	9 - 2	17 - 11	15 - 11	14 - 9	12 - 11	20 - 1	18 - 3	17 - 1	15 - 6
SP02	8:12	1	12	18 - 2	15 - 0	13 - 3	11 - 5	21 - 10	19 - 10	18 - 7	16 - 2	24 - 5	22 - 2	20 - 10	19 - 4
SP02	8:12	1	14	19 - 11	17 - 2	14 - 11	12 - 11	25 - 8	22 - 3	20 - 3	18 - 2	26 - 0	26 - 0	24 - 7	22 - 6
SP02	8:12	2n	4	4 - 3	3 - 8	3 - 4	3 - 0	5 - 2	4 - 7	4 - 4	4 - 0	5 - 11	5 - 3	4 - 11	4 - 7
SP02	8:12	2n	6	7 - 2	6 - 2	5 - 6	4 - 10	8 - 8	7 - 10	7 - 3	6 - 7	9 - 10	8 - 10	8 - 3	7 - 7
SP02	8:12	2n	8	9 - 9	8 - 3	7 - 5	6 - 5	11 - 11	10 - 7	9 - 11	8 - 9	13 - 6	12 - 1	11 - 3	10 - 4
SP02	8:12	2n	10	12 - 1	10 - 1	9 - 1	7 - 11	15 - 7	13 - 9	12 - 5	10 - 9	17 - 9	15 - 11	14 - 10	13 - 8
SP02	8:12	2n	12	14 - 8	12 - 5	11 - 0	9 - 7	19 - 6	16 - 10	15 - 0	13 - 2	22 - 1	19 - 10	18 - 6	17 - 1
SP02	8:12	2n	14	16 - 3	13 - 8	12 - 4	10 - 9	22 - 2	18 - 8	16 - 9	14 - 7	26 - 0	24 - 0	21 - 8	18 - 11
SP02	9:12	1	4	4 - 9	4 - 4	4 - 1	3 - 8	5 - 8	5 - 2	4 - 10	4 - 6	6 - 5	5 - 9	5 - 5	5 - 0
SP02	9:12	1	6	7 - 10	7 - 0	6 - 4	5 - 7	9 - 6	8 - 6	8 - 0	7 - 4	10 - 11	9 - 8	9 - 0	8 - 4
SP02	9:12	1	8	10 - 10	9 - 6	8 - 6	7 - 5	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
SP02	9:12	1	10	14 - 6	12 - 1	10 - 7	9 - 2	17 - 11	15 - 11	14 - 9	12 - 11	20 - 1	18 - 3	17 - 1	15 - 6
SP02	9:12	1	12	18 - 2	15 - 0	13 - 3	11 - 5	21 - 10	19 - 10	18 - 7	16 - 2	24 - 5	22 - 2	20 - 10	19 - 4
SP02	9:12	1	14	19 - 11	17 - 2	14 - 11	12 - 11	25 - 8	22 - 3	20 - 3	18 - 2	26 - 0	26 - 11	24 - 7	22 - 6
SP02	9:12	2n	4	4 - 3	3 - 8	3 - 4	3 - 0	5 - 2	4 - 7	4 - 4	4 - 0	5 - 11	5 - 3	4 - 11	4 - 7
SP02	9:12	2n	6	7 - 2	6 - 2	5 - 6	4 - 10	8 - 8	7 - 10	7 - 3	6 - 7	9 - 10	8 - 10	8 - 3	7 - 7
SP02	9:12	2n	8	9 - 9	8 - 3	7 - 5	6 - 5	11 - 11	10 - 7	9 - 11	8 - 9	13 - 6	12 - 1	11 - 3	10 - 4
SP02	9:12	2n	10	12 - 1	10 - 1	9 - 1	7 - 11	15 - 7	13 - 9	12 - 5	10 - 9	17 - 9	15 - 11	14 - 10	13 - 8
SP02	9:12	2n	12	14 - 8	12 - 5	11 - 0	9 - 7	19 - 6	16 - 10	15 - 0	13 - 2	22 - 1	19 - 10	18 - 6	17 - 1
SP02	9:12	2n	14	16 - 3	13 - 8	12 - 4	10 - 9	22 - 2	18 - 8	16 - 9	14 - 7	26 - 0	24 - 0	21 - 8	18 - 11
SP02	10:12	1	4	4 - 9	4 - 4	4 - 1	3 - 8	5 - 8	5 - 2	4 - 10	4 - 6	6 - 5	5 - 9	5 - 5	5 - 0
SP02	10:12	1	6	7 - 10	7 - 0	6 - 4	5 - 7	9 - 6	8 - 6	8 - 0	7 - 4	10 - 11	9 - 8	9 - 0	8 - 4
SP02	10:12	1	8	10 - 10	9 - 6	8 - 6	7 - 5	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
SP02	10:12	1	10	14 - 6	12 - 1	10 - 7	9 - 2	17 - 11	15 - 11	14 - 9	12 - 11	20 - 1	18 - 3	17 - 1	15 - 6
SP02	10:12	1	12	18 - 2	15 - 0	13 - 3	11 - 5	21 - 10	19 - 10	18 - 7	16 - 2	24 - 5	22 - 2	20 - 10	19 - 4
SP02	10:12	1	14	19 - 11	17 - 2	14 - 11	12 - 11	25 - 8	22 - 3	20 - 3	18 - 2	26 - 0	26 - 0	24 - 7	22 - 6
SP02	10:12	2n	4	4 - 3	3 - 8	3 - 4	3 - 0	5 - 2	4 - 7	4 - 4	4 - 0	5 - 11	5 - 3	4 - 11	4 - 7
SP02	10:12	2n	6	7 - 2	6 - 2	5 - 6	4 - 10	8 - 8	7 - 10	7 - 3	6 - 7	9 - 10	8 - 10	8 - 3	7 - 7
SP02	10:12	2n	8	9 - 9	8 - 3	7 - 5	6 - 5	11 - 11	10 - 7	9 - 11	8 - 9	13 - 6	12 - 1	11 - 3	10 - 4
SP02	10:12	2n	10	12 - 1	10 - 1	9 - 1	7 - 11	15 - 7	13 - 9	12 - 5	10 - 9	17 - 9	15 - 11	14 - 10	13 - 8
SP02	10:12	2n	12	14 - 8	12 - 5	11 - 0	9 - 7	19 - 6	16 - 10	15 - 0	13 - 2	22 - 1	19 - 10	18 - 6	17 - 1
SP02	10:12	2n	14	16 - 3	13 - 8	12 - 4	10 - 9	22 - 2	18 - 8	16 - 9	14 - 7	26 - 0	24 - 0	21 - 8	18 - 11
SP02	11:12	1	4	4 - 9	4 - 4	4 - 1	3 - 8	5 - 8	5 - 2	4 - 10	4 - 6	6 - 5	5 - 9	5 - 5	5 - 0
SP02	11:12	1	6	7 - 10	7 - 0	6 - 4	5 - 7	9 - 6	8 - 6	8 - 0	7 - 4	10 - 11	9 - 8	9 - 0	8 - 4
SP02	11:12	1	8	10 - 10	9 - 6	8 - 6	7 - 5	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
SP02	11:12	1	10	14 - 6	12 - 1	10 - 7	9 - 2	17 - 11	15 - 11	14 - 9	12 - 11	20 - 1	18 - 3	17 - 1	15 - 6
SP02	11:12	1	12	18 - 2	15 - 0	13 - 3	11 - 5	21 - 10	19 - 10	18 - 7	16 - 2	24 - 5	22 - 2	20 - 10	19 - 4
SP02	11:12	1	14	19 - 11	17 - 2	14 - 11	12 - 11	25 - 8	22 - 3	20 - 3	18 - 2	26 - 0	26 - 0	24 - 7	22 - 6
SP02	11:12	2n	4	4 - 3	3 - 8	3 - 4	3 - 0	5 - 2	4 - 7	4 - 4	4 - 0	5 - 11	5 - 3	4 - 11	4 - 7
SP02	11:12	2n	6	7 - 2	6 - 2	5 - 6	4 - 10	8 - 8	7 - 10	7 - 3	6 - 7	9 - 10	8 - 10	8 - 3	7 - 7
SP02	11:12	2n	8	9 - 9	8 - 3	7 - 5	6 - 5	11 - 11	10 - 7	9 - 11	8 - 9	13 - 6	12 - 1	11 - 3	10 - 4
SP02	11:12	2n	10	12 - 1	10 - 1	9 - 1	7 - 11	15 - 7	13 - 9	12 - 5	10 - 9	17 - 9	15 - 11	14 - 10	13 - 8
SP02	11:12	2n	12	14 - 8	12 - 5	11 - 0	9 - 7	19 - 6	16 - 10	15 - 0	13 - 2	22 - 1	19 - 10	18 - 6	17 - 1
SP02	11:12	2n	14	16 - 3	13 - 8	12 - 4	10 - 9	22 - 2	18 - 8	16 - 9	14 - 7	26 - 0	24 - 0	21 - 8	18 - 11
SP02	12:12	1	4	4 - 9	4 - 4	4 - 1	3 - 8	5 - 8	5 - 2	4 - 10	4 - 6	6 - 5	5 - 9	5 - 5	5 - 0
SP02	12:12	1	6	7 - 10	7 - 0	6 - 4	5 - 7	9 - 6	8 - 6	8 - 0	7 - 4	10 - 11	9 - 8	9 - 0	8 - 4
SP02	12:12	1	8	10 - 10	9 - 6	8 - 6	7 - 5	13 - 4	11 - 10	11 - 0	10 - 0	15 - 3	13 - 7	12 - 8	11 - 6
SP02	12:12	1	10	14 - 6	12 - 1	10 - 7	9 - 2	17 - 11	15 - 11	14 - 9	12 - 11	20 - 1	18 - 3	17 - 1	15 - 6
SP02	12:12	1	12	18 - 2	15 - 0	13 - 3	11 - 5	21 - 10	19 - 10	18 - 7	16 - 2	24 - 5	22 - 2	20 - 10	19 - 4
SP02	12:12	1	14	19 - 11	17 - 2	14 - 11	12 - 11	25 - 8	22 - 3	20 - 3	18 - 2	26 - 0	26 - 0	24 - 7	22 - 6
SP02	12:12	2n	4	4 - 3	3 - 8	3 - 4	3 - 0	5 - 2	4 - 7	4 - 4	4 - 0	5 - 11	5 - 3	4 - 11	4 - 7
SP02	12:12	2n	6	7 - 2	6 - 2	5 - 6	4 - 10	8 - 8	7 - 10	7 - 3	6 - 7	9 - 10	8 - 10	8 - 3	7 - 7
SP02	12:12	2n	8	9 - 9	8 - 3	7 - 5	6 - 5	11 - 11	10 - 7	9 - 11	8 - 9	13 - 6	12 - 1	11 - 3	10 - 4
SP02	12:12	2n	10	12 - 1	10 - 1	9 - 1	7 - 11	15 - 7	13 - 9	12 - 5	10 - 9	17 - 9	15 - 11	14 - 10	13 - 8
SP02	12:12	2n	12	14 - 8	12 - 5	11 - 0	9 - 7	19 - 6	16 - 10	15 - 0	13 - 2	22 - 1	19 - 10	18 - 6	17 - 1
SP02	12:12	2n	14	16 - 3	13 - 8	12 - 4	10 - 9	22 - 2	18 - 8	16 - 9	14 - 7	26 - 0	24 - 0	21 - 8	19 - 0

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE H-EXP. B, Kzt = 2.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-37

Sheet Number 37 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure D, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
DFL1	3:12	1	4	5 - 1	4 - 6	4 - 3	3 - 11	6 - 2	5 - 6	5 - 2	4 - 9	7 - 0	6 - 3	5 - 10	5 - 5
DFL1	3:12	1	6	8 - 6	7 - 7	7 - 1	6 - 6	10 - 7	9 - 4	8 - 8	7 - 11	12 - 5	10 - 10	10 - 0	9 - 1
DFL1	3:12	1	8	12 - 4	10 - 9	9 - 11	8 - 11	15 - 6	13 - 7	12 - 6	11 - 3	17 - 11	15 - 10	14 - 7	13 - 2
DFL1	3:12	1	10	17 - 2	15 - 1	13 - 10	12 - 5	20 - 6	18 - 7	17 - 6	15 - 9	23 - 0	20 - 10	19 - 7	18 - 2
DFL1	3:12	1	12	21 - 0	19 - 1	17 - 11	15 - 10	25 - 1	22 - 8	21 - 4	19 - 9	26 - 11	25 - 6	23 - 11	22 - 2
DFL1	3:12	1	14	24 - 11	22 - 6	20 - 8	18 - 4	26 - 0	26 - 0	25 - 3	23 - 4	26 - 0	26 - 0	26 - 11	26 - 0
DFL1	3:12	2n	4	4 - 4	3 - 10	3 - 7	3 - 3	5 - 4	4 - 9	4 - 5	4 - 1	6 - 1	5 - 5	5 - 0	4 - 7
DFL1	3:12	2n	6	7 - 6	6 - 8	6 - 0	5 - 2	9 - 3	8 - 3	7 - 8	6 - 11	10 - 8	9 - 5	8 - 9	8 - 0
DFL1	3:12	2n	8	10 - 7	9 - 4	8 - 5	7 - 3	13 - 1	11 - 7	10 - 9	9 - 9	14 - 11	13 - 4	12 - 5	11 - 3
DFL1	3:12	2n	10	14 - 3	12 - 9	11 - 2	9 - 6	17 - 6	15 - 7	14 - 6	13 - 3	19 - 10	17 - 10	16 - 7	15 - 2
DFL1	3:12	2n	12	18 - 0	15 - 5	13 - 8	11 - 9	21 - 10	19 - 7	18 - 3	16 - 7	25 - 1	22 - 4	20 - 9	19 - 1
DFL1	3:12	2n	14	21 - 3	17 - 10	15 - 10	13 - 8	26 - 0	23 - 9	21 - 10	19 - 0	26 - 0	26 - 0	25 - 3	23 - 1
DFL1	4:12	1	4	5 - 1	4 - 6	4 - 3	3 - 11	6 - 2	5 - 6	5 - 2	4 - 9	7 - 0	6 - 3	5 - 10	5 - 5
DFL1	4:12	1	6	8 - 6	7 - 7	7 - 1	6 - 6	10 - 7	9 - 4	8 - 8	7 - 11	12 - 5	10 - 10	10 - 0	9 - 1
DFL1	4:12	1	8	12 - 4	10 - 9	9 - 11	8 - 11	15 - 6	13 - 7	12 - 6	11 - 3	17 - 11	15 - 10	14 - 7	13 - 2
DFL1	4:12	1	10	17 - 2	15 - 1	13 - 10	12 - 5	20 - 6	18 - 7	17 - 6	15 - 9	23 - 0	20 - 10	19 - 7	18 - 2
DFL1	4:12	1	12	21 - 0	19 - 1	17 - 11	15 - 10	25 - 1	22 - 8	21 - 4	19 - 9	26 - 11	25 - 6	23 - 11	22 - 2
DFL1	4:12	1	14	24 - 11	22 - 6	20 - 8	18 - 4	26 - 0	26 - 0	25 - 3	23 - 4	26 - 0	26 - 0	26 - 11	26 - 0
DFL1	4:12	2n	4	4 - 4	3 - 10	3 - 7	3 - 3	5 - 4	4 - 9	4 - 5	4 - 1	6 - 1	5 - 5	5 - 0	4 - 7
DFL1	4:12	2n	6	7 - 6	6 - 8	6 - 0	5 - 2	9 - 3	8 - 3	7 - 8	6 - 11	10 - 8	9 - 5	8 - 9	8 - 0
DFL1	4:12	2n	8	10 - 7	9 - 4	8 - 5	7 - 3	13 - 1	11 - 7	10 - 9	9 - 9	14 - 11	13 - 4	12 - 5	11 - 3
DFL1	4:12	2n	10	14 - 3	12 - 9	11 - 2	9 - 6	17 - 6	15 - 7	14 - 6	13 - 3	19 - 10	17 - 10	16 - 7	15 - 2
DFL1	4:12	2n	12	18 - 0	15 - 5	13 - 8	11 - 9	21 - 10	19 - 7	18 - 3	16 - 7	25 - 1	22 - 4	20 - 9	19 - 1
DFL1	4:12	2n	14	21 - 3	17 - 10	15 - 10	13 - 8	26 - 0	23 - 9	21 - 10	19 - 0	26 - 0	26 - 11	25 - 3	23 - 1
DFL1	5:12	1	4	5 - 3	4 - 9	4 - 5	4 - 1	6 - 5	5 - 9	5 - 4	4 - 11	7 - 4	6 - 7	6 - 1	5 - 7
DFL1	5:12	1	6	8 - 10	7 - 11	7 - 5	6 - 10	10 - 8	9 - 7	9 - 0	8 - 3	12 - 0	10 - 10	10 - 2	9 - 4
DFL1	5:12	1	8	11 - 11	10 - 9	10 - 1	9 - 3	14 - 4	12 - 11	12 - 1	11 - 2	16 - 1	14 - 7	13 - 8	12 - 7
DFL1	5:12	1	10	15 - 5	14 - 0	13 - 1	11 - 10	18 - 5	16 - 8	15 - 8	14 - 6	20 - 9	18 - 9	17 - 7	16 - 4
DFL1	5:12	1	12	18 - 11	17 - 2	15 - 7	13 - 10	22 - 7	20 - 5	19 - 2	17 - 9	25 - 4	22 - 11	21 - 7	20 - 0
DFL1	5:12	1	14	22 - 5	19 - 4	17 - 6	15 - 7	26 - 11	24 - 2	22 - 9	20 - 5	26 - 0	26 - 0	25 - 6	23 - 7
DFL1	5:12	2n	4	4 - 5	3 - 11	3 - 8	3 - 5	5 - 6	4 - 11	4 - 6	4 - 2	6 - 5	5 - 8	5 - 3	4 - 10
DFL1	5:12	2n	6	7 - 11	7 - 0	6 - 6	5 - 7	9 - 8	8 - 8	8 - 1	7 - 4	11 - 0	9 - 10	9 - 2	8 - 5
DFL1	5:12	2n	8	11 - 0	9 - 10	9 - 2	7 - 11	13 - 3	12 - 0	11 - 2	10 - 2	15 - 0	13 - 6	12 - 8	11 - 8
DFL1	5:12	2n	10	14 - 5	13 - 0	11 - 9	10 - 2	17 - 4	15 - 7	14 - 7	13 - 6	19 - 8	17 - 8	16 - 6	15 - 2
DFL1	5:12	2n	12	17 - 10	15 - 6	13 - 11	12 - 4	21 - 6	19 - 5	18 - 2	16 - 5	24 - 1	21 - 11	20 - 6	18 - 11
DFL1	5:12	2n	14	20 - 10	17 - 8	15 - 10	13 - 11	25 - 4	23 - 0	21 - 4	18 - 9	26 - 11	25 - 9	24 - 3	22 - 6
DFL1	6:12	1	4	5 - 3	4 - 9	4 - 5	4 - 1	6 - 5	5 - 9	5 - 4	4 - 11	7 - 4	6 - 7	6 - 1	5 - 7
DFL1	6:12	1	6	8 - 10	7 - 11	7 - 5	6 - 10	10 - 8	9 - 7	9 - 0	8 - 3	12 - 0	10 - 10	10 - 2	9 - 4
DFL1	6:12	1	8	11 - 11	10 - 9	10 - 1	9 - 3	14 - 4	12 - 11	12 - 1	11 - 2	16 - 1	14 - 7	13 - 8	12 - 7
DFL1	6:12	1	10	15 - 5	14 - 0	13 - 1	11 - 10	18 - 5	16 - 8	15 - 8	14 - 6	20 - 9	18 - 9	17 - 7	16 - 4
DFL1	6:12	1	12	18 - 11	17 - 2	15 - 7	13 - 10	22 - 7	20 - 5	19 - 2	17 - 9	25 - 4	22 - 11	21 - 7	20 - 0
DFL1	6:12	1	14	22 - 5	19 - 4	17 - 6	15 - 7	26 - 11	24 - 2	22 - 9	20 - 5	26 - 0	26 - 11	25 - 6	23 - 7
DFL1	6:12	2n	4	4 - 5	3 - 11	3 - 8	3 - 5	5 - 6	4 - 11	4 - 6	4 - 2	6 - 5	5 - 8	5 - 3	4 - 10
DFL1	6:12	2n	6	7 - 11	7 - 0	6 - 6	5 - 7	9 - 8	8 - 8	8 - 1	7 - 4	11 - 0	9 - 10	9 - 2	8 - 5
DFL1	6:12	2n	8	11 - 0	9 - 10	9 - 2	7 - 11	13 - 3	12 - 0	11 - 2	10 - 2	15 - 0	13 - 6	12 - 8	11 - 8
DFL1	6:12	2n	10	14 - 5	13 - 0	11 - 9	10 - 2	17 - 4	15 - 7	14 - 7	13 - 6	19 - 8	17 - 8	16 - 6	15 - 2
DFL1	6:12	2n	12	17 - 10	15 - 6	13 - 11	12 - 4	21 - 6	19 - 5	18 - 2	16 - 5	24 - 1	21 - 11	20 - 6	18 - 11
DFL1	6:12	2n	14	20 - 10	17 - 8	15 - 10	13 - 11	25 - 4	23 - 0	21 - 4	18 - 9	26 - 0	25 - 9	24 - 3	22 - 6
DFL1	7:12	1	4	5 - 5	4 - 11	4 - 7	4 - 3	6 - 7	5 - 10	5 - 6	5 - 1	7 - 6	6 - 8	6 - 3	5 - 9
DFL1	7:12	1	6	9 - 1	8 - 2	7 - 7	6 - 11	11 - 1	9 - 11	9 - 2	8 - 5	12 - 9	11 - 4	10 - 6	9 - 7
DFL1	7:12	1	8	12 - 8	11 - 3	10 - 5	9 - 7	15 - 7	13 - 10	12 - 10	11 - 9	17 - 10	15 - 10	14 - 8	13 - 5
DFL1	7:12	1	10	17 - 2	15 - 1	14 - 0	12 - 10	20 - 4	18 - 6	17 - 5	15 - 10	22 - 9	20 - 8	19 - 6	18 - 1
DFL1	7:12	1	12	20 - 11	19 - 0	17 - 10	15 - 9	24 - 9	22 - 6	21 - 2	19 - 8	26 - 0	25 - 2	23 - 8	22 - 0
DFL1	7:12	1	14	24 - 7	22 - 4	20 - 5	18 - 3	26 - 0	26 - 0	24 - 11	23 - 2	26 - 0	26 - 0	26 - 11	25 - 11
DFL1	7:12	2n	4	4 - 11	4 - 4	4 - 1	3 - 10	6 - 0	5 - 4	5 - 0	4 - 8	6 - 10	6 - 1	5 - 8	5 - 3
DFL1	7:12	2n	6	8 - 3	7 - 5	6 - 11	6 - 4	10 - 0	9 - 0	8 - 5	7 - 9	11 - 5	10 - 2	9 - 6	8 - 9
DFL1	7:12	2n	8	11 - 4	10 - 1	9 - 5	8 - 5	13 - 8	12 - 4	11 - 6	10 - 6	15 - 7	13 - 11	13 - 1	12 - 0
DFL1	7:12	2n	10	14 - 11	13 - 4	12 - 4	10 - 9	18 - 1	16 - 2	15 - 1	13 - 11	20 - 6	18 - 5	17 - 2	15 - 9
DFL1	7:12	2n	12	18 - 7	16 - 5	14 - 9	12 - 11	22 - 6	20 - 2	18 - 10	17 - 5	25 - 7	22 - 11	21 - 5	19 - 8
DFL1	7:12	2n	14	22 - 4	18 - 9	16 - 10	14 - 8	26 - 0	24 - 5	22 - 8	20 - 0	26 - 0	26 - 0	25 - 9	23 - 9

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE A-EXP. D, Kzt = 1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-38

Sheet Number 38 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure D, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
DFL1	8:12	1	4	5 - 5	4 - 11	4 - 7	4 - 3	6 - 7	5 - 10	5 - 6	5 - 1	7 - 6	6 - 8	6 - 3	5 - 9
DFL1	8:12	1	6	9 - 1	8 - 2	7 - 7	6 - 11	11 - 1	9 - 11	9 - 2	8 - 5	12 - 9	11 - 4	10 - 6	9 - 7
DFL1	8:12	1	8	12 - 8	11 - 3	10 - 5	9 - 7	15 - 7	13 - 10	12 - 10	11 - 9	17 - 10	15 - 10	14 - 8	13 - 5
DFL1	8:12	1	10	17 - 2	15 - 1	14 - 0	12 - 10	20 - 4	18 - 6	17 - 5	15 - 10	22 - 9	20 - 8	19 - 6	18 - 1
DFL1	8:12	1	12	20 - 11	19 - 0	17 - 10	15 - 9	24 - 9	22 - 6	21 - 2	19 - 8	26 - 11	25 - 2	23 - 8	22 - 0
DFL1	8:12	1	14	24 - 7	22 - 4	20 - 5	18 - 3	26 - 0	26 - 0	24 - 11	23 - 2	26 - 0	26 - 0	26 - 0	25 - 11
DFL1	8:12	2n	4	4 - 11	4 - 4	4 - 1	3 - 10	6 - 0	5 - 4	5 - 0	4 - 8	6 - 10	6 - 1	5 - 8	5 - 3
DFL1	8:12	2n	6	8 - 3	7 - 5	6 - 11	6 - 4	10 - 0	9 - 0	8 - 5	7 - 9	11 - 5	10 - 2	9 - 6	8 - 9
DFL1	8:12	2n	8	11 - 4	10 - 1	9 - 5	8 - 5	13 - 8	12 - 4	11 - 6	10 - 6	15 - 7	13 - 11	13 - 1	12 - 0
DFL1	8:12	2n	10	14 - 11	13 - 4	12 - 4	10 - 9	18 - 1	16 - 2	15 - 1	13 - 11	20 - 6	18 - 5	17 - 2	15 - 9
DFL1	8:12	2n	12	18 - 7	16 - 5	14 - 9	12 - 11	22 - 6	20 - 2	18 - 10	17 - 5	25 - 7	22 - 11	21 - 5	19 - 8
DFL1	8:12	2n	14	22 - 4	18 - 9	16 - 10	14 - 8	26 - 0	24 - 5	22 - 8	20 - 0	26 - 0	26 - 0	25 - 9	23 - 9
DFL1	9:12	1	4	5 - 5	4 - 11	4 - 7	4 - 3	6 - 7	5 - 10	5 - 6	5 - 1	7 - 6	6 - 8	6 - 3	5 - 9
DFL1	9:12	1	6	9 - 1	8 - 2	7 - 7	6 - 11	11 - 1	9 - 11	9 - 2	8 - 5	12 - 9	11 - 4	10 - 6	9 - 7
DFL1	9:12	1	8	12 - 8	11 - 3	10 - 5	9 - 7	15 - 7	13 - 10	12 - 10	11 - 9	17 - 10	15 - 10	14 - 8	13 - 5
DFL1	9:12	1	10	17 - 2	15 - 1	14 - 0	12 - 10	20 - 4	18 - 6	17 - 5	15 - 10	22 - 9	20 - 8	19 - 6	18 - 1
DFL1	9:12	1	12	20 - 11	19 - 0	17 - 10	15 - 9	24 - 9	22 - 6	21 - 2	19 - 8	26 - 11	25 - 2	23 - 8	22 - 0
DFL1	9:12	1	14	24 - 7	22 - 4	20 - 5	18 - 3	26 - 0	26 - 0	24 - 11	23 - 2	26 - 0	26 - 0	26 - 11	25 - 11
DFL1	9:12	2n	4	4 - 11	4 - 4	4 - 1	3 - 10	6 - 0	5 - 4	5 - 0	4 - 8	6 - 10	6 - 1	5 - 8	5 - 3
DFL1	9:12	2n	6	8 - 3	7 - 5	6 - 11	6 - 4	10 - 0	9 - 0	8 - 5	7 - 9	11 - 5	10 - 2	9 - 6	8 - 9
DFL1	9:12	2n	8	11 - 4	10 - 1	9 - 5	8 - 5	13 - 8	12 - 4	11 - 6	10 - 6	15 - 7	13 - 11	13 - 1	12 - 0
DFL1	9:12	2n	10	14 - 11	13 - 4	12 - 4	10 - 9	18 - 1	16 - 2	15 - 1	13 - 11	20 - 6	18 - 5	17 - 2	15 - 9
DFL1	9:12	2n	12	18 - 7	16 - 5	14 - 9	12 - 11	22 - 6	20 - 2	18 - 10	17 - 5	25 - 7	22 - 11	21 - 5	19 - 8
DFL1	9:12	2n	14	22 - 4	18 - 9	16 - 10	14 - 8	26 - 11	24 - 5	22 - 8	20 - 0	26 - 0	26 - 0	25 - 9	23 - 9
DFL1	10:12	1	4	5 - 5	4 - 11	4 - 7	4 - 3	6 - 7	5 - 10	5 - 6	5 - 1	7 - 6	6 - 8	6 - 3	5 - 9
DFL1	10:12	1	6	9 - 1	8 - 2	7 - 7	6 - 11	11 - 1	9 - 11	9 - 2	8 - 5	12 - 9	11 - 4	10 - 6	9 - 7
DFL1	10:12	1	8	12 - 8	11 - 3	10 - 5	9 - 7	15 - 7	13 - 10	12 - 10	11 - 9	17 - 10	15 - 10	14 - 8	13 - 5
DFL1	10:12	1	10	17 - 2	15 - 1	14 - 0	12 - 10	20 - 4	18 - 6	17 - 5	15 - 10	22 - 9	20 - 8	19 - 6	18 - 1
DFL1	10:12	1	12	20 - 11	19 - 0	17 - 10	15 - 9	24 - 9	22 - 6	21 - 2	19 - 8	26 - 0	25 - 2	23 - 8	22 - 0
DFL1	10:12	1	14	24 - 7	22 - 4	20 - 5	18 - 3	26 - 0	26 - 11	24 - 11	23 - 2	26 - 0	26 - 0	26 - 11	25 - 11
DFL1	10:12	2n	4	4 - 11	4 - 4	4 - 1	3 - 10	6 - 0	5 - 4	5 - 0	4 - 8	6 - 10	6 - 1	5 - 8	5 - 3
DFL1	10:12	2n	6	8 - 3	7 - 5	6 - 11	6 - 4	10 - 0	9 - 0	8 - 5	7 - 9	11 - 5	10 - 2	9 - 6	8 - 9
DFL1	10:12	2n	8	11 - 4	10 - 1	9 - 5	8 - 5	13 - 8	12 - 4	11 - 6	10 - 6	15 - 7	13 - 11	13 - 1	12 - 0
DFL1	10:12	2n	10	14 - 11	13 - 4	12 - 4	10 - 9	18 - 1	16 - 2	15 - 1	13 - 11	20 - 6	18 - 5	17 - 2	15 - 9
DFL1	10:12	2n	12	18 - 7	16 - 5	14 - 9	12 - 11	22 - 6	20 - 2	18 - 10	17 - 5	25 - 7	22 - 11	21 - 5	19 - 8
DFL1	10:12	2n	14	22 - 4	18 - 9	16 - 10	14 - 8	26 - 0	24 - 5	22 - 8	20 - 0	26 - 11	26 - 0	25 - 9	23 - 9
DFL1	11:12	1	4	5 - 5	4 - 11	4 - 7	4 - 3	6 - 7	5 - 10	5 - 6	5 - 1	7 - 6	6 - 8	6 - 3	5 - 9
DFL1	11:12	1	6	9 - 1	8 - 2	7 - 7	6 - 11	11 - 1	9 - 11	9 - 2	8 - 5	12 - 9	11 - 4	10 - 6	9 - 7
DFL1	11:12	1	8	12 - 8	11 - 3	10 - 5	9 - 7	15 - 7	13 - 10	12 - 10	11 - 9	17 - 10	15 - 10	14 - 8	13 - 5
DFL1	11:12	1	10	17 - 2	15 - 1	14 - 0	12 - 10	20 - 4	18 - 6	17 - 5	15 - 10	22 - 9	20 - 8	19 - 6	18 - 1
DFL1	11:12	1	12	20 - 11	19 - 0	17 - 10	15 - 9	24 - 9	22 - 6	21 - 2	19 - 8	26 - 11	25 - 2	23 - 8	22 - 0
DFL1	11:12	1	14	24 - 7	22 - 4	20 - 5	18 - 3	26 - 0	26 - 0	24 - 11	23 - 2	26 - 0	26 - 11	26 - 0	25 - 11
DFL1	11:12	2n	4	4 - 11	4 - 4	4 - 1	3 - 10	6 - 0	5 - 4	5 - 0	4 - 8	6 - 10	6 - 1	5 - 8	5 - 3
DFL1	11:12	2n	6	8 - 3	7 - 5	6 - 11	6 - 4	10 - 0	9 - 0	8 - 5	7 - 9	11 - 5	10 - 2	9 - 6	8 - 9
DFL1	11:12	2n	8	11 - 4	10 - 1	9 - 5	8 - 5	13 - 8	12 - 4	11 - 6	10 - 6	15 - 7	13 - 11	13 - 1	12 - 0
DFL1	11:12	2n	10	14 - 11	13 - 4	12 - 4	10 - 9	18 - 1	16 - 2	15 - 1	13 - 11	20 - 6	18 - 5	17 - 2	15 - 9
DFL1	11:12	2n	12	18 - 7	16 - 5	14 - 9	12 - 11	22 - 6	20 - 2	18 - 10	17 - 5	25 - 7	22 - 11	21 - 5	19 - 8
DFL1	11:12	2n	14	22 - 4	18 - 9	16 - 10	14 - 8	26 - 0	24 - 5	22 - 8	20 - 0	26 - 0	26 - 11	25 - 9	23 - 9
DFL1	12:12	1	4	5 - 5	4 - 11	4 - 7	4 - 3	6 - 7	5 - 10	5 - 6	5 - 1	7 - 6	6 - 8	6 - 3	5 - 9
DFL1	12:12	1	6	9 - 1	8 - 2	7 - 7	6 - 11	11 - 1	9 - 11	9 - 2	8 - 5	12 - 9	11 - 4	10 - 6	9 - 7
DFL1	12:12	1	8	12 - 8	11 - 3	10 - 5	9 - 7	15 - 7	13 - 10	12 - 10	11 - 9	17 - 10	15 - 10	14 - 8	13 - 5
DFL1	12:12	1	10	17 - 2	15 - 1	14 - 0	12 - 10	20 - 4	18 - 6	17 - 5	15 - 10	22 - 9	20 - 8	19 - 6	18 - 1
DFL1	12:12	1	12	20 - 11	19 - 0	17 - 10	15 - 9	24 - 9	22 - 6	21 - 2	19 - 8	26 - 11	25 - 2	23 - 8	22 - 0
DFL1	12:12	1	14	24 - 7	22 - 4	20 - 5	18 - 3	26 - 0	26 - 0	24 - 11	23 - 2	26 - 0	26 - 0	26 - 0	25 - 11
DFL1	12:12	2n	4	4 - 11	4 - 4	4 - 1	3 - 10	6 - 0	5 - 4	5 - 0	4 - 8	6 - 10	6 - 1	5 - 8	5 - 3
DFL1	12:12	2n	6	8 - 3	7 - 5	6 - 11	6 - 4	10 - 0	9 - 0	8 - 5	7 - 9	11 - 5	10 - 2	9 - 6	8 - 9
DFL1	12:12	2n	8	11 - 4	10 - 1	9 - 5	8 - 5	13 - 8	12 - 4	11 - 6	10 - 6	15 - 7	13 - 11	13 - 1	12 - 0
DFL1	12:12	2n	10	14 - 11	13 - 4	12 - 4	10 - 9	18 - 1	16 - 2	15 - 1	13 - 11	20 - 6	18 - 5	17 - 2	15 - 9
DFL1	12:12	2n	12	18 - 7	16 - 5	14 - 9	12 - 11	22 - 6	20 - 2	18 - 10	17 - 5	25 - 7	22 - 11	21 - 5	19 - 8
DFL1	12:12	2n	14	22 - 4	18 - 9	16 - 10	14 - 8	26 - 11	24 - 5	22 - 8	20 - 0	26 - 0	26 - 0	25 - 9	23 - 9

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE B-EXP. D, Kzt = 1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-39

Sheet Number 39 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure D, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
DFL2	3:12	1	4	4 - 11	4 - 5	4 - 2	3 - 10	6 - 0	5 - 5	5 - 0	4 - 8	6 - 10	6 - 2	5 - 9	5 - 3
DFL2	3:12	1	6	8 - 4	7 - 5	6 - 11	6 - 3	10 - 3	9 - 1	8 - 5	7 - 9	12 - 1	10 - 6	9 - 8	8 - 10
DFL2	3:12	1	8	11 - 11	10 - 5	9 - 8	8 - 4	15 - 1	13 - 2	12 - 2	10 - 11	17 - 7	15 - 5	14 - 2	12 - 10
DFL2	3:12	1	10	16 - 8	14 - 8	13 - 5	11 - 3	20 - 1	18 - 2	17 - 0	15 - 4	22 - 6	20 - 5	19 - 2	17 - 9
DFL2	3:12	1	12	20 - 7	18 - 8	17 - 6	14 - 5	24 - 6	22 - 3	20 - 11	19 - 4	26 - 0	24 - 11	23 - 5	21 - 9
DFL2	3:12	1	14	24 - 4	21 - 6	19 - 6	17 - 4	26 - 0	26 - 0	24 - 8	22 - 8	26 - 0	26 - 0	26 - 0	25 - 8
DFL2	3:12	2n	4	4 - 3	3 - 9	3 - 5	3 - 1	5 - 2	4 - 7	4 - 4	4 - 0	5 - 11	5 - 3	4 - 11	4 - 6
DFL2	3:12	2n	6	7 - 4	6 - 4	5 - 7	4 - 10	9 - 0	8 - 0	7 - 5	6 - 9	10 - 4	9 - 2	8 - 6	7 - 10
DFL2	3:12	2n	8	10 - 3	8 - 11	7 - 10	6 - 8	12 - 9	11 - 4	10 - 5	9 - 6	14 - 7	13 - 0	12 - 1	11 - 0
DFL2	3:12	2n	10	13 - 11	11 - 10	10 - 4	8 - 10	17 - 1	15 - 3	14 - 2	12 - 9	19 - 5	17 - 5	16 - 2	14 - 10
DFL2	3:12	2n	12	17 - 5	14 - 5	12 - 9	10 - 11	21 - 4	19 - 1	17 - 10	15 - 5	24 - 6	21 - 9	20 - 3	18 - 7
DFL2	3:12	2n	14	19 - 11	16 - 8	14 - 9	12 - 9	26 - 0	23 - 0	20 - 5	17 - 10	26 - 0	26 - 0	24 - 8	22 - 6
DFL2	4:12	1	4	4 - 11	4 - 5	4 - 2	3 - 10	6 - 0	5 - 5	5 - 0	4 - 8	6 - 10	6 - 2	5 - 9	5 - 3
DFL2	4:12	1	6	8 - 4	7 - 5	6 - 11	6 - 3	10 - 3	9 - 1	8 - 5	7 - 9	12 - 1	10 - 6	9 - 8	8 - 10
DFL2	4:12	1	8	11 - 11	10 - 5	9 - 8	8 - 4	15 - 1	13 - 2	12 - 2	10 - 11	17 - 7	15 - 5	14 - 2	12 - 10
DFL2	4:12	1	10	16 - 8	14 - 8	13 - 5	11 - 3	20 - 1	18 - 2	17 - 0	15 - 4	22 - 6	20 - 5	19 - 2	17 - 9
DFL2	4:12	1	12	20 - 7	18 - 8	17 - 6	14 - 5	24 - 6	22 - 3	20 - 11	19 - 4	26 - 0	24 - 11	23 - 5	21 - 9
DFL2	4:12	1	14	24 - 4	21 - 6	19 - 6	17 - 4	26 - 0	26 - 0	24 - 8	22 - 8	26 - 0	26 - 0	26 - 0	25 - 8
DFL2	4:12	2n	4	4 - 3	3 - 9	3 - 5	3 - 1	5 - 2	4 - 7	4 - 4	4 - 0	5 - 11	5 - 3	4 - 11	4 - 6
DFL2	4:12	2n	6	7 - 4	6 - 4	5 - 7	4 - 10	9 - 0	8 - 0	7 - 5	6 - 9	10 - 4	9 - 2	8 - 6	7 - 10
DFL2	4:12	2n	8	10 - 3	8 - 11	7 - 10	6 - 8	12 - 9	11 - 4	10 - 5	9 - 6	14 - 7	13 - 0	12 - 1	11 - 0
DFL2	4:12	2n	10	13 - 11	11 - 10	10 - 4	8 - 10	17 - 1	15 - 3	14 - 2	12 - 9	19 - 5	17 - 5	16 - 2	14 - 10
DFL2	4:12	2n	12	17 - 5	14 - 5	12 - 9	10 - 11	21 - 4	19 - 1	17 - 10	15 - 5	24 - 6	21 - 9	20 - 3	18 - 7
DFL2	4:12	2n	14	19 - 11	16 - 8	14 - 9	12 - 9	26 - 0	23 - 0	20 - 5	17 - 10	26 - 0	26 - 0	24 - 8	22 - 6
DFL2	5:12	1	4	5 - 2	4 - 8	4 - 4	4 - 0	6 - 3	5 - 7	5 - 3	4 - 10	7 - 2	6 - 5	6 - 0	5 - 6
DFL2	5:12	1	6	8 - 8	7 - 9	7 - 3	6 - 8	10 - 5	9 - 4	8 - 9	8 - 1	11 - 9	10 - 7	9 - 11	9 - 2
DFL2	5:12	1	8	11 - 8	10 - 6	9 - 10	8 - 10	14 - 0	12 - 8	11 - 10	10 - 11	15 - 9	14 - 3	13 - 4	12 - 4
DFL2	5:12	1	10	15 - 1	13 - 8	12 - 7	11 - 1	18 - 1	16 - 4	15 - 4	14 - 2	20 - 3	18 - 4	17 - 3	15 - 11
DFL2	5:12	1	12	18 - 6	16 - 3	14 - 9	13 - 1	22 - 1	20 - 0	18 - 10	17 - 2	24 - 10	22 - 6	21 - 2	19 - 7
DFL2	5:12	1	14	21 - 3	18 - 3	16 - 7	14 - 8	26 - 0	23 - 8	21 - 9	19 - 4	26 - 0	26 - 11	25 - 0	23 - 2
DFL2	5:12	2n	4	4 - 4	3 - 10	3 - 7	3 - 2	5 - 5	4 - 9	4 - 5	4 - 1	6 - 3	5 - 6	5 - 1	4 - 8
DFL2	5:12	2n	6	7 - 9	6 - 10	6 - 1	5 - 2	9 - 5	8 - 6	7 - 11	7 - 2	10 - 9	9 - 8	9 - 0	8 - 3
DFL2	5:12	2n	8	10 - 8	9 - 7	8 - 7	7 - 5	13 - 0	11 - 8	10 - 10	10 - 0	14 - 8	13 - 3	12 - 5	11 - 4
DFL2	5:12	2n	10	14 - 1	12 - 4	11 - 0	9 - 7	17 - 0	15 - 3	14 - 3	13 - 1	19 - 2	17 - 4	16 - 2	14 - 10
DFL2	5:12	2n	12	17 - 3	14 - 7	13 - 2	11 - 6	21 - 1	18 - 11	17 - 8	15 - 6	23 - 7	21 - 5	20 - 1	18 - 6
DFL2	5:12	2n	14	19 - 7	16 - 7	14 - 11	13 - 2	24 - 10	22 - 2	20 - 1	17 - 8	26 - 0	25 - 3	23 - 9	22 - 1
DFL2	6:12	1	4	5 - 2	4 - 8	4 - 4	4 - 0	6 - 3	5 - 7	5 - 3	4 - 10	7 - 2	6 - 5	6 - 0	5 - 6
DFL2	6:12	1	6	8 - 8	7 - 9	7 - 3	6 - 8	10 - 5	9 - 4	8 - 9	8 - 1	11 - 9	10 - 7	9 - 11	9 - 2
DFL2	6:12	1	8	11 - 8	10 - 6	9 - 10	8 - 10	14 - 0	12 - 8	11 - 10	10 - 11	15 - 9	14 - 3	13 - 4	12 - 4
DFL2	6:12	1	10	15 - 1	13 - 8	12 - 7	11 - 1	18 - 1	16 - 4	15 - 4	14 - 2	20 - 3	18 - 4	17 - 3	15 - 11
DFL2	6:12	1	12	18 - 6	16 - 3	14 - 9	13 - 1	22 - 1	20 - 0	18 - 10	17 - 2	24 - 10	22 - 6	21 - 2	19 - 7
DFL2	6:12	1	14	21 - 3	18 - 3	16 - 7	14 - 8	26 - 0	23 - 8	21 - 9	19 - 4	26 - 0	26 - 0	25 - 0	23 - 2
DFL2	6:12	2n	4	4 - 4	3 - 10	3 - 7	3 - 2	5 - 5	4 - 9	4 - 5	4 - 1	6 - 3	5 - 6	5 - 1	4 - 8
DFL2	6:12	2n	6	7 - 9	6 - 10	6 - 1	5 - 2	9 - 5	8 - 6	7 - 11	7 - 2	10 - 9	9 - 8	9 - 0	8 - 3
DFL2	6:12	2n	8	10 - 8	9 - 7	8 - 7	7 - 5	13 - 0	11 - 8	10 - 10	10 - 0	14 - 8	13 - 3	12 - 5	11 - 4
DFL2	6:12	2n	10	14 - 1	12 - 4	11 - 0	9 - 7	17 - 0	15 - 3	14 - 3	13 - 1	19 - 2	17 - 4	16 - 2	14 - 10
DFL2	6:12	2n	12	17 - 3	14 - 7	13 - 2	11 - 6	21 - 1	18 - 11	17 - 8	15 - 6	23 - 7	21 - 5	20 - 1	18 - 6
DFL2	6:12	2n	14	19 - 7	16 - 7	14 - 11	13 - 2	24 - 10	22 - 2	20 - 1	17 - 8	26 - 0	25 - 3	23 - 9	22 - 1
DFL2	7:12	1	4	5 - 4	4 - 10	4 - 6	4 - 2	6 - 5	5 - 9	5 - 4	5 - 0	7 - 4	6 - 6	6 - 1	5 - 7
DFL2	7:12	1	6	8 - 10	7 - 11	7 - 5	6 - 9	10 - 10	9 - 8	9 - 0	8 - 3	12 - 6	11 - 0	10 - 3	9 - 5
DFL2	7:12	1	8	12 - 5	10 - 11	10 - 2	9 - 2	15 - 2	13 - 6	12 - 7	11 - 5	17 - 6	15 - 6	14 - 4	13 - 2
DFL2	7:12	1	10	16 - 8	14 - 9	13 - 8	12 - 1	19 - 11	18 - 2	17 - 0	15 - 5	22 - 4	20 - 3	19 - 1	17 - 9
DFL2	7:12	1	12	20 - 6	18 - 7	17 - 4	14 - 8	24 - 3	22 - 1	20 - 9	19 - 3	26 - 0	24 - 8	23 - 3	21 - 7
DFL2	7:12	1	14	24 - 1	21 - 2	19 - 4	17 - 4	26 - 0	26 - 0	24 - 5	22 - 4	26 - 0	26 - 0	26 - 11	25 - 5
DFL2	7:12	2n	4	4 - 9	4 - 3	4 - 0	3 - 9	5 - 10	5 - 3	4 - 10	4 - 6	6 - 8	5 - 11	5 - 7	5 - 2
DFL2	7:12	2n	6	8 - 1	7 - 3	6 - 9	5 - 11	9 - 9	8 - 9	8 - 2	7 - 7	11 - 1	9 - 11	9 - 4	8 - 7
DFL2	7:12	2n	8	11 - 0	9 - 11	9 - 1	7 - 11	13 - 5	12 - 1	11 - 3	10 - 3	15 - 2	13 - 8	12 - 9	11 - 9
DFL2	7:12	2n	10	14 - 7	12 - 11	11 - 7	10 - 1	17 - 8	15 - 10	14 - 9	13 - 7	20 - 0	18 - 0	16 - 10	15 - 5
DFL2	7:12	2n	12	18 - 2	15 - 5	13 - 10	12 - 2	22 - 0	19 - 9	18 - 5	16 - 5	25 - 0	22 - 5	20 - 11	19 - 3
DFL2	7:12	2n	14	20 - 11	17 - 8	15 - 9	13 - 9	26 - 0	23 - 10	21 - 6	18 - 9	26 - 0	26 - 0	25 - 2	23 - 2

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE C-EXP. D, Kzt =1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-40

Sheet Number 40 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure D, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
DFL2	8:12	1	4	5 - 4	4 - 10	4 - 6	4 - 2	6 - 5	5 - 9	5 - 4	5 - 0	7 - 4	6 - 6	6 - 1	5 - 7
DFL2	8:12	1	6	8 - 10	7 - 11	7 - 5	6 - 9	10 - 10	9 - 8	9 - 0	8 - 3	12 - 6	11 - 0	10 - 3	9 - 5
DFL2	8:12	1	8	12 - 5	10 - 11	10 - 2	9 - 2	15 - 2	13 - 6	12 - 7	11 - 5	17 - 6	15 - 6	14 - 4	13 - 2
DFL2	8:12	1	10	16 - 8	14 - 9	13 - 8	12 - 1	19 - 11	18 - 2	17 - 0	15 - 5	22 - 4	20 - 3	19 - 1	17 - 9
DFL2	8:12	1	12	20 - 6	18 - 7	17 - 4	14 - 8	24 - 3	22 - 1	20 - 9	19 - 3	26 - 0	24 - 8	23 - 3	21 - 7
DFL2	8:12	1	14	24 - 1	21 - 2	19 - 4	17 - 4	26 - 0	26 - 0	24 - 5	22 - 4	26 - 11	26 - 0	26 - 11	25 - 5
DFL2	8:12	2n	4	4 - 9	4 - 3	4 - 0	3 - 9	5 - 10	5 - 3	4 - 10	4 - 6	6 - 8	5 - 11	5 - 7	5 - 2
DFL2	8:12	2n	6	8 - 1	7 - 3	6 - 9	5 - 11	9 - 9	8 - 9	8 - 2	7 - 7	11 - 1	9 - 11	9 - 4	8 - 7
DFL2	8:12	2n	8	11 - 0	9 - 11	9 - 1	7 - 11	13 - 5	12 - 1	11 - 3	10 - 3	15 - 2	13 - 8	12 - 9	11 - 9
DFL2	8:12	2n	10	14 - 7	12 - 11	11 - 7	10 - 1	17 - 8	15 - 10	14 - 9	13 - 7	20 - 0	18 - 0	16 - 10	15 - 5
DFL2	8:12	2n	12	18 - 2	15 - 5	13 - 10	12 - 2	22 - 0	19 - 9	18 - 5	16 - 5	25 - 0	22 - 5	20 - 11	19 - 3
DFL2	8:12	2n	14	20 - 11	17 - 8	15 - 9	13 - 9	26 - 0	23 - 10	21 - 6	18 - 9	26 - 11	26 - 0	25 - 2	23 - 2
DFL2	9:12	1	4	5 - 4	4 - 10	4 - 6	4 - 2	6 - 5	5 - 9	5 - 4	5 - 0	7 - 4	6 - 6	6 - 1	5 - 7
DFL2	9:12	1	6	8 - 10	7 - 11	7 - 5	6 - 9	10 - 10	9 - 8	9 - 0	8 - 3	12 - 6	11 - 0	10 - 3	9 - 5
DFL2	9:12	1	8	12 - 5	10 - 11	10 - 2	9 - 2	15 - 2	13 - 6	12 - 7	11 - 5	17 - 6	15 - 6	14 - 4	13 - 2
DFL2	9:12	1	10	16 - 8	14 - 9	13 - 8	12 - 1	19 - 11	18 - 2	17 - 0	15 - 5	22 - 4	20 - 3	19 - 1	17 - 9
DFL2	9:12	1	12	20 - 6	18 - 7	17 - 4	14 - 8	24 - 3	22 - 1	20 - 9	19 - 3	26 - 0	24 - 8	23 - 3	21 - 7
DFL2	9:12	1	14	24 - 1	21 - 2	19 - 4	17 - 4	26 - 0	26 - 0	24 - 5	22 - 4	26 - 0	26 - 0	26 - 0	25 - 5
DFL2	9:12	2n	4	4 - 9	4 - 3	4 - 0	3 - 9	5 - 10	5 - 3	4 - 10	4 - 6	6 - 8	5 - 11	5 - 7	5 - 2
DFL2	9:12	2n	6	8 - 1	7 - 3	6 - 9	5 - 11	9 - 9	8 - 9	8 - 2	7 - 7	11 - 1	9 - 11	9 - 4	8 - 7
DFL2	9:12	2n	8	11 - 0	9 - 11	9 - 1	7 - 11	13 - 5	12 - 1	11 - 3	10 - 3	15 - 2	13 - 8	12 - 9	11 - 9
DFL2	9:12	2n	10	14 - 7	12 - 11	11 - 7	10 - 1	17 - 8	15 - 10	14 - 9	13 - 7	20 - 0	18 - 0	16 - 10	15 - 5
DFL2	9:12	2n	12	18 - 2	15 - 5	13 - 10	12 - 2	22 - 0	19 - 9	18 - 5	16 - 5	25 - 0	22 - 5	20 - 11	19 - 3
DFL2	9:12	2n	14	20 - 11	17 - 8	15 - 9	13 - 9	26 - 0	23 - 10	21 - 6	18 - 9	26 - 0	26 - 0	25 - 2	23 - 2
DFL2	10:12	1	4	5 - 4	4 - 10	4 - 6	4 - 2	6 - 5	5 - 9	5 - 4	5 - 0	7 - 4	6 - 6	6 - 1	5 - 7
DFL2	10:12	1	6	8 - 10	7 - 11	7 - 5	6 - 9	10 - 10	9 - 8	9 - 0	8 - 3	12 - 6	11 - 0	10 - 3	9 - 5
DFL2	10:12	1	8	12 - 5	10 - 11	10 - 2	9 - 2	15 - 2	13 - 6	12 - 7	11 - 5	17 - 6	15 - 6	14 - 4	13 - 2
DFL2	10:12	1	10	16 - 8	14 - 9	13 - 8	12 - 1	19 - 11	18 - 2	17 - 0	15 - 5	22 - 4	20 - 3	19 - 1	17 - 9
DFL2	10:12	1	12	20 - 6	18 - 7	17 - 4	14 - 8	24 - 3	22 - 1	20 - 9	19 - 3	26 - 11	24 - 8	23 - 3	21 - 7
DFL2	10:12	1	14	24 - 1	21 - 2	19 - 4	17 - 4	26 - 0	26 - 0	24 - 5	22 - 4	26 - 0	26 - 0	26 - 0	25 - 5
DFL2	10:12	2n	4	4 - 9	4 - 3	4 - 0	3 - 9	5 - 10	5 - 3	4 - 10	4 - 6	6 - 8	5 - 11	5 - 7	5 - 2
DFL2	10:12	2n	6	8 - 1	7 - 3	6 - 9	5 - 11	9 - 9	8 - 9	8 - 2	7 - 7	11 - 1	9 - 11	9 - 4	8 - 7
DFL2	10:12	2n	8	11 - 0	9 - 11	9 - 1	7 - 11	13 - 5	12 - 1	11 - 3	10 - 3	15 - 2	13 - 8	12 - 9	11 - 9
DFL2	10:12	2n	10	14 - 7	12 - 11	11 - 7	10 - 1	17 - 8	15 - 10	14 - 9	13 - 7	20 - 0	18 - 0	16 - 10	15 - 5
DFL2	10:12	2n	12	18 - 2	15 - 5	13 - 10	12 - 2	22 - 0	19 - 9	18 - 5	16 - 5	25 - 0	22 - 5	20 - 11	19 - 3
DFL2	10:12	2n	14	20 - 11	17 - 8	15 - 9	13 - 9	26 - 0	23 - 10	21 - 6	18 - 9	26 - 0	26 - 0	25 - 2	23 - 2
DFL2	11:12	1	4	5 - 4	4 - 10	4 - 6	4 - 2	6 - 5	5 - 9	5 - 4	5 - 0	7 - 4	6 - 6	6 - 1	5 - 7
DFL2	11:12	1	6	8 - 10	7 - 11	7 - 5	6 - 9	10 - 10	9 - 8	9 - 0	8 - 3	12 - 6	11 - 0	10 - 3	9 - 5
DFL2	11:12	1	8	12 - 5	10 - 11	10 - 2	9 - 2	15 - 2	13 - 6	12 - 7	11 - 5	17 - 6	15 - 6	14 - 4	13 - 2
DFL2	11:12	1	10	16 - 8	14 - 9	13 - 8	12 - 1	19 - 11	18 - 2	17 - 0	15 - 5	22 - 4	20 - 3	19 - 1	17 - 9
DFL2	11:12	1	12	20 - 6	18 - 7	17 - 4	14 - 8	24 - 3	22 - 1	20 - 9	19 - 3	26 - 0	24 - 8	23 - 3	21 - 7
DFL2	11:12	1	14	24 - 1	21 - 2	19 - 4	17 - 4	26 - 0	26 - 0	24 - 5	22 - 4	26 - 0	26 - 0	26 - 0	25 - 5
DFL2	11:12	2n	4	4 - 9	4 - 3	4 - 0	3 - 9	5 - 10	5 - 3	4 - 10	4 - 6	6 - 8	5 - 11	5 - 7	5 - 2
DFL2	11:12	2n	6	8 - 1	7 - 3	6 - 9	5 - 11	9 - 9	8 - 9	8 - 2	7 - 7	11 - 1	9 - 11	9 - 4	8 - 7
DFL2	11:12	2n	8	11 - 0	9 - 11	9 - 1	7 - 11	13 - 5	12 - 1	11 - 3	10 - 3	15 - 2	13 - 8	12 - 9	11 - 9
DFL2	11:12	2n	10	14 - 7	12 - 11	11 - 7	10 - 1	17 - 8	15 - 10	14 - 9	13 - 7	20 - 0	18 - 0	16 - 10	15 - 5
DFL2	11:12	2n	12	18 - 2	15 - 5	13 - 10	12 - 2	22 - 0	19 - 9	18 - 5	16 - 5	25 - 0	22 - 5	20 - 11	19 - 3
DFL2	11:12	2n	14	20 - 11	17 - 8	15 - 9	13 - 9	26 - 0	23 - 10	21 - 6	18 - 9	26 - 0	26 - 11	25 - 2	23 - 2
DFL2	12:12	1	4	5 - 4	4 - 10	4 - 6	4 - 2	6 - 5	5 - 9	5 - 4	5 - 0	7 - 4	6 - 6	6 - 1	5 - 7
DFL2	12:12	1	6	8 - 10	7 - 11	7 - 5	6 - 9	10 - 10	9 - 8	9 - 0	8 - 3	12 - 6	11 - 0	10 - 3	9 - 5
DFL2	12:12	1	8	12 - 5	10 - 11	10 - 2	9 - 2	15 - 2	13 - 6	12 - 7	11 - 5	17 - 6	15 - 6	14 - 4	13 - 2
DFL2	12:12	1	10	16 - 8	14 - 9	13 - 8	12 - 1	19 - 11	18 - 2	17 - 0	15 - 5	22 - 4	20 - 3	19 - 1	17 - 9
DFL2	12:12	1	12	20 - 6	18 - 7	17 - 4	14 - 8	24 - 3	22 - 1	20 - 9	19 - 3	26 - 0	24 - 8	23 - 3	21 - 7
DFL2	12:12	1	14	24 - 1	21 - 2	19 - 4	17 - 4	26 - 0	26 - 0	24 - 5	22 - 4	26 - 0	26 - 0	26 - 11	25 - 5
DFL2	12:12	2n	4	4 - 9	4 - 3	4 - 0	3 - 9	5 - 10	5 - 3	4 - 10	4 - 6	6 - 8	5 - 11	5 - 7	5 - 2
DFL2	12:12	2n	6	8 - 1	7 - 3	6 - 9	5 - 11	9 - 9	8 - 9	8 - 2	7 - 7	11 - 1	9 - 11	9 - 4	8 - 7
DFL2	12:12	2n	8	11 - 0	9 - 11	9 - 1	7 - 11	13 - 5	12 - 1	11 - 3	10 - 3	15 - 2	13 - 8	12 - 9	11 - 9
DFL2	12:12	2n	10	14 - 7	12 - 11	11 - 7	10 - 1	17 - 8	15 - 10	14 - 9	13 - 7	20 - 0	18 - 0	16 - 10	15 - 5
DFL2	12:12	2n	12	18 - 2	15 - 5	13 - 10	12 - 2	22 - 0	19 - 9	18 - 5	16 - 5	25 - 0	22 - 5	20 - 11	19 - 3
DFL2	12:12	2n	14	20 - 11	17 - 8	15 - 9	13 - 9	26 - 0	23 - 10	21 - 6	18 - 9	26 - 0	26 - 0	25 - 2	23 - 2

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE D-EXP. D, Kzt = 1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-41

Sheet Number 41 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure D, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
SP01	3:12	1	4	4 - 11	4 - 5	4 - 2	3 - 10	6 - 0	5 - 5	5 - 0	4 - 8	6 - 10	6 - 2	5 - 9	5 - 3
SP01	3:12	1	6	8 - 4	7 - 5	6 - 11	6 - 5	10 - 3	9 - 1	8 - 5	7 - 9	12 - 1	10 - 6	9 - 8	8 - 10
SP01	3:12	1	8	11 - 11	10 - 5	9 - 8	8 - 9	15 - 1	13 - 2	12 - 2	10 - 11	17 - 7	15 - 5	14 - 2	12 - 10
SP01	3:12	1	10	16 - 8	14 - 8	13 - 5	11 - 10	20 - 1	18 - 2	17 - 0	15 - 4	22 - 6	20 - 5	19 - 2	17 - 9
SP01	3:12	1	12	20 - 7	18 - 8	17 - 7	15 - 10	24 - 6	22 - 3	20 - 11	19 - 4	26 - 0	24 - 11	23 - 5	21 - 9
SP01	3:12	1	14	24 - 4	21 - 11	19 - 11	17 - 9	26 - 0	26 - 0	24 - 8	22 - 11	26 - 0	26 - 0	26 - 0	25 - 8
SP01	3:12	2n	4	4 - 3	3 - 9	3 - 6	3 - 3	5 - 2	4 - 7	4 - 4	4 - 0	5 - 11	5 - 3	4 - 11	4 - 6
SP01	3:12	2n	6	7 - 4	6 - 6	6 - 0	5 - 4	9 - 0	8 - 0	7 - 5	6 - 9	10 - 4	9 - 2	8 - 6	7 - 10
SP01	3:12	2n	8	10 - 3	9 - 2	8 - 6	7 - 5	12 - 9	11 - 4	10 - 5	9 - 6	14 - 7	13 - 0	12 - 1	11 - 0
SP01	3:12	2n	10	13 - 11	12 - 4	10 - 9	9 - 3	17 - 1	15 - 3	14 - 2	12 - 11	19 - 5	17 - 5	16 - 2	14 - 10
SP01	3:12	2n	12	17 - 7	15 - 5	13 - 8	11 - 9	21 - 4	19 - 1	17 - 10	16 - 4	24 - 6	21 - 9	20 - 3	18 - 7
SP01	3:12	2n	14	20 - 4	17 - 1	15 - 2	13 - 1	26 - 0	23 - 2	20 - 11	18 - 3	26 - 0	26 - 11	24 - 8	22 - 6
SP01	4:12	1	4	4 - 11	4 - 5	4 - 2	3 - 10	6 - 0	5 - 5	5 - 0	4 - 8	6 - 10	6 - 2	5 - 9	5 - 3
SP01	4:12	1	6	8 - 4	7 - 5	6 - 11	6 - 5	10 - 3	9 - 1	8 - 5	7 - 9	12 - 1	10 - 6	9 - 8	8 - 10
SP01	4:12	1	8	11 - 11	10 - 5	9 - 8	8 - 9	15 - 1	13 - 2	12 - 2	10 - 11	17 - 7	15 - 5	14 - 2	12 - 10
SP01	4:12	1	10	16 - 8	14 - 8	13 - 5	11 - 10	20 - 1	18 - 2	17 - 0	15 - 4	22 - 6	20 - 5	19 - 2	17 - 9
SP01	4:12	1	12	20 - 7	18 - 8	17 - 7	15 - 10	24 - 6	22 - 3	20 - 11	19 - 4	26 - 0	24 - 11	23 - 5	21 - 9
SP01	4:12	1	14	24 - 4	21 - 11	19 - 11	17 - 9	26 - 0	26 - 0	24 - 8	22 - 11	26 - 11	26 - 0	26 - 0	25 - 8
SP01	4:12	2n	4	4 - 3	3 - 9	3 - 6	3 - 3	5 - 2	4 - 7	4 - 4	4 - 0	5 - 11	5 - 3	4 - 11	4 - 6
SP01	4:12	2n	6	7 - 4	6 - 6	6 - 0	5 - 4	9 - 0	8 - 0	7 - 5	6 - 9	10 - 4	9 - 2	8 - 6	7 - 10
SP01	4:12	2n	8	10 - 3	9 - 2	8 - 6	7 - 5	12 - 9	11 - 4	10 - 5	9 - 6	14 - 7	13 - 0	12 - 1	11 - 0
SP01	4:12	2n	10	13 - 11	12 - 4	10 - 9	9 - 3	17 - 1	15 - 3	14 - 2	12 - 11	19 - 5	17 - 5	16 - 2	14 - 10
SP01	4:12	2n	12	17 - 7	15 - 5	13 - 8	11 - 9	21 - 4	19 - 1	17 - 10	16 - 4	24 - 6	21 - 9	20 - 3	18 - 7
SP01	4:12	2n	14	20 - 4	17 - 1	15 - 2	13 - 1	26 - 0	23 - 2	20 - 11	18 - 3	26 - 0	26 - 0	24 - 8	22 - 6
SP01	5:12	1	4	5 - 2	4 - 8	4 - 4	4 - 0	6 - 3	5 - 7	5 - 3	4 - 10	7 - 2	6 - 5	6 - 0	5 - 6
SP01	5:12	1	6	8 - 8	7 - 9	7 - 3	6 - 8	10 - 5	9 - 4	8 - 9	8 - 1	11 - 9	10 - 7	9 - 11	9 - 2
SP01	5:12	1	8	11 - 8	10 - 6	9 - 10	9 - 1	14 - 0	12 - 8	11 - 10	10 - 11	15 - 9	14 - 3	13 - 4	12 - 4
SP01	5:12	1	10	15 - 1	13 - 8	12 - 10	11 - 6	18 - 1	16 - 4	15 - 4	14 - 2	20 - 3	18 - 4	17 - 3	15 - 11
SP01	5:12	1	12	18 - 6	16 - 9	15 - 7	13 - 10	22 - 1	20 - 0	18 - 10	17 - 5	24 - 10	22 - 6	21 - 2	19 - 7
SP01	5:12	1	14	21 - 8	18 - 7	16 - 11	15 - 0	26 - 0	23 - 8	22 - 2	19 - 8	26 - 0	26 - 11	25 - 0	23 - 2
SP01	5:12	2n	4	4 - 4	3 - 10	3 - 7	3 - 4	5 - 5	4 - 9	4 - 5	4 - 1	6 - 3	5 - 6	5 - 1	4 - 8
SP01	5:12	2n	6	7 - 9	6 - 10	6 - 4	5 - 9	9 - 5	8 - 6	7 - 11	7 - 2	10 - 9	9 - 8	9 - 0	8 - 3
SP01	5:12	2n	8	10 - 8	9 - 7	8 - 11	8 - 2	13 - 0	11 - 8	10 - 10	10 - 0	14 - 8	13 - 3	12 - 5	11 - 4
SP01	5:12	2n	10	14 - 1	12 - 8	11 - 5	9 - 11	17 - 0	15 - 3	14 - 3	13 - 2	19 - 2	17 - 4	16 - 2	14 - 10
SP01	5:12	2n	12	17 - 6	15 - 5	13 - 11	12 - 4	21 - 1	18 - 11	17 - 9	16 - 4	23 - 7	21 - 5	20 - 1	18 - 6
SP01	5:12	2n	14	20 - 0	16 - 11	15 - 3	13 - 5	24 - 10	22 - 7	20 - 6	18 - 0	26 - 0	25 - 3	23 - 9	22 - 1
SP01	6:12	1	4	5 - 2	4 - 8	4 - 4	4 - 0	6 - 3	5 - 7	5 - 3	4 - 10	7 - 2	6 - 5	6 - 0	5 - 6
SP01	6:12	1	6	8 - 8	7 - 9	7 - 3	6 - 8	10 - 5	9 - 4	8 - 9	8 - 1	11 - 9	10 - 7	9 - 11	9 - 2
SP01	6:12	1	8	11 - 8	10 - 6	9 - 10	9 - 1	14 - 0	12 - 8	11 - 10	10 - 11	15 - 9	14 - 3	13 - 4	12 - 4
SP01	6:12	1	10	15 - 1	13 - 8	12 - 10	11 - 6	18 - 1	16 - 4	15 - 4	14 - 2	20 - 3	18 - 4	17 - 3	15 - 11
SP01	6:12	1	12	18 - 6	16 - 9	15 - 7	13 - 10	22 - 1	20 - 0	18 - 10	17 - 5	24 - 10	22 - 6	21 - 2	19 - 7
SP01	6:12	1	14	21 - 8	18 - 7	16 - 11	15 - 0	26 - 0	23 - 8	22 - 2	19 - 8	26 - 0	26 - 0	25 - 0	23 - 2
SP01	6:12	2n	4	4 - 4	3 - 10	3 - 7	3 - 4	5 - 5	4 - 9	4 - 5	4 - 1	6 - 3	5 - 6	5 - 1	4 - 8
SP01	6:12	2n	6	7 - 9	6 - 10	6 - 4	5 - 9	9 - 5	8 - 6	7 - 11	7 - 2	10 - 9	9 - 8	9 - 0	8 - 3
SP01	6:12	2n	8	10 - 8	9 - 7	8 - 11	8 - 2	13 - 0	11 - 8	10 - 10	10 - 0	14 - 8	13 - 3	12 - 5	11 - 4
SP01	6:12	2n	10	14 - 1	12 - 8	11 - 5	9 - 11	17 - 0	15 - 3	14 - 3	13 - 2	19 - 2	17 - 4	16 - 2	14 - 10
SP01	6:12	2n	12	17 - 6	15 - 5	13 - 11	12 - 4	21 - 1	18 - 11	17 - 9	16 - 4	23 - 7	21 - 5	20 - 1	18 - 6
SP01	6:12	2n	14	20 - 0	16 - 11	15 - 3	13 - 5	24 - 10	22 - 7	20 - 6	18 - 0	26 - 0	25 - 3	23 - 9	22 - 1
SP01	7:12	1	4	5 - 4	4 - 10	4 - 6	4 - 2	6 - 5	5 - 9	5 - 4	5 - 0	7 - 4	6 - 6	6 - 1	5 - 7
SP01	7:12	1	6	8 - 10	7 - 11	7 - 5	6 - 9	10 - 10	9 - 8	9 - 0	8 - 3	12 - 6	11 - 0	10 - 3	9 - 5
SP01	7:12	1	8	12 - 5	10 - 11	10 - 2	9 - 4	15 - 2	13 - 6	12 - 7	11 - 5	17 - 6	15 - 6	14 - 4	13 - 2
SP01	7:12	1	10	16 - 8	14 - 9	13 - 8	12 - 7	19 - 11	18 - 2	17 - 0	15 - 5	22 - 4	20 - 3	19 - 1	17 - 9
SP01	7:12	1	12	20 - 6	18 - 7	17 - 6	15 - 9	24 - 3	22 - 1	20 - 9	19 - 3	26 - 0	24 - 8	23 - 3	21 - 7
SP01	7:12	1	14	24 - 1	21 - 7	19 - 9	17 - 7	26 - 0	26 - 0	24 - 5	22 - 8	26 - 0	26 - 0	26 - 11	25 - 5
SP01	7:12	2n	4	4 - 9	4 - 3	4 - 0	3 - 9	5 - 10	5 - 3	4 - 10	4 - 6	6 - 8	5 - 11	5 - 7	5 - 2
SP01	7:12	2n	6	8 - 1	7 - 3	6 - 9	6 - 2	9 - 9	8 - 9	8 - 2	7 - 7	11 - 1	9 - 11	9 - 4	8 - 7
SP01	7:12	2n	8	11 - 0	9 - 11	9 - 3	8 - 6	13 - 5	12 - 1	11 - 3	10 - 3	15 - 2	13 - 8	12 - 9	11 - 9
SP01	7:12	2n	10	14 - 7	13 - 1	12 - 0	10 - 5	17 - 8	15 - 10	14 - 9	13 - 7	20 - 0	18 - 0	16 - 10	15 - 5
SP01	7:12	2n	12	18 - 2	16 - 4	14 - 9	12 - 11	22 - 0	19 - 9	18 - 5	17 - 0	25 - 0	22 - 5	20 - 11	19 - 3
SP01	7:12	2n	14	21 - 5	18 - 0	16 - 2	14 - 1	26 - 0	23 - 10	22 - 0	19 - 2	26 - 0	26 - 0	25 - 2	23 - 2

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE E-EXP. D, Kzt = 1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-42

Sheet Number 42 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure D, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
SP01	8:12	1	4	5 - 4	4 - 10	4 - 6	4 - 2	6 - 5	5 - 9	5 - 4	5 - 0	7 - 4	6 - 6	6 - 1	5 - 7
SP01	8:12	1	6	8 - 10	7 - 11	7 - 5	6 - 9	10 - 10	9 - 8	9 - 0	8 - 3	12 - 6	11 - 0	10 - 3	9 - 5
SP01	8:12	1	8	12 - 5	10 - 11	10 - 2	9 - 4	15 - 2	13 - 6	12 - 7	11 - 5	17 - 6	15 - 6	14 - 4	13 - 2
SP01	8:12	1	10	16 - 8	14 - 9	13 - 8	12 - 7	19 - 11	18 - 2	17 - 0	15 - 5	22 - 4	20 - 3	19 - 1	17 - 9
SP01	8:12	1	12	20 - 6	18 - 7	17 - 6	15 - 9	24 - 3	22 - 1	20 - 9	19 - 3	26 - 0	24 - 8	23 - 3	21 - 7
SP01	8:12	1	14	24 - 1	21 - 7	19 - 9	17 - 7	26 - 0	26 - 0	24 - 5	22 - 8	26 - 0	26 - 0	26 - 0	25 - 5
SP01	8:12	2n	4	4 - 9	4 - 3	4 - 0	3 - 9	5 - 10	5 - 3	4 - 10	4 - 6	6 - 8	5 - 11	5 - 7	5 - 2
SP01	8:12	2n	6	8 - 1	7 - 3	6 - 9	6 - 2	9 - 9	8 - 9	8 - 2	7 - 7	11 - 1	9 - 11	9 - 4	8 - 7
SP01	8:12	2n	8	11 - 0	9 - 11	9 - 3	8 - 6	13 - 5	12 - 1	11 - 3	10 - 3	15 - 2	13 - 8	12 - 9	11 - 9
SP01	8:12	2n	10	14 - 7	13 - 1	12 - 0	10 - 5	17 - 8	15 - 10	14 - 9	13 - 7	20 - 0	18 - 0	16 - 10	15 - 5
SP01	8:12	2n	12	18 - 2	16 - 4	14 - 9	12 - 11	22 - 0	19 - 9	18 - 5	17 - 0	25 - 0	22 - 5	20 - 11	19 - 3
SP01	8:12	2n	14	21 - 5	18 - 0	16 - 2	14 - 1	26 - 0	23 - 10	22 - 0	19 - 2	26 - 0	26 - 0	25 - 2	23 - 2
SP01	9:12	1	4	5 - 4	4 - 10	4 - 6	4 - 2	6 - 5	5 - 9	5 - 4	5 - 0	7 - 4	6 - 6	6 - 1	5 - 7
SP01	9:12	1	6	8 - 10	7 - 11	7 - 5	6 - 9	10 - 10	9 - 8	9 - 0	8 - 3	12 - 6	11 - 0	10 - 3	9 - 5
SP01	9:12	1	8	12 - 5	10 - 11	10 - 2	9 - 4	15 - 2	13 - 6	12 - 7	11 - 5	17 - 6	15 - 6	14 - 4	13 - 2
SP01	9:12	1	10	16 - 8	14 - 9	13 - 8	12 - 7	19 - 11	18 - 2	17 - 0	15 - 5	22 - 4	20 - 3	19 - 1	17 - 9
SP01	9:12	1	12	20 - 6	18 - 7	17 - 6	15 - 9	24 - 3	22 - 1	20 - 9	19 - 3	26 - 0	24 - 8	23 - 3	21 - 7
SP01	9:12	1	14	24 - 1	21 - 7	19 - 9	17 - 7	26 - 0	26 - 11	24 - 5	22 - 8	26 - 0	26 - 11	26 - 0	25 - 5
SP01	9:12	2n	4	4 - 9	4 - 3	4 - 0	3 - 9	5 - 10	5 - 3	4 - 10	4 - 6	6 - 8	5 - 11	5 - 7	5 - 2
SP01	9:12	2n	6	8 - 1	7 - 3	6 - 9	6 - 2	9 - 9	8 - 9	8 - 2	7 - 7	11 - 1	9 - 11	9 - 4	8 - 7
SP01	9:12	2n	8	11 - 0	9 - 11	9 - 3	8 - 6	13 - 5	12 - 1	11 - 3	10 - 3	15 - 2	13 - 8	12 - 9	11 - 9
SP01	9:12	2n	10	14 - 7	13 - 1	12 - 0	10 - 5	17 - 8	15 - 10	14 - 9	13 - 7	20 - 0	18 - 0	16 - 10	15 - 5
SP01	9:12	2n	12	18 - 2	16 - 4	14 - 9	12 - 11	22 - 0	19 - 9	18 - 5	17 - 0	25 - 0	22 - 5	20 - 11	19 - 3
SP01	9:12	2n	14	21 - 5	18 - 0	16 - 2	14 - 1	26 - 0	23 - 10	22 - 0	19 - 2	26 - 0	26 - 0	25 - 2	23 - 2
SP01	10:12	1	4	5 - 4	4 - 10	4 - 6	4 - 2	6 - 5	5 - 9	5 - 4	5 - 0	7 - 4	6 - 6	6 - 1	5 - 7
SP01	10:12	1	6	8 - 10	7 - 11	7 - 5	6 - 9	10 - 10	9 - 8	9 - 0	8 - 3	12 - 6	11 - 0	10 - 3	9 - 5
SP01	10:12	1	8	12 - 5	10 - 11	10 - 2	9 - 4	15 - 2	13 - 6	12 - 7	11 - 5	17 - 6	15 - 6	14 - 4	13 - 2
SP01	10:12	1	10	16 - 8	14 - 9	13 - 8	12 - 7	19 - 11	18 - 2	17 - 0	15 - 5	22 - 4	20 - 3	19 - 1	17 - 9
SP01	10:12	1	12	20 - 6	18 - 7	17 - 6	15 - 9	24 - 3	22 - 1	20 - 9	19 - 3	26 - 11	24 - 8	23 - 3	21 - 7
SP01	10:12	1	14	24 - 1	21 - 7	19 - 9	17 - 7	26 - 11	26 - 0	24 - 5	22 - 8	26 - 11	26 - 0	26 - 0	25 - 5
SP01	10:12	2n	4	4 - 9	4 - 3	4 - 0	3 - 9	5 - 10	5 - 3	4 - 10	4 - 6	6 - 8	5 - 11	5 - 7	5 - 2
SP01	10:12	2n	6	8 - 1	7 - 3	6 - 9	6 - 2	9 - 9	8 - 9	8 - 2	7 - 7	11 - 1	9 - 11	9 - 4	8 - 7
SP01	10:12	2n	8	11 - 0	9 - 11	9 - 3	8 - 6	13 - 5	12 - 1	11 - 3	10 - 3	15 - 2	13 - 8	12 - 9	11 - 9
SP01	10:12	2n	10	14 - 7	13 - 1	12 - 0	10 - 5	17 - 8	15 - 10	14 - 9	13 - 7	20 - 0	18 - 0	16 - 10	15 - 5
SP01	10:12	2n	12	18 - 2	16 - 4	14 - 9	12 - 11	22 - 0	19 - 9	18 - 5	17 - 0	25 - 0	22 - 5	20 - 11	19 - 3
SP01	10:12	2n	14	21 - 5	18 - 0	16 - 2	14 - 1	26 - 0	23 - 10	22 - 0	19 - 2	26 - 0	26 - 0	25 - 2	23 - 2
SP01	11:12	1	4	5 - 4	4 - 10	4 - 6	4 - 2	6 - 5	5 - 9	5 - 4	5 - 0	7 - 4	6 - 6	6 - 1	5 - 7
SP01	11:12	1	6	8 - 10	7 - 11	7 - 5	6 - 9	10 - 10	9 - 8	9 - 0	8 - 3	12 - 6	11 - 0	10 - 3	9 - 5
SP01	11:12	1	8	12 - 5	10 - 11	10 - 2	9 - 4	15 - 2	13 - 6	12 - 7	11 - 5	17 - 6	15 - 6	14 - 4	13 - 2
SP01	11:12	1	10	16 - 8	14 - 9	13 - 8	12 - 7	19 - 11	18 - 2	17 - 0	15 - 5	22 - 4	20 - 3	19 - 1	17 - 9
SP01	11:12	1	12	20 - 6	18 - 7	17 - 6	15 - 9	24 - 3	22 - 1	20 - 9	19 - 3	26 - 0	24 - 8	23 - 3	21 - 7
SP01	11:12	1	14	24 - 1	21 - 7	19 - 9	17 - 7	26 - 0	26 - 0	24 - 5	22 - 8	26 - 0	26 - 0	26 - 0	25 - 5
SP01	11:12	2n	4	4 - 9	4 - 3	4 - 0	3 - 9	5 - 10	5 - 3	4 - 10	4 - 6	6 - 8	5 - 11	5 - 7	5 - 2
SP01	11:12	2n	6	8 - 1	7 - 3	6 - 9	6 - 2	9 - 9	8 - 9	8 - 2	7 - 7	11 - 1	9 - 11	9 - 4	8 - 7
SP01	11:12	2n	8	11 - 0	9 - 11	9 - 3	8 - 6	13 - 5	12 - 1	11 - 3	10 - 3	15 - 2	13 - 8	12 - 9	11 - 9
SP01	11:12	2n	10	14 - 7	13 - 1	12 - 0	10 - 5	17 - 8	15 - 10	14 - 9	13 - 7	20 - 0	18 - 0	16 - 10	15 - 5
SP01	11:12	2n	12	18 - 2	16 - 4	14 - 9	12 - 11	22 - 0	19 - 9	18 - 5	17 - 0	25 - 0	22 - 5	20 - 11	19 - 3
SP01	11:12	2n	14	21 - 5	18 - 0	16 - 2	14 - 1	26 - 0	23 - 10	22 - 0	19 - 2	26 - 0	26 - 0	25 - 2	23 - 2
SP01	12:12	1	4	5 - 4	4 - 10	4 - 6	4 - 2	6 - 5	5 - 9	5 - 4	5 - 0	7 - 4	6 - 6	6 - 1	5 - 7
SP01	12:12	1	6	8 - 10	7 - 11	7 - 5	6 - 9	10 - 10	9 - 8	9 - 0	8 - 3	12 - 6	11 - 0	10 - 3	9 - 5
SP01	12:12	1	8	12 - 5	10 - 11	10 - 2	9 - 4	15 - 2	13 - 6	12 - 7	11 - 5	17 - 6	15 - 6	14 - 4	13 - 2
SP01	12:12	1	10	16 - 8	14 - 9	13 - 8	12 - 7	19 - 11	18 - 2	17 - 0	15 - 5	22 - 4	20 - 3	19 - 1	17 - 9
SP01	12:12	1	12	20 - 6	18 - 7	17 - 6	15 - 9	24 - 3	22 - 1	20 - 9	19 - 3	26 - 0	24 - 8	23 - 3	21 - 7
SP01	12:12	1	14	24 - 1	21 - 7	19 - 9	17 - 7	26 - 0	26 - 0	24 - 5	22 - 8	26 - 11	26 - 11	26 - 11	25 - 5
SP01	12:12	2n	4	4 - 9	4 - 3	4 - 0	3 - 9	5 - 10	5 - 3	4 - 10	4 - 6	6 - 8	5 - 11	5 - 7	5 - 2
SP01	12:12	2n	6	8 - 1	7 - 3	6 - 9	6 - 2	9 - 9	8 - 9	8 - 2	7 - 7	11 - 1	9 - 11	9 - 4	8 - 7
SP01	12:12	2n	8	11 - 0	9 - 11	9 - 3	8 - 6	13 - 5	12 - 1	11 - 3	10 - 3	15 - 2	13 - 8	12 - 9	11 - 9
SP01	12:12	2n	10	14 - 7	13 - 1	12 - 0	10 - 5	17 - 8	15 - 10	14 - 9	13 - 7	20 - 0	18 - 0	16 - 10	15 - 5
SP01	12:12	2n	12	18 - 2	16 - 4	14 - 9	12 - 11	22 - 0	19 - 9	18 - 5	17 - 0	25 - 0	22 - 5	20 - 11	19 - 3
SP01	12:12	2n	14	21 - 5	18 - 0	16 - 2	14 - 1	26 - 0	23 - 10	22 - 0	19 - 2	26 - 0	26 - 0	25 - 2	23 - 2

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE F-EXP. D, Kzt = 1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-43

Sheet Number 43 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure D, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
SP02	3:12	1	4	4 - 8	4 - 2	3 - 11	3 - 5	5 - 9	5 - 1	4 - 9	4 - 5	6 - 6	5 - 10	5 - 5	5 - 0
SP02	3:12	1	6	7 - 11	7 - 1	6 - 6	5 - 7	9 - 8	8 - 7	8 - 0	7 - 4	11 - 3	9 - 11	9 - 2	8 - 5
SP02	3:12	1	8	11 - 2	9 - 10	8 - 9	7 - 7	14 - 2	12 - 5	11 - 5	10 - 4	16 - 7	14 - 6	13 - 4	12 - 1
SP02	3:12	1	10	15 - 8	13 - 3	11 - 4	9 - 6	19 - 2	17 - 5	16 - 0	14 - 5	21 - 6	19 - 6	18 - 4	16 - 10
SP02	3:12	1	12	19 - 8	17 - 6	14 - 11	12 - 6	23 - 5	21 - 3	19 - 11	18 - 5	26 - 0	23 - 10	22 - 5	20 - 9
SP02	3:12	1	14	22 - 2	19 - 0	17 - 3	14 - 1	26 - 0	24 - 11	22 - 7	20 - 1	26 - 0	26 - 0	26 - 11	24 - 6
SP02	3:12	2n	4	4 - 0	3 - 5	3 - 1	2 - 9	4 - 11	4 - 4	4 - 1	3 - 8	5 - 7	5 - 0	4 - 8	4 - 3
SP02	3:12	2n	6	6 - 11	5 - 8	5 - 0	4 - 5	8 - 6	7 - 7	7 - 0	6 - 2	9 - 10	8 - 8	8 - 1	7 - 4
SP02	3:12	2n	8	9 - 9	8 - 0	7 - 0	6 - 0	12 - 1	10 - 8	9 - 11	8 - 7	13 - 10	12 - 4	11 - 5	10 - 4
SP02	3:12	2n	10	12 - 6	10 - 1	8 - 11	7 - 8	16 - 2	14 - 5	12 - 10	10 - 11	18 - 5	16 - 6	15 - 4	14 - 0
SP02	3:12	2n	12	15 - 5	12 - 9	11 - 3	9 - 7	20 - 3	17 - 10	15 - 10	13 - 8	23 - 2	20 - 8	19 - 3	17 - 9
SP02	3:12	2n	14	17 - 4	14 - 4	12 - 8	10 - 10	24 - 0	19 - 10	17 - 9	15 - 4	26 - 0	25 - 2	23 - 4	20 - 2
SP02	4:12	1	4	4 - 8	4 - 2	3 - 11	3 - 5	5 - 9	5 - 1	4 - 9	4 - 5	6 - 6	5 - 10	5 - 5	5 - 0
SP02	4:12	1	6	7 - 11	7 - 1	6 - 6	5 - 7	9 - 8	8 - 7	8 - 0	7 - 4	11 - 3	9 - 11	9 - 2	8 - 5
SP02	4:12	1	8	11 - 2	9 - 10	8 - 9	7 - 7	14 - 2	12 - 5	11 - 5	10 - 4	16 - 7	14 - 6	13 - 4	12 - 1
SP02	4:12	1	10	15 - 8	13 - 3	11 - 4	9 - 6	19 - 2	17 - 5	16 - 0	14 - 5	21 - 6	19 - 6	18 - 4	16 - 10
SP02	4:12	1	12	19 - 8	17 - 6	14 - 11	12 - 6	23 - 5	21 - 3	19 - 11	18 - 5	26 - 0	23 - 10	22 - 5	20 - 9
SP02	4:12	1	14	22 - 2	19 - 0	17 - 3	14 - 1	26 - 0	24 - 11	22 - 7	20 - 1	26 - 0	26 - 0	26 - 11	24 - 6
SP02	4:12	2n	4	4 - 0	3 - 5	3 - 1	2 - 9	4 - 11	4 - 4	4 - 1	3 - 8	5 - 7	5 - 0	4 - 8	4 - 3
SP02	4:12	2n	6	6 - 11	5 - 8	5 - 0	4 - 5	8 - 6	7 - 7	7 - 0	6 - 2	9 - 10	8 - 8	8 - 1	7 - 4
SP02	4:12	2n	8	9 - 9	8 - 0	7 - 0	6 - 0	12 - 1	10 - 8	9 - 11	8 - 7	13 - 10	12 - 4	11 - 5	10 - 4
SP02	4:12	2n	10	12 - 6	10 - 1	8 - 11	7 - 8	16 - 2	14 - 5	12 - 10	10 - 11	18 - 5	16 - 6	15 - 4	14 - 0
SP02	4:12	2n	12	15 - 5	12 - 9	11 - 3	9 - 7	20 - 3	17 - 10	15 - 10	13 - 8	23 - 2	20 - 8	19 - 3	17 - 9
SP02	4:12	2n	14	17 - 4	14 - 4	12 - 8	10 - 10	24 - 0	19 - 10	17 - 9	15 - 4	26 - 0	25 - 2	23 - 4	20 - 2
SP02	5:12	1	4	4 - 11	4 - 5	4 - 1	3 - 8	6 - 0	5 - 4	5 - 0	4 - 7	6 - 10	6 - 1	5 - 8	5 - 2
SP02	5:12	1	6	8 - 3	7 - 5	6 - 11	6 - 0	9 - 11	8 - 11	8 - 4	7 - 8	11 - 2	10 - 1	9 - 5	8 - 8
SP02	5:12	1	8	11 - 2	10 - 0	9 - 2	8 - 1	13 - 4	12 - 1	11 - 4	10 - 5	15 - 0	13 - 7	12 - 9	11 - 9
SP02	5:12	1	10	14 - 5	12 - 5	11 - 2	9 - 10	17 - 3	15 - 7	14 - 8	13 - 1	19 - 4	17 - 6	16 - 6	15 - 3
SP02	5:12	1	12	17 - 2	14 - 9	13 - 5	11 - 10	21 - 2	19 - 1	17 - 7	15 - 7	23 - 8	21 - 6	20 - 2	18 - 8
SP02	5:12	1	14	18 - 10	16 - 2	14 - 8	13 - 0	24 - 8	21 - 3	19 - 3	17 - 1	26 - 0	25 - 5	23 - 10	21 - 6
SP02	5:12	2n	4	4 - 1	3 - 6	3 - 2	2 - 10	5 - 1	4 - 6	4 - 2	3 - 10	5 - 11	5 - 2	4 - 10	4 - 5
SP02	5:12	2n	6	7 - 4	6 - 2	5 - 4	4 - 8	9 - 0	8 - 0	7 - 6	6 - 9	10 - 3	9 - 2	8 - 6	7 - 10
SP02	5:12	2n	8	10 - 2	8 - 8	7 - 9	6 - 7	12 - 5	11 - 1	10 - 4	9 - 3	14 - 0	12 - 7	11 - 9	10 - 9
SP02	5:12	2n	10	12 - 10	10 - 9	9 - 7	8 - 4	16 - 2	14 - 6	13 - 2	11 - 6	18 - 4	16 - 5	15 - 4	14 - 2
SP02	5:12	2n	12	15 - 6	13 - 2	11 - 10	10 - 3	20 - 1	17 - 8	15 - 10	13 - 11	22 - 7	20 - 5	19 - 1	17 - 7
SP02	5:12	2n	14	17 - 3	14 - 6	13 - 1	11 - 6	22 - 10	19 - 7	17 - 7	15 - 5	26 - 0	24 - 2	22 - 5	19 - 10
SP02	6:12	1	4	4 - 11	4 - 5	4 - 1	3 - 8	6 - 0	5 - 4	5 - 0	4 - 7	6 - 10	6 - 1	5 - 8	5 - 2
SP02	6:12	1	6	8 - 3	7 - 5	6 - 11	6 - 0	9 - 11	8 - 11	8 - 4	7 - 8	11 - 2	10 - 1	9 - 5	8 - 8
SP02	6:12	1	8	11 - 2	10 - 0	9 - 2	8 - 1	13 - 4	12 - 1	11 - 4	10 - 5	15 - 0	13 - 7	12 - 9	11 - 9
SP02	6:12	1	10	14 - 5	12 - 5	11 - 2	9 - 10	17 - 3	15 - 7	14 - 8	13 - 1	19 - 4	17 - 6	16 - 6	15 - 3
SP02	6:12	1	12	17 - 2	14 - 9	13 - 5	11 - 10	21 - 2	19 - 1	17 - 7	15 - 7	23 - 8	21 - 6	20 - 2	18 - 8
SP02	6:12	1	14	18 - 10	16 - 2	14 - 8	13 - 0	24 - 8	21 - 3	19 - 3	17 - 1	26 - 0	25 - 5	23 - 10	21 - 6
SP02	6:12	2n	4	4 - 1	3 - 6	3 - 2	2 - 10	5 - 1	4 - 6	4 - 2	3 - 10	5 - 11	5 - 2	4 - 10	4 - 5
SP02	6:12	2n	6	7 - 4	6 - 2	5 - 4	4 - 8	9 - 0	8 - 0	7 - 6	6 - 9	10 - 3	9 - 2	8 - 6	7 - 10
SP02	6:12	2n	8	10 - 2	8 - 8	7 - 9	6 - 7	12 - 5	11 - 1	10 - 4	9 - 3	14 - 0	12 - 7	11 - 9	10 - 9
SP02	6:12	2n	10	12 - 10	10 - 9	9 - 7	8 - 4	16 - 2	14 - 6	13 - 2	11 - 6	18 - 4	16 - 5	15 - 4	14 - 2
SP02	6:12	2n	12	15 - 6	13 - 2	11 - 10	10 - 3	20 - 1	17 - 8	15 - 10	13 - 11	22 - 7	20 - 5	19 - 1	17 - 7
SP02	6:12	2n	14	17 - 3	14 - 6	13 - 1	11 - 6	22 - 10	19 - 7	17 - 7	15 - 5	26 - 0	24 - 2	22 - 5	19 - 10
SP02	7:12	1	4	5 - 1	4 - 7	4 - 4	4 - 0	6 - 1	5 - 6	5 - 2	4 - 9	6 - 11	6 - 2	5 - 9	5 - 4
SP02	7:12	1	6	8 - 5	7 - 7	7 - 0	6 - 2	10 - 3	9 - 2	8 - 7	7 - 10	11 - 9	10 - 5	9 - 9	8 - 11
SP02	7:12	1	8	11 - 8	10 - 4	9 - 7	8 - 4	14 - 4	12 - 10	11 - 11	10 - 10	16 - 6	14 - 8	13 - 7	12 - 6
SP02	7:12	1	10	15 - 9	13 - 8	12 - 2	10 - 4	19 - 1	17 - 4	16 - 0	14 - 7	21 - 4	19 - 5	18 - 3	16 - 10
SP02	7:12	1	12	19 - 7	17 - 4	15 - 1	13 - 0	23 - 3	21 - 1	19 - 10	18 - 3	26 - 0	23 - 7	22 - 2	20 - 7
SP02	7:12	1	14	21 - 10	18 - 11	17 - 3	14 - 7	26 - 0	24 - 5	22 - 4	19 - 11	26 - 0	26 - 0	26 - 0	24 - 3
SP02	7:12	2n	4	4 - 6	4 - 1	3 - 9	3 - 4	5 - 7	5 - 0	4 - 7	4 - 4	6 - 4	5 - 8	5 - 3	4 - 11
SP02	7:12	2n	6	7 - 8	6 - 10	6 - 2	5 - 5	9 - 4	8 - 4	7 - 10	7 - 2	10 - 7	9 - 6	8 - 10	8 - 2
SP02	7:12	2n	8	10 - 6	9 - 2	8 - 3	7 - 3	12 - 9	11 - 5	10 - 8	9 - 9	14 - 5	13 - 0	12 - 2	11 - 1
SP02	7:12	2n	10	13 - 6	11 - 4	10 - 2	8 - 10	16 - 10	15 - 1	13 - 10	12 - 2	19 - 0	17 - 1	15 - 11	14 - 8
SP02	7:12	2n	12	16 - 5	13 - 10	12 - 5	10 - 10	20 - 11	18 - 9	16 - 11	14 - 8	23 - 10	21 - 4	19 - 11	18 - 4
SP02	7:12	2n	14	18 - 3	15 - 4	13 - 9	12 - 1	25 - 0	20 - 10	18 - 9	16 - 4	26 - 0	25 - 7	24 - 0	21 - 3

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE G-EXP. D, Kzt = 1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-44

Sheet Number 44 of 45

RAFTERS ALLOWABLE SPANS
USVI

Date: 3/6/2018
Governing Code: 2018 IBC/ASCE 7-16
Risk Category: II
Base Wind Speed: 165 MPH

Dead Load: 10 PSF
Deflection Limits: L/180
Limits and Assumption: See Appendix General Notes
Per ASCE 7-16, Zone 1 refers to the interior zone and Zone 2n refers to the edge zone of the roof. User may conservatively assume that Zone 2n extends four feet from the roof edge.

Exposure D, K_{zt} = 1.0

Governing Span (ft-in)

Wood Species	Slope	Zone	Nominal Depth (in)	Nominal 2 inch Thick Sections				Nominal 3 inch Thick Sections				Nominal 4 inch Thick Sections			
				Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing	Span @12" Spacing	Span @16" Spacing	Span @19.2" Spacing	Span @24" Spacing
SP02	8:12	1	4	5 - 1	4 - 7	4 - 4	4 - 0	6 - 1	5 - 6	5 - 2	4 - 9	6 - 11	6 - 2	5 - 9	5 - 4
SP02	8:12	1	6	8 - 5	7 - 7	7 - 0	6 - 2	10 - 3	9 - 2	8 - 7	7 - 10	11 - 9	10 - 5	9 - 9	8 - 11
SP02	8:12	1	8	11 - 8	10 - 4	9 - 7	8 - 4	14 - 4	12 - 10	11 - 11	10 - 10	16 - 6	14 - 8	13 - 7	12 - 6
SP02	8:12	1	10	15 - 9	13 - 8	12 - 2	10 - 4	19 - 1	17 - 4	16 - 0	14 - 7	21 - 4	19 - 5	18 - 3	16 - 10
SP02	8:12	1	12	19 - 7	17 - 4	15 - 1	13 - 0	23 - 3	21 - 1	19 - 10	18 - 3	26 - 0	23 - 7	22 - 2	20 - 7
SP02	8:12	1	14	21 - 10	18 - 11	17 - 3	14 - 7	26 - 0	24 - 5	22 - 4	19 - 11	26 - 0	26 - 0	26 - 0	24 - 3
SP02	8:12	2n	4	4 - 6	4 - 1	3 - 9	3 - 4	5 - 7	5 - 0	4 - 7	4 - 4	6 - 4	5 - 8	5 - 3	4 - 11
SP02	8:12	2n	6	7 - 8	6 - 10	6 - 2	5 - 5	9 - 4	8 - 4	7 - 10	7 - 2	10 - 7	9 - 6	8 - 10	8 - 2
SP02	8:12	2n	8	10 - 6	9 - 2	8 - 3	7 - 3	12 - 9	11 - 5	10 - 8	9 - 9	14 - 5	13 - 0	12 - 2	11 - 1
SP02	8:12	2n	10	13 - 6	11 - 4	10 - 2	8 - 10	16 - 10	15 - 1	13 - 10	12 - 2	19 - 0	17 - 1	15 - 11	14 - 8
SP02	8:12	2n	12	16 - 5	13 - 10	12 - 5	10 - 10	20 - 11	18 - 9	16 - 11	14 - 8	23 - 10	21 - 4	19 - 11	18 - 4
SP02	8:12	2n	14	18 - 3	15 - 4	13 - 9	12 - 1	25 - 0	20 - 10	18 - 9	16 - 4	26 - 0	25 - 7	24 - 0	21 - 3
SP02	9:12	1	4	5 - 1	4 - 7	4 - 4	4 - 0	6 - 1	5 - 6	5 - 2	4 - 9	6 - 11	6 - 2	5 - 9	5 - 4
SP02	9:12	1	6	8 - 5	7 - 7	7 - 0	6 - 2	10 - 3	9 - 2	8 - 7	7 - 10	11 - 9	10 - 5	9 - 9	8 - 11
SP02	9:12	1	8	11 - 8	10 - 4	9 - 7	8 - 4	14 - 4	12 - 10	11 - 11	10 - 10	16 - 6	14 - 8	13 - 7	12 - 6
SP02	9:12	1	10	15 - 9	13 - 8	12 - 2	10 - 4	19 - 1	17 - 4	16 - 0	14 - 7	21 - 4	19 - 5	18 - 3	16 - 10
SP02	9:12	1	12	19 - 7	17 - 4	15 - 1	13 - 0	23 - 3	21 - 1	19 - 10	18 - 3	26 - 11	23 - 7	22 - 2	20 - 7
SP02	9:12	1	14	21 - 10	18 - 11	17 - 3	14 - 7	26 - 11	24 - 5	22 - 4	19 - 11	26 - 0	26 - 11	26 - 0	24 - 3
SP02	9:12	2n	4	4 - 6	4 - 1	3 - 9	3 - 4	5 - 7	5 - 0	4 - 7	4 - 4	6 - 4	5 - 8	5 - 3	4 - 11
SP02	9:12	2n	6	7 - 8	6 - 10	6 - 2	5 - 5	9 - 4	8 - 4	7 - 10	7 - 2	10 - 7	9 - 6	8 - 10	8 - 2
SP02	9:12	2n	8	10 - 6	9 - 2	8 - 3	7 - 3	12 - 9	11 - 5	10 - 8	9 - 9	14 - 5	13 - 0	12 - 2	11 - 1
SP02	9:12	2n	10	13 - 6	11 - 4	10 - 2	8 - 10	16 - 10	15 - 1	13 - 10	12 - 2	19 - 0	17 - 1	15 - 11	14 - 8
SP02	9:12	2n	12	16 - 5	13 - 10	12 - 5	10 - 10	20 - 11	18 - 9	16 - 11	14 - 8	23 - 10	21 - 4	19 - 11	18 - 4
SP02	9:12	2n	14	18 - 3	15 - 4	13 - 9	12 - 1	25 - 0	20 - 10	18 - 9	16 - 4	26 - 0	25 - 7	24 - 0	21 - 3
SP02	10:12	1	4	5 - 1	4 - 7	4 - 4	4 - 0	6 - 1	5 - 6	5 - 2	4 - 9	6 - 11	6 - 2	5 - 9	5 - 4
SP02	10:12	1	6	8 - 5	7 - 7	7 - 0	6 - 2	10 - 3	9 - 2	8 - 7	7 - 10	11 - 9	10 - 5	9 - 9	8 - 11
SP02	10:12	1	8	11 - 8	10 - 4	9 - 7	8 - 4	14 - 4	12 - 10	11 - 11	10 - 10	16 - 6	14 - 8	13 - 7	12 - 6
SP02	10:12	1	10	15 - 9	13 - 8	12 - 2	10 - 4	19 - 1	17 - 4	16 - 0	14 - 7	21 - 4	19 - 5	18 - 3	16 - 10
SP02	10:12	1	12	19 - 7	17 - 4	15 - 1	13 - 0	23 - 3	21 - 1	19 - 10	18 - 3	26 - 0	23 - 7	22 - 2	20 - 7
SP02	10:12	1	14	21 - 10	18 - 11	17 - 3	14 - 7	26 - 0	24 - 5	22 - 4	19 - 11	26 - 0	26 - 0	26 - 0	24 - 3
SP02	10:12	2n	4	4 - 6	4 - 1	3 - 9	3 - 4	5 - 7	5 - 0	4 - 7	4 - 4	6 - 4	5 - 8	5 - 3	4 - 11
SP02	10:12	2n	6	7 - 8	6 - 10	6 - 2	5 - 5	9 - 4	8 - 4	7 - 10	7 - 2	10 - 7	9 - 6	8 - 10	8 - 2
SP02	10:12	2n	8	10 - 6	9 - 2	8 - 3	7 - 3	12 - 9	11 - 5	10 - 8	9 - 9	14 - 5	13 - 0	12 - 2	11 - 1
SP02	10:12	2n	10	13 - 6	11 - 4	10 - 2	8 - 10	16 - 10	15 - 1	13 - 10	12 - 2	19 - 0	17 - 1	15 - 11	14 - 8
SP02	10:12	2n	12	16 - 5	13 - 10	12 - 5	10 - 10	20 - 11	18 - 9	16 - 11	14 - 8	23 - 10	21 - 4	19 - 11	18 - 4
SP02	10:12	2n	14	18 - 3	15 - 4	13 - 9	12 - 1	25 - 0	20 - 10	18 - 9	16 - 4	26 - 0	25 - 7	24 - 0	21 - 3
SP02	11:12	1	4	5 - 1	4 - 7	4 - 4	4 - 0	6 - 1	5 - 6	5 - 2	4 - 9	6 - 11	6 - 2	5 - 9	5 - 4
SP02	11:12	1	6	8 - 5	7 - 7	7 - 0	6 - 2	10 - 3	9 - 2	8 - 7	7 - 10	11 - 9	10 - 5	9 - 9	8 - 11
SP02	11:12	1	8	11 - 8	10 - 4	9 - 7	8 - 4	14 - 4	12 - 10	11 - 11	10 - 10	16 - 6	14 - 8	13 - 7	12 - 6
SP02	11:12	1	10	15 - 9	13 - 8	12 - 2	10 - 4	19 - 1	17 - 4	16 - 0	14 - 7	21 - 4	19 - 5	18 - 3	16 - 10
SP02	11:12	1	12	19 - 7	17 - 4	15 - 1	13 - 0	23 - 3	21 - 1	19 - 10	18 - 3	26 - 0	23 - 7	22 - 2	20 - 7
SP02	11:12	1	14	21 - 10	18 - 11	17 - 3	14 - 7	26 - 0	24 - 5	22 - 4	19 - 11	26 - 0	26 - 0	26 - 0	24 - 3
SP02	11:12	2n	4	4 - 6	4 - 1	3 - 9	3 - 4	5 - 7	5 - 0	4 - 7	4 - 4	6 - 4	5 - 8	5 - 3	4 - 11
SP02	11:12	2n	6	7 - 8	6 - 10	6 - 2	5 - 5	9 - 4	8 - 4	7 - 10	7 - 2	10 - 7	9 - 6	8 - 10	8 - 2
SP02	11:12	2n	8	10 - 6	9 - 2	8 - 3	7 - 3	12 - 9	11 - 5	10 - 8	9 - 9	14 - 5	13 - 0	12 - 2	11 - 1
SP02	11:12	2n	10	13 - 6	11 - 4	10 - 2	8 - 10	16 - 10	15 - 1	13 - 10	12 - 2	19 - 0	17 - 1	15 - 11	14 - 8
SP02	11:12	2n	12	16 - 5	13 - 10	12 - 5	10 - 10	20 - 11	18 - 9	16 - 11	14 - 8	23 - 10	21 - 4	19 - 11	18 - 4
SP02	11:12	2n	14	18 - 3	15 - 4	13 - 9	12 - 1	25 - 0	20 - 10	18 - 9	16 - 4	26 - 0	25 - 7	24 - 0	21 - 3
SP02	12:12	1	4	5 - 1	4 - 7	4 - 4	4 - 0	6 - 1	5 - 6	5 - 2	4 - 9	6 - 11	6 - 2	5 - 9	5 - 4
SP02	12:12	1	6	8 - 5	7 - 7	7 - 0	6 - 2	10 - 3	9 - 2	8 - 7	7 - 10	11 - 9	10 - 5	9 - 9	8 - 11
SP02	12:12	1	8	11 - 8	10 - 4	9 - 7	8 - 4	14 - 4	12 - 10	11 - 11	10 - 10	16 - 6	14 - 8	13 - 7	12 - 6
SP02	12:12	1	10	15 - 9	13 - 8	12 - 2	10 - 4	19 - 1	17 - 4	16 - 0	14 - 7	21 - 4	19 - 5	18 - 3	16 - 10
SP02	12:12	1	12	19 - 7	17 - 4	15 - 1	13 - 0	23 - 3	21 - 1	19 - 10	18 - 3	26 - 0	23 - 7	22 - 2	20 - 7
SP02	12:12	1	14	21 - 10	18 - 11	17 - 3	14 - 7	26 - 0	24 - 5	22 - 4	19 - 11	26 - 0	26 - 0	26 - 0	24 - 3
SP02	12:12	2n	4	4 - 6	4 - 1	3 - 9	3 - 4	5 - 7	5 - 0	4 - 7	4 - 4	6 - 4	5 - 8	5 - 3	4 - 11
SP02	12:12	2n	6	7 - 8	6 - 10	6 - 2	5 - 5	9 - 4	8 - 4	7 - 10	7 - 2	10 - 7	9 - 6	8 - 10	8 - 2
SP02	12:12	2n	8	10 - 6	9 - 2	8 - 3	7 - 3	12 - 9	11 - 5	10 - 8	9 - 9	14 - 5	13 - 0	12 - 2	11 - 1
SP02	12:12	2n	10	13 - 6	11 - 4	10 - 2	8 - 10	16 - 10	15 - 1	13 - 10	12 - 2	19 - 0	17 - 1	15 - 11	14 - 8
SP02	12:12	2n	12	16 - 5	13 - 10	12 - 5	10 - 10	20 - 11	18 - 9	16 - 11	14 - 8	23 - 10	21 - 4	19 - 11	18 - 4
SP02	12:12	2n	14	18 - 3	15 - 4	13 - 9	12 - 1	25 - 0	20 - 10	18 - 9	16 - 4	26 - 0	25 - 7	24 - 0	21 - 3

DEPARTMENT OF PLANNING AND NATURAL RESOURCES

BY COMMISSIONER: DAWN L. HENRY

DRAWING TITLE: RAFTER DESIGN TABLE H-EXP. D, Kzt = 1.0

Note: Prior to construction contact U.S.V.I. Department of Planning and Natural Resources, Division of Permits for building requirements in the Virgin Islands. This information has been developed solely as guidance and is believed to meet the U.S.V.I. Building Code. All drawings must be separately approved by DPNR, Division of Permits upon submission of a building permit application.

Sheet Number:

A-45

Sheet Number 45 of 45

APPENDIX J: COVERED PROJECT (PR1)

Project Description and Eligibility

1.0 Project Scope

1.1.0 Virgin Islands Water and Power Authority Overview

The Virgin Islands Water and Power Authority ("WAPA", or the "Authority") is a rate-regulated municipal utility that provides electricity and potable water service to the U.S. Virgin Islands. WAPA is the sole utility-scale provider of electricity and potable water in the U.S. Virgin Islands.

- *Electricity*- WAPA owns and operates two power plants. The Estate Richmond Power Plant on St. Croix and the Randolph Harley Power Plant on St. Thomas. St. Thomas is electrically interconnected with St. John and Water Island (St. Thomas/St. John District) via subsea cables; however, St. Croix (St. Croix District) is not electrically interconnected with the St. Thomas/St. John District. Accordingly, the St. Thomas/St. John District and the St. Croix District operate as two separate electrical grids and offer no redundancy to either district. WAPA also owns and operates the electric transmission and distribution system that delivers electricity to customers.

- *Potable Water* - In addition to the production, transmission, and distribution of electricity, WAPA also produces potable water under a Water-as-a-Service contract with its partner Seven Seas Water via reverse osmosis with facilities on both St. Croix and St. Thomas. Under the Water-as-a-Service structure, WAPA does not own or operate the reverse osmosis plants, but rather makes monthly contractual payments to Seven Seas Water for its services. Water production on St. Thomas supplies St. John and Water Island by underwater pipeline. WAPA's electricity generation is critical to the production of water because the reverse osmosis plants cannot operate without the electricity that WAPA generates.

1.1.1 WAPA Service Area – Territory-wide

WAPA serves a community of approximately 100,000 people and has approximately 55,000 electric meters. Residential electric meters represent approximately 45,000 of the installed meters, or approximately 85% of total installed meters. The most recent U.S. Census identified that the typical household population in the Territory is comprised of 2.14 residents. While not a perfect one-for-one relationship, one residential meter is typically one household, accordingly, WAPA provides electricity to approximately 96,000 residents. Non-residential electric meters are comprised primarily of governmental and commercial customers. WAPA has approximately 15,000 water meters. Residential water meters represent approximately 12,000 of the installed meters, or approximately 80% of total installed meters. Applying the same U.S. Census information discussed above, WAPA provides potable water to approximately 26,000 residents. Non-residential water meters are comprised primarily of governmental and commercial customers. WAPA is the sole utility-scale provider of electricity and water to the Territory, so if WAPA is unable to generate electricity, the people of the Virgin Islands lose electricity service, and the production of drinking water would stop.

1.1.2 Service Territory at High Risk for Natural Disasters

The Territory has been impacted by 13 hurricanes in the past 35 years, or one storm less than every three years on average. Over 50% of the hurricanes that impacted the Territory over that period were rated higher than a Category 1 hurricane. Most recently back-to-back Category 5 hurricanes, Irma and Maria, impacted the Territory over a two-week span in September 2017. The devastation from Irma and Maria was catastrophic for the Territory, and the probability of a major hurricane impacting the Territory at some time in the future is high.

The Territory also experiences seismic activity, and seismic activity can also trigger tsunamis. The Authority's power plants are at sea level and could suffer damage from either seismic activity, tsunamis, or both.

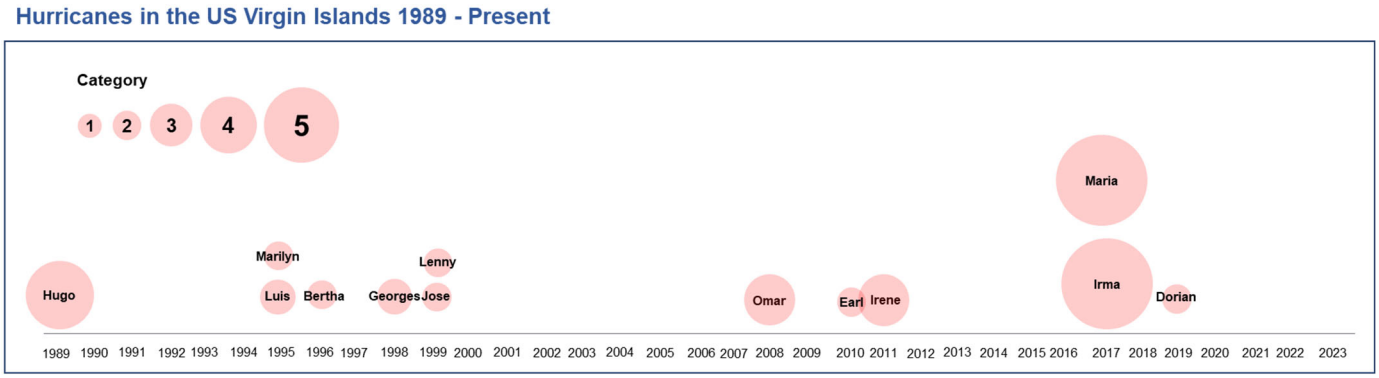


Figure 55- Historical Data - Hurricanes that Impacted Territory

1.1.3 Overview of Power Generation Assets

St. Thomas/St. John District

The Randolph Harley Power Plant is located on Krum Bay on the south side of the island. It has three gas turbine generators, Unit 15 which can operate on propane or diesel, and Units 23 & 27 which can currently operate only on diesel. The conversion of Unit 27, which currently only operates on diesel, to enable propane operations is underway. The Randolph Harley Power Plant also has three reciprocating internal combustion engines, or RICE engines, (the "Wartsilas") that can only operate on propane. In its current optimal operating state for the St. Thomas/St. John district WAPA dispatches the three Wartsilas burning propane, Unit 15 burning propane, and Unit 27 burning diesel. WAPA's current fuel mix in its optimal operating state at the Randolph Harley Power plant is approximately 70% propane and 30% diesel. WAPA's current optimal operating configuration for St. Thomas is shown below. Note that throughout this document the term "diesel" is used to refer to No. 2 Oil and/or light fuel oil interchangeably.

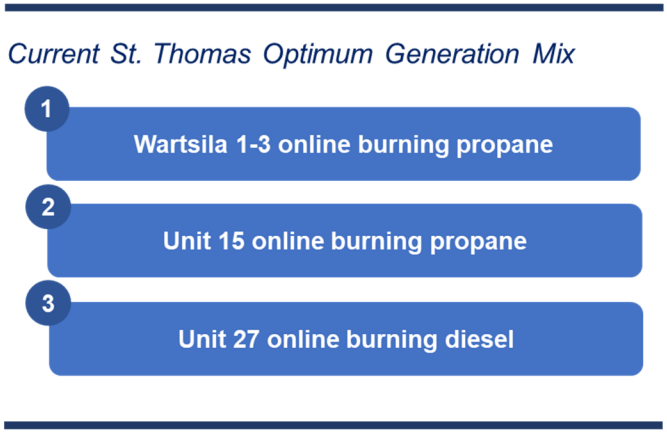


Figure 56 - Impact of New Generation to Operations- St. Thomas

1.1.4 New Generation Changing the Optimal Operating State and Fuel Mix on St. Thomas

A critical project is nearing completion at the Randolph Harley Power Plant. WAPA received a CDBG-DR HUD grant for $84.2 million to install new efficient, reliable generation at the plant. Four additional RICE engines (the "new Wartsilas") are being installed along with a Battery Energy Storage System (BESS). The new Wartsilas can operate on either propane or diesel and were first fired on June 16, 2023, commencing with Wartsila 5. Commissioning of Wartsila 4, 6, and 7 subsequently followed. Wartsila 4-7 are expected to be fully in service on diesel, with in service on propane following shortly thereafter. Wartsila 4-7 will operate on propane as their primary fuel. Please note that although Wartsila 4-7 operate on propane as their primary fuel, the generators require approximately a 5% blend of diesel to optimize combustion. For purposes of discussion in this document, Wartsila 4-7 are referred to as operating on propane, but they will require a small quantity of diesel for efficient combustion. With the new Wartsilas in operation, the optimal operating state at the Randolph Harley Power Plant will change. In its optimal operating state, WAPA will dispatch the existing three Wartsila RICE engines burning propane and the four new Wartsila RICE engines burning propane, so St. Thomas will operate 100% on propane. Figure 56 depicts this future optimum operating configuration reflecting Wartsila 1-3 and Wartsila 4-7 online all burning propane. During WAPA's heaviest periods of demand for electricity, WAPA will likely need to discharge its battery energy storage system, or start an additional generator (operating on propane) for a brief period; however, this does not represent a significant number of hours during the year.

.

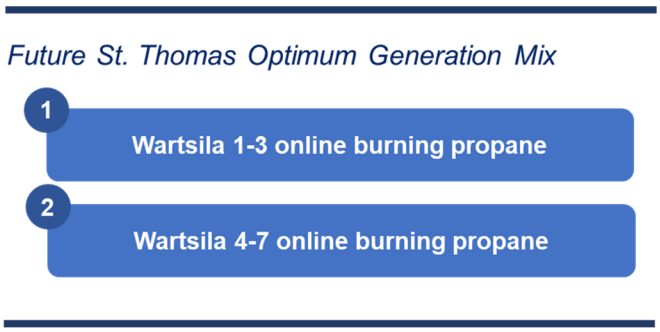


Figure 57 - Impact of Future Generation Mix

The new Wartsila generators that are slated to be in service in the near-term and the $84.2 million CDBG-DR grant funding will have to be taken out of service and therefore become stranded assets without access to propane. The generators are dual fuel and can operate on either propane or diesel; however, the environmental controls that allow the new generators to operate in compliance with U.S. Environmental Protection Agency limits require propane to operate. Without the Propane Supply Infrastructure and access to the propane it provides, operating the new generators would violate emissions limits. Accordingly, WAPA would not be able to operate the new Wartsilas until WAPA could secure a new source of propane to operate the required environmental controls on the generators.

The roster of current and future generation on St. Thomas is shown below along with the contribution from each generator to 2022 electricity generation. As can be seen in the two-pie chart, WAPA's current preferred generation mix as well as its future preferred generation mix, with Wartsila 4-7 in service, favors generators that can burn propane. Note that the current optimal fuel mix for St. Thomas was described as 70% propane and 30% diesel; however as can be seen in the pie chart showing 2022 generation mix, the actual fuel mix was closer to 60% propane and 40% diesel. That is due to operational outages, which result in WAPA not always operating with its optimal generation mix; and therefore, burning more diesel than it would burn when operating in its optimal operating state.

St. Thomas Generation Fleet - Current

Generator	Age	Type	Manufacturer	Capacity (Megawatts)	Fuel Type
Unit 15	43 years	Gas Turbine	GE	21 MW	Propane / Diesel
Unit 23	19 years	Gas Turbine	GE	36 MW	Diesel
Unit 27	11 years	Gas Turbine	GE	24 MW	Diesel
Wartsila 1-3	4 years	Reciprocating Engine	Wartsila	21 MW	Propane
			Total	**102 MW**	

Figure 58- Fleet Generation St. Thomas/St. John District- Current

St. Thomas Generation Fleet - Future

Generator	Age	Type	Manufacturer	Capacity (Megawatts)	Fuel Type
Unit 15	43 years	Gas Turbine	GE	21 MW	Propane / Diesel
Unit 23	19 years	Gas Turbine	GE	36 MW	Diesel
Unit 27	11 years	Gas Turbine	GE	24 MW	Diesel
Wartsila 1-3	4 years	Reciprocating Engine	Wartsila	21 MW	Propane
Wartsila 4-7	0 years	Reciprocating Engine	Wartsila	36 MW	Propane / Diesel
			Total	**138 MW**	

Figure 59- Fleet Generation St. Thomas/St. John District- Future

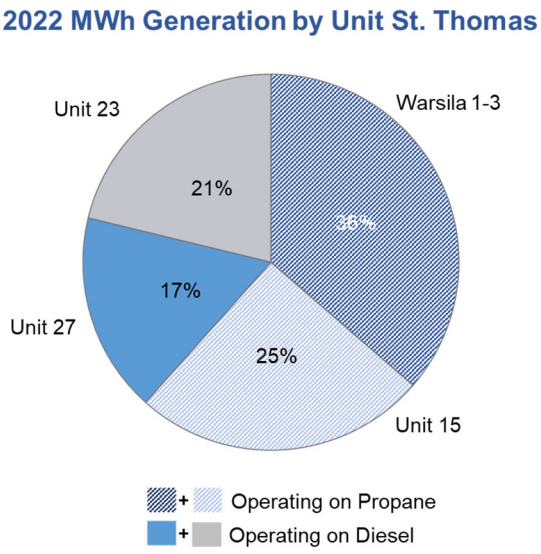


Figure 60 - St. Thomas/St. John 2022 Generation

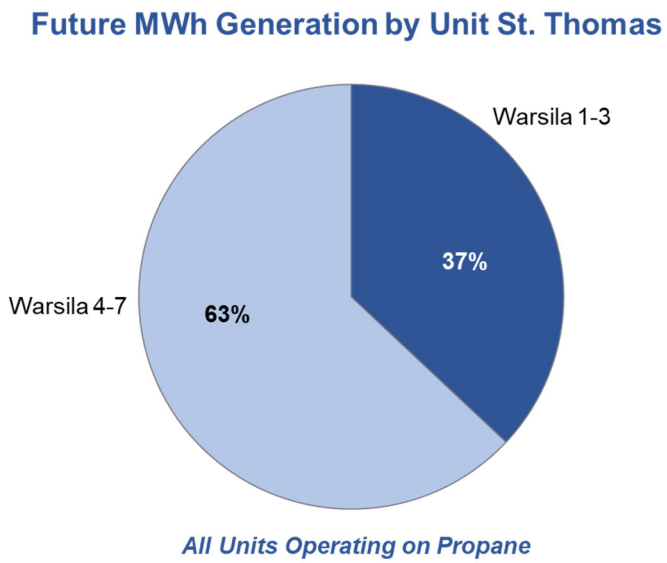


Figure 61 - St. Thomas/St. John Generation - Future

St. Croix District

The Estate Richmond Power Plant is located west of Christiansted Harbor on the north shore of the island. It has three gas turbine generators that can operate on either propane or diesel as well as 18 reciprocating engines, or RICE engines, (the "Aggrekos") that can only operate on propane. In its optimal operating state for St. Croix WAPA dispatches the Aggreko engines and Unit 20 or Unit 17, all operating on propane. Unit 20 and Unit 17 are identical GE Frame 5 turbines, and are dispatched interchangeably by WAPA This results in St. Croix operating 100% on propane. WAPA's current optimal operating configuration for St. Croix is shown below.

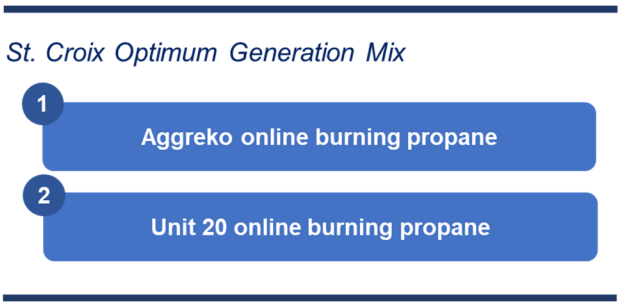


Figure 62 St. Croix District Generation - Optimum

The roster of generation on St. Croix is shown below along with the contribution from each generator to 2022 electricity generation. As can be seen in the pie chart, WAPA's preferred generation mix favors generators that can burn propane.

St. Croix

Generator	Age	Type	Manufacturer	Capacity (Megawatts)	Fuel Type
Unit 17	35 years	Gas Turbine	GE	20 MW	Propane / Diesel
Unit 19	29 years	Gas Turbine	GE	19 MW	Diesel
Unit 20	29 years	Gas Turbine	GE	22 MW	Propane / Diesel
Aggrekos[1]	5 years	Reciprocating Engine	GE - Jenbacher	20 MW	Propane
			Total	**81 MW**	

Figure 63 - St. Croix District Generation Matrix

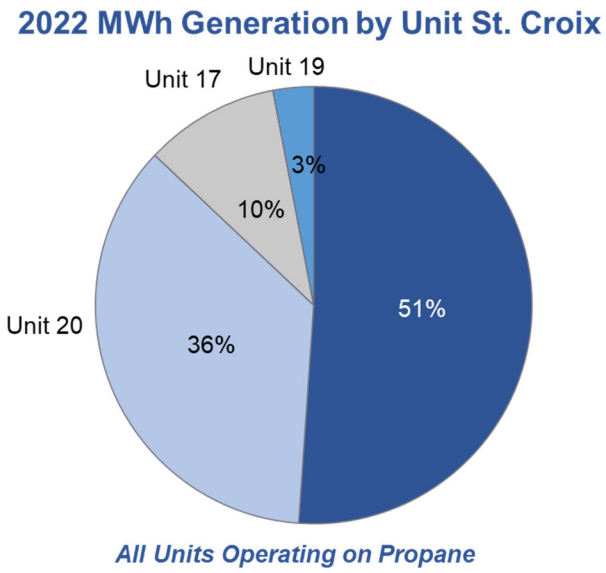


Figure 64 - St. Croix Generation by Unit

1.1.5 Overview of Reverse Osmosis Water Production Assets

WAPA is the sole source of utility-scale drinking water in the Territory, and WAPA generates the electricity required by the reverse osmosis plants operated by Seven Seas Water which produce drinking water. The reverse osmosis plants also include secondary treatment that produces Ultrapure Water. Ultrapure water is used by WAPA's generators to cool the generators while in operation and Ultrapure Water is injected into the generator's combustion to reduce the generator's emissions of Nitrous Oxide (NOx). WAPA can only operate its generators for 5-7 days with Ultrapure Water on hand before it requires resupply. Accordingly, WAPA's power generating assets and the reverse osmosis plants should be considered hand-in-hand as one cannot function without the other and vice versa.

St. Thomas

The St. Thomas reverse osmosis system is comprised of two seawater intake lines that feed a permanently installed reverses osmosis plant, containerized mobile water production skids, and the secondary treatment that produces Ultrapure Water. The facility produces a maximum of 3.3 million gallons of potable water per day, which is approximately 90% of daily water consumption during the peak-usage dry season, and approximately 60% of daily water consumption during the wet season. The facility has the capacity to produce 500,000 gallons of Ultrapure Water per day.

St. Croix

The St. Croix reverse osmosis system is comprised of two seawater intake lines that feed a permanently installed reverses osmosis plant. The plant also included the secondary treatment that produces Ultrapure Water. The facility produces a maximum of 3.7 million gallons of potable water per day, which is approximately 70% of daily water consumption during the peak-usage dry season, and approximately 55% of daily water consumption during the wet season. The facility has the capacity to produce 250,000 gallons of Ultrapure Water per day.

1.1.6 Propane Supply Infrastructure Overview

A component-by-component discussion of the Propane Supply Infrastructure is presented later; but in summary, the Propane Supply Infrastructure exists to receive Liquified Petroleum Gas (LPG), from a ship, store it, convert it to gaseous propane, and deliver gaseous propane to WAPA's generators. The components of the Propane Supply Infrastructure are illustrated in the graphic below. There are two propane facilities, one on St. Thomas and another on St. Croix. The infrastructure is largely identical on each island with the most notable exception being that St. Thomas has ten LPG bullet tanks while St. Croix only has eight. The proposed acquisition will facilitate the transfer of both facilities thus benefiting both the St. Thomas/St. John district and the St. Croix district.

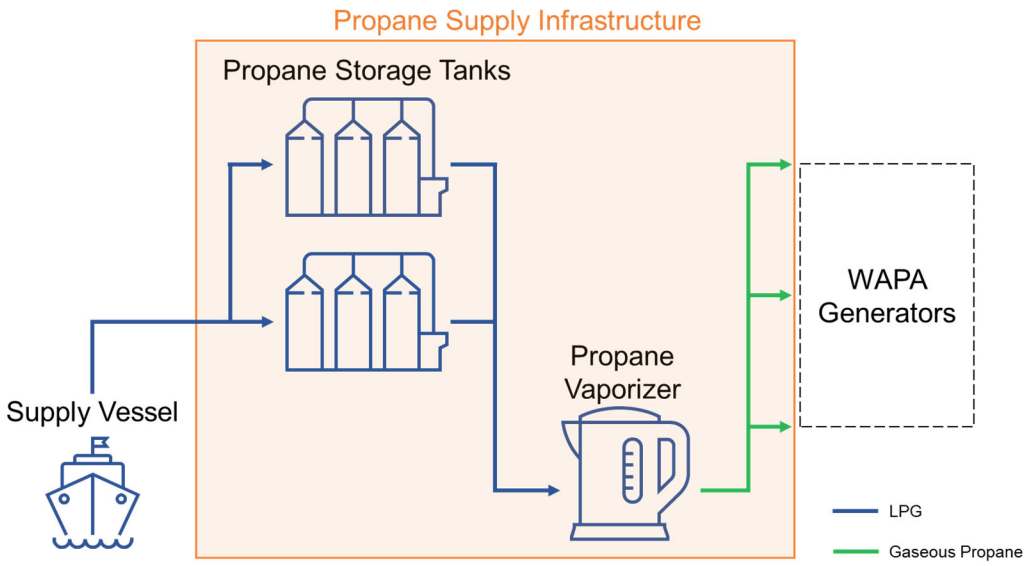


Figure 65 - Supply Diagram

1.2 Activity Benefits

1.2.0 Owning the Propane Supply Infrastructure Mitigates Significant Risk

The supply of propane is critical for WAPA to generate electricity and produce potable water. Without propane supply, WAPA cannot operate the Aggrekos on St. Croix or the Wartsilas currently in service on St. Thomas. Without the Aggrekos or the Wartsilas online, WAPA must operate generators that can only burn diesel. Given the high cost of diesel versus propane and the poorer efficiency of WAPA's diesel generation versus its propane generation, WAPA's cost of making electricity increases significantly. It must also rely on older, less reliable generators to make electricity, which causes its reliability to suffer resulting in service interruptions to customers. WAPA's environmental profile also gets worse because propane is a cleaner fuel than diesel and its older, less efficient generation burns more fuel than its new, efficient generation.

1.2.1 Owning the Propane Supply Infrastructure Supports FEMA Community Lifelines

The US Department of Homeland Security's Federal Emergency Management Agency (FEMA) utilizes a Community Lifelines framework to identify fundamental services in the community that must be stabilized following a disaster to enable all other aspects of society to function. Energy, Fuel, and Electric Grid is a specific Community Lifeline identified by FEMA. Additionally, other FEMA Community Lifelines depend on the Energy, Fuel, and Electric Grid Community Lifeline being in place. Community Lifelines that depend on the Energy, Fuel, and Electric Grid Community Lifeline include Food, Water, and Shelter (WAPA makes potable water for the Territory and the Authority requires electricity to make potable water), Health and Medical, Communications, and Transportation, all of which need electricity to function.

Ownership of the Propane Supply Infrastructure mitigates several risks that WAPA would face in the event of a natural disaster that could limit or completely impair its ability to make electricity and drinking water and maintain the Energy, Fuel, and Electric Grid Community Lifeline.

In addition to supporting Community Lifelines, ownership of the propane infrastructure is also critical to the community of the Virgin Islands for additional key reasons:

- **Maintain Lower Fuel Costs** -The Authority currently has access to the Propane Supply Infrastructure but does not own it, and the Authority has lost access to the Propane Supply Infrastructure on more than one occasion in the past. The Authority's fuel costs spike sharply if it cannot use the Propane Supply Infrastructure. Without the Propane Supply Infrastructure, the Authority's only option is to operate on diesel and diesel is significantly more expensive than propane – currently 1.7x more expensive on an energy equivalent basis (diesel is more "energy dense" than propane, so the different in energy content between diesel and propane must be taken into account when comparing the cost of operating on the two fuels). Accordingly, ownership of the Propane Supply Infrastructure ensures that the Authority can continue to operate on propane. A comparison of WAPA's projected fuel-only cost of generating electricity while operating 100% on propane versus 100% on diesel is shown below (based on delivered commodity costs as of May 12, 2023). WAPA's total Residential rate (Base Rate plus Fuel) operating 100% on propane versus 100% on diesel is also shown below.

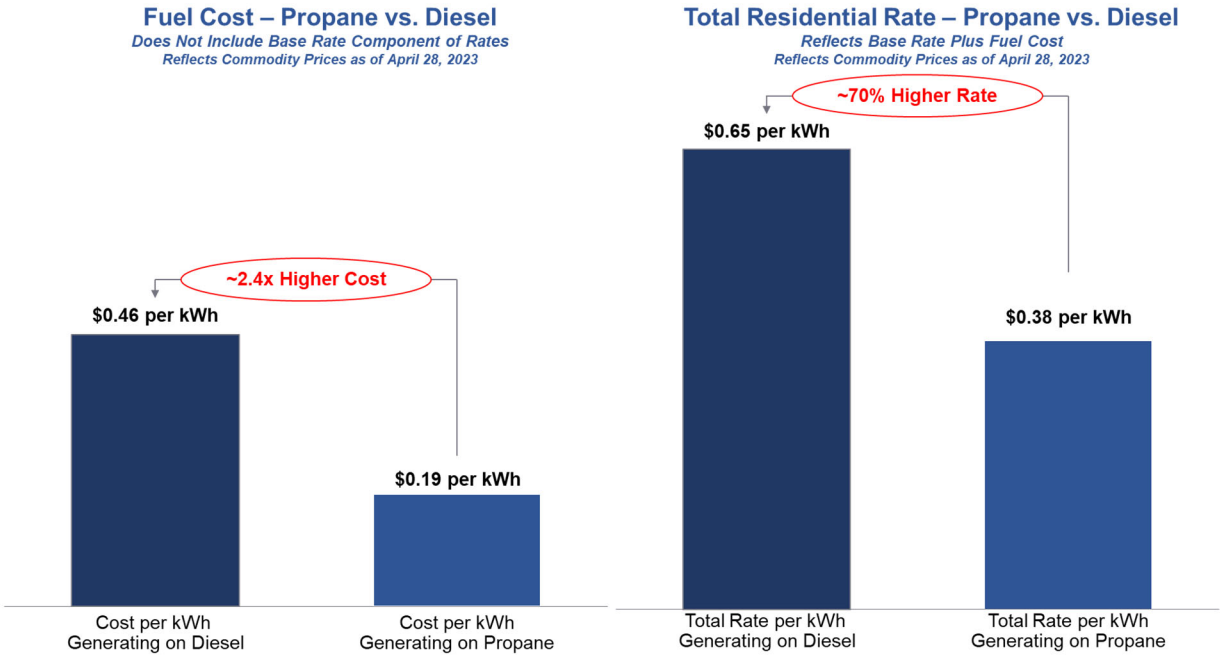


Figure 66 - Rate Structure Variance between Diesel and Propane

The chart shown above illustrates that WAPA's cost to generate electricity by burning diesel is 2.4x higher that by burning propane. As noted in the narrative above, the cost of diesel is 1.7x more expensive than propane on an energy equivalent basis. The impact to WAPA's cost is greater than 1.7x because WAPA's diesel generators are less efficient and therefore require not only more expensive fuel, but also required a greater quantity of fuel.

The fuel efficiency of a vehicle is expressed in miles per gallon. As efficiency and miles per gallon increase, the fuel required to travel a given number of miles decreases.

Miles per Gallon	Efficiency	Gallons per Mile	Efficiency
45		0.022	
35		0.029	
25		0.040	
15		0.067	

Figure 67 - Efficiency Rate - Mileage per Gallon

The efficiency of a generator is expressed in terms of a measure of heat content - British Thermal Units (btu) - consumed to make one kilowatt hour (kWh) of electricity, so the rate is expressed as btu/kWh. This metric is referred to as a generator's heat rate and represents how much energy is needed to make a kWh of electricity. Larger values reflect poorer efficiency. The higher the btu/kWh value, the more energy is required to make one

kWh of electricity. A generator's heat rate is similar to the gallons per mile calculation for a vehicle shown above (higher values are worse). The heat rates for St. Thomas, St. Croix, and Territory-Wide operating on 100% propane versus operating 100% on diesel are shown below. Note that St. Thomas is shown pro forma for Wartsila 4-7 being in service burning propane.

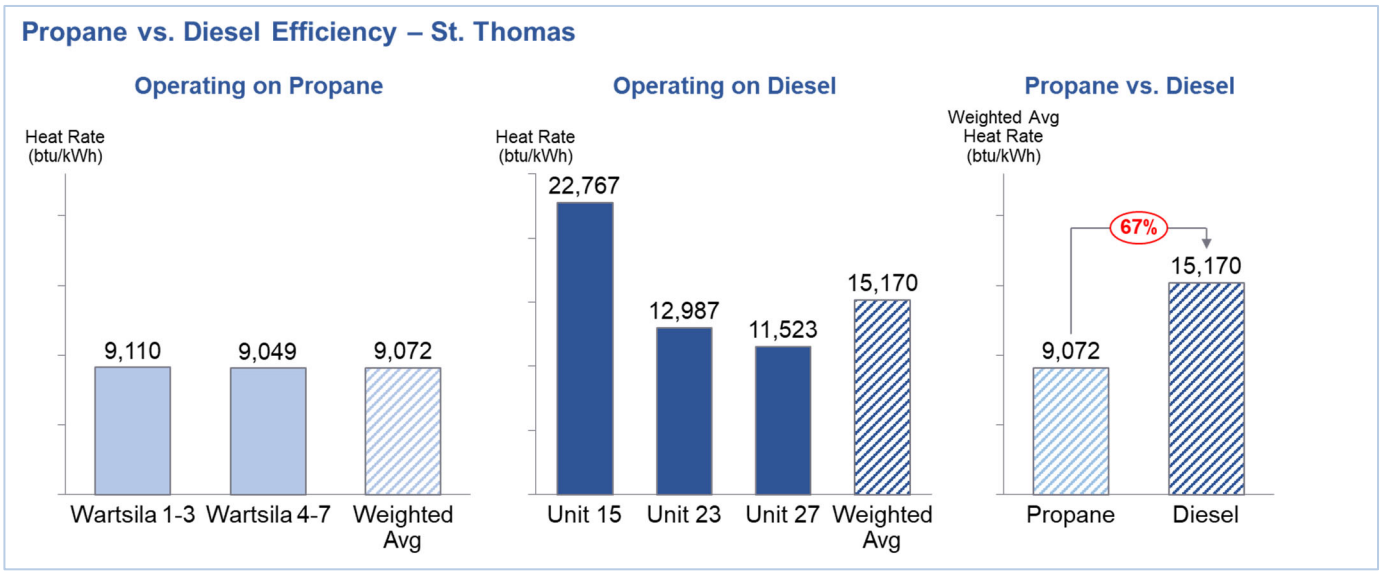


Figure 68 Comparison of Propane to Diesel Efficiency STT/STJ District

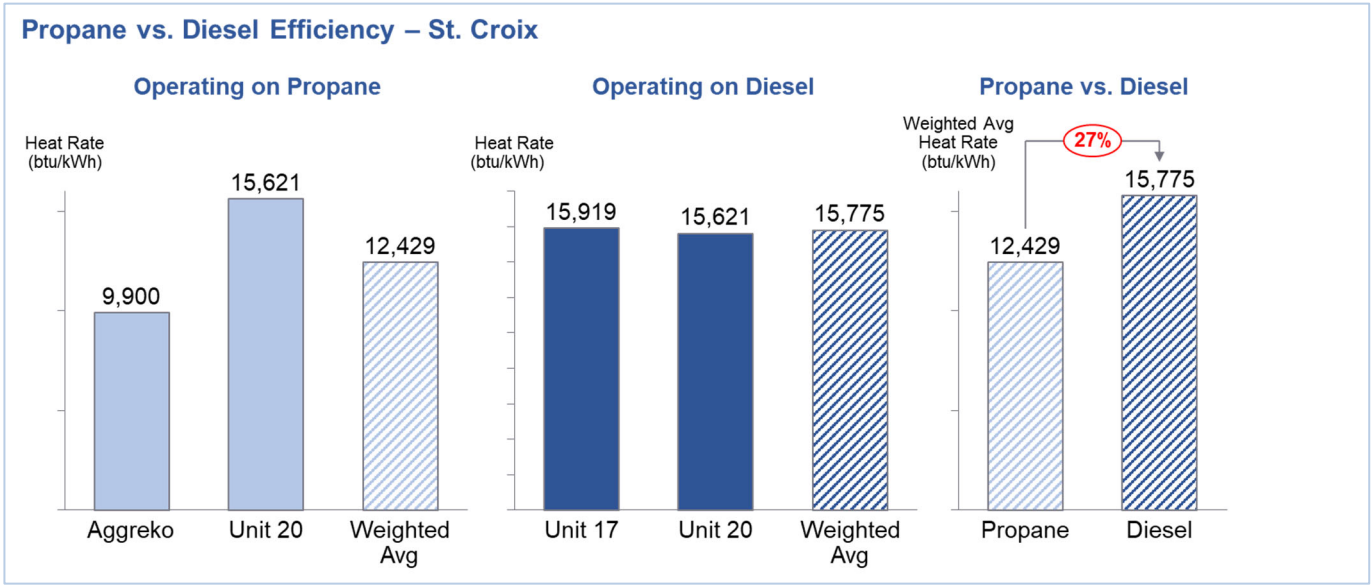


Figure 69 Comparison of Propane to Diesel Efficiency STX District

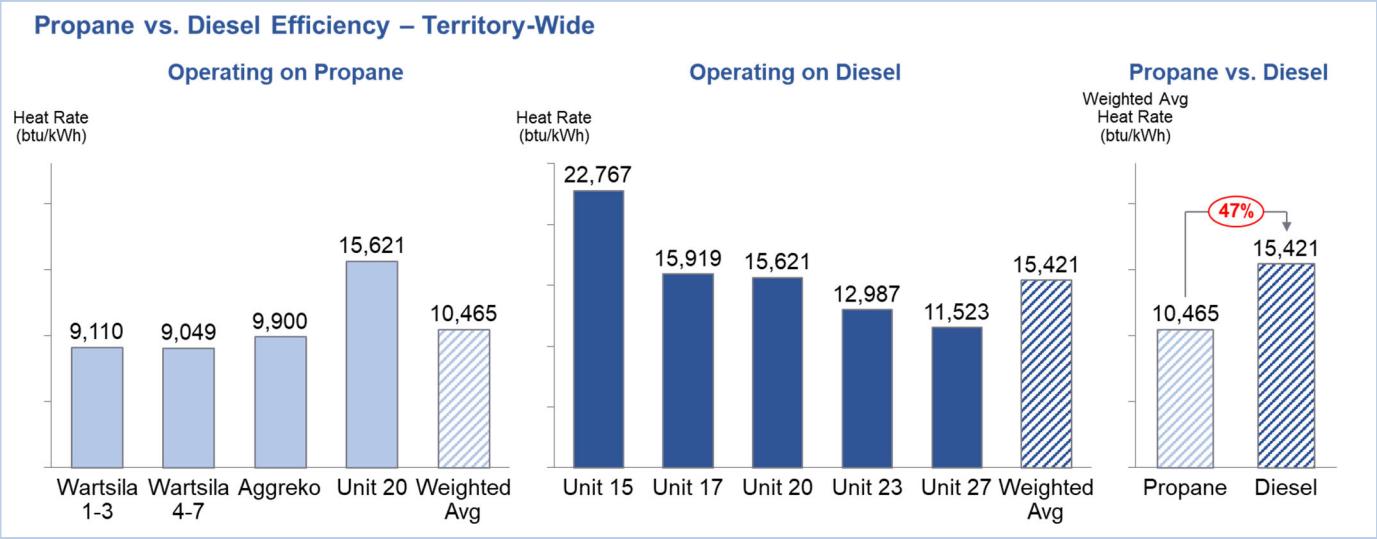


Figure 70 Propane to Diesel Efficiency - Territory Wide

The projected cost of generating electricity on propane versus diesel was shown above; however, to further illustrate the higher cost of operating on diesel in lieu of propane, an additional backward-looking analysis is presented below. WAPA was forced to operate on close to 100% diesel in December 2022 when it lost access to the Propane Supply Infrastructure, and WAPA operated as close as possible to its optimal fuel mix earlier in the year (WAPA's fuel mix can vary from month-to-month depending on the operational performance of its generating fleet, as generator outages can cause WAPA to burn more diesel that it otherwise would choose to). The average delivered price of propane and diesel from December 2022 were held constant to eliminate the impact of commodity price variability and back-cast using WAPA's actual kWh production by fuel type for 2022. WAPA's fuel mix by month is shown below.

Note that this analysis holds December 2022 commodity prices constant across all of 2022 to remove the impact of variability in commodity prices and isolate the impact of the different mix of propane and diesel; however, the actual price of propane and diesel was significantly higher earlier in the year. Accordingly, the cost of generation shown below does reflect the actual cost of WAPA's generation earlier in the year.

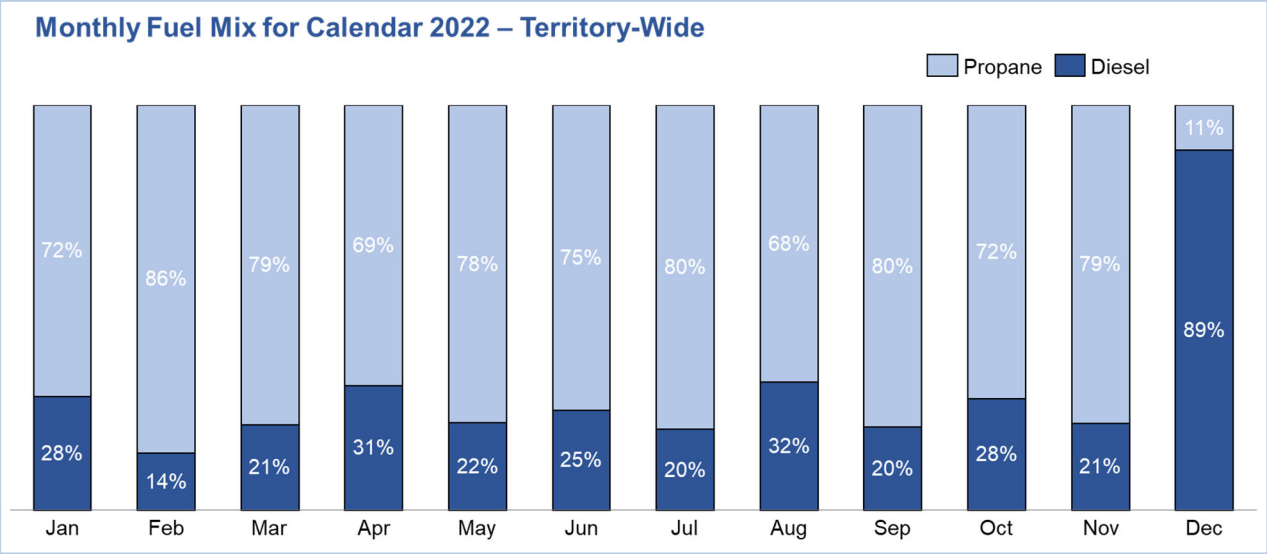


Figure 71 Monthly Fuel Mix 2022 Territory Wide

WAPA's cost of generating electricity by month based on the methodology described above is shown below.

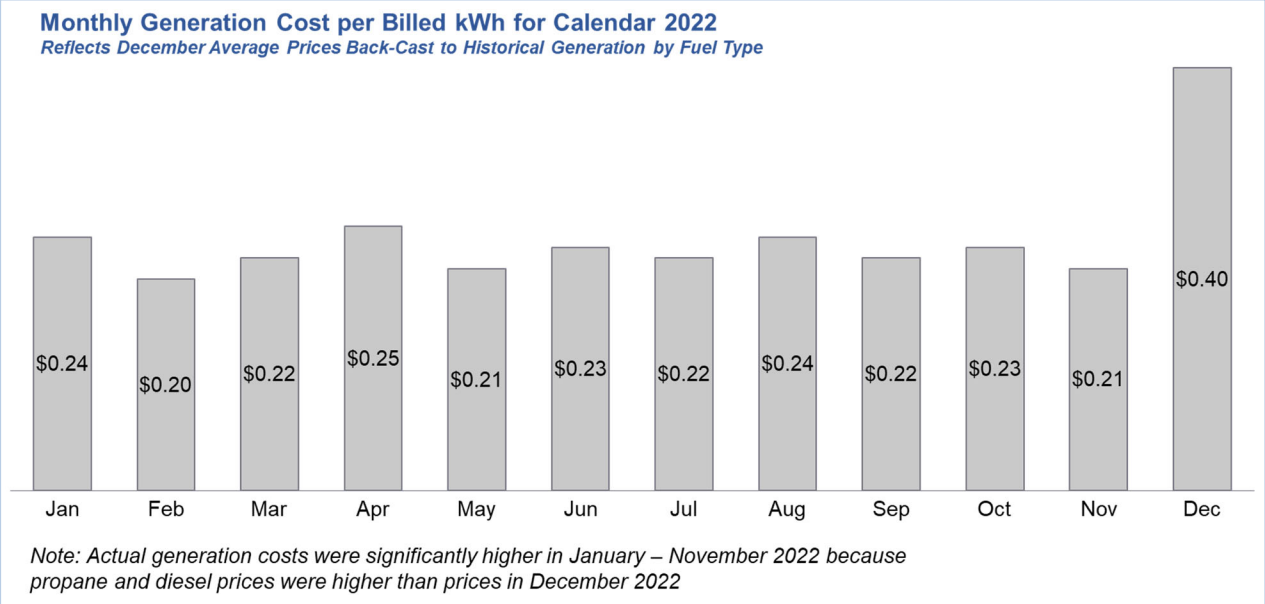


Figure 72 2022 Cost Billed Per kWh

The two calculations are combined in the chart below. The relationship between fuel mix (left y-axis), and the cost of generation (right y-axis), is clear.

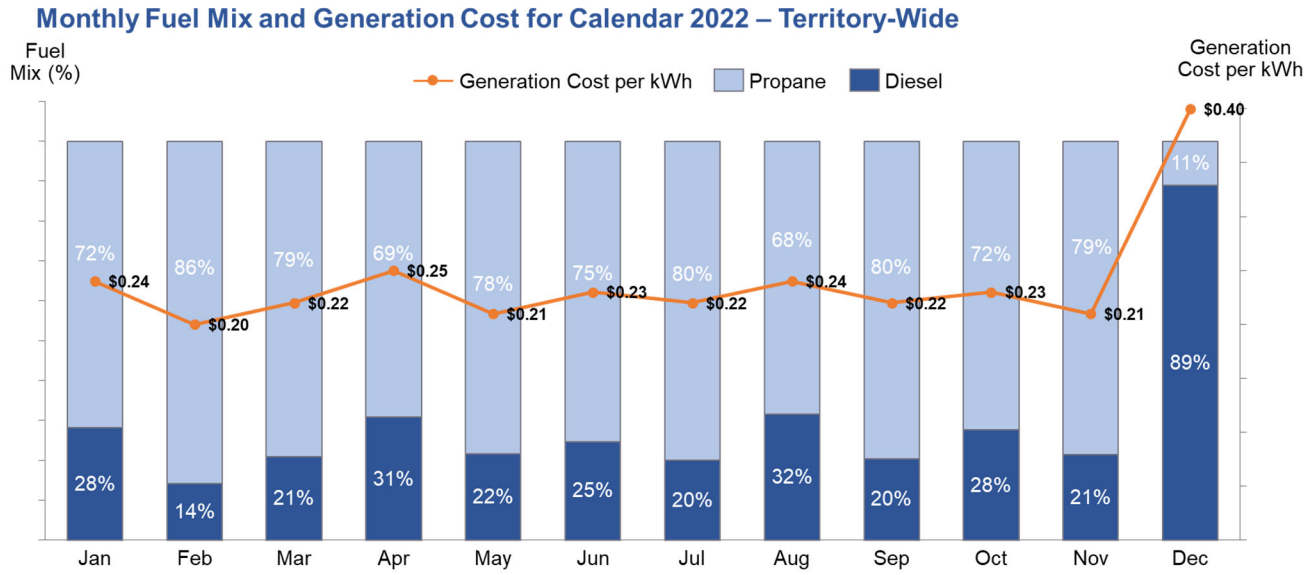


Figure 73 - Cost per Generation Fuel Mix

Obtain Lower Propane Transportation Costs – The fuel supply contract associated with the Propane Supply Infrastructure is above-market based on initial competitive market supply indications. Ownership of the Propane Supply Infrastructure will enable WAPA to secure propane transportation service at a competitive market rate. Savings from lower propane transportation cost are not reflected in the comparative rate analysis for diesel versus propane operations shown above. The transportation cost for shipping propane to the Territory is part of the fuel charge that WAPA collects from its customers in rates, and all else being equal customer rates would therefore be lower. Savings from securing competitive market rate propane transportation cannot be achieved without ownership of the Propane Supply Infrastructure. The figure shown below reflects illustrative annual savings for sourcing competitive propane supply at a range of lower transportation costs versus the transportation cost that WAPA currently pays. The timing of realization of these savings depends on when the acquisition of the Propane Supply Infrastructure closes. Note that the costs shown below reflect transportation costs per gallon and are independent of the commodity price of propane.

Propane Transportation *$ per Gallon*	Cost Reduction *$ per Gallon*	Cost Reduction *$ per year*	Cost Reduction *$ per kWh*
$0.38	$(0.02)		
$0.36	$(0.04)	~$1,800,000	$0.003
$0.34	$(0.06)	~$3,600,000	$0.006
$0.32	$(0.08)	~$5,400,000	$0.009
$0.30		~$7,200,000	$0.012

Figure 74 - Relative Costs for Propane Fuel

- **Fuel Redundancy** – Ownership of the Propane Supply Infrastructure allows WAPA to operate on propane or diesel (with its existing diesel supply infrastructure). Without the Propane Supply Infrastructure, the only fuel WAPA can burn to generate electricity is diesel. If the supply of diesel is interrupted or WAPA's diesel infrastructure is impaired or rendered unusable by a hurricane, earthquake, tornado, or other natural disaster, WAPA could be left unable to generate electricity, and by extension unable to make potable water. For example, steel diesel storage tanks are exposed to damage from high winds during a storm, whereas the propane storage is housed in mounds that are constructed of alternating layers of sand and soil, and ultimately encased in concrete bunkers. WAPA's steel diesel storage tanks and its water storage tanks both sustained damage during the 2017 Hurricanes. In fact, Tank #10 which was used to store diesel in the St. Thomas/St. John district was rendered unusable (the damaged diesel storage tank has been subsequently demolished).

Figure 75 - Image of St. Thomas/St. John Propane Storage

Photograph of mounded propane storage bunker with steel tanks installed under multiple layers of sand and soil and encased in concrete bunkers at the Randolph Harley Power Plant on St. Thomas; facility on St. Croix is similar.

- **Fuel Security** – Ownership of the Propane Supply Infrastructure increases the amount of fuel inventory WAPA can hold, and thus be able to have sufficient fuel to operate its generators. Without the Propane Supply Infrastructure, WAPA's diesel in storage would allow it to operate for 35 days without fuel resupply on St. Thomas and 26 days on St. Croix. With propane infrastructure in addition to diesel storage, St. Thomas can operate without fuel supply for 62 days and St. Croix can operate for 44 days. The additional storage mitigates the risk of WAPA not being able to receive marine shipments of fuel, for example, if the channel to its fuel docks is blocked or its fuel docks are damaged in a natural disaster. Note that the days of storage for St. Thomas is shown pro forma with the new Wartsilas in service.

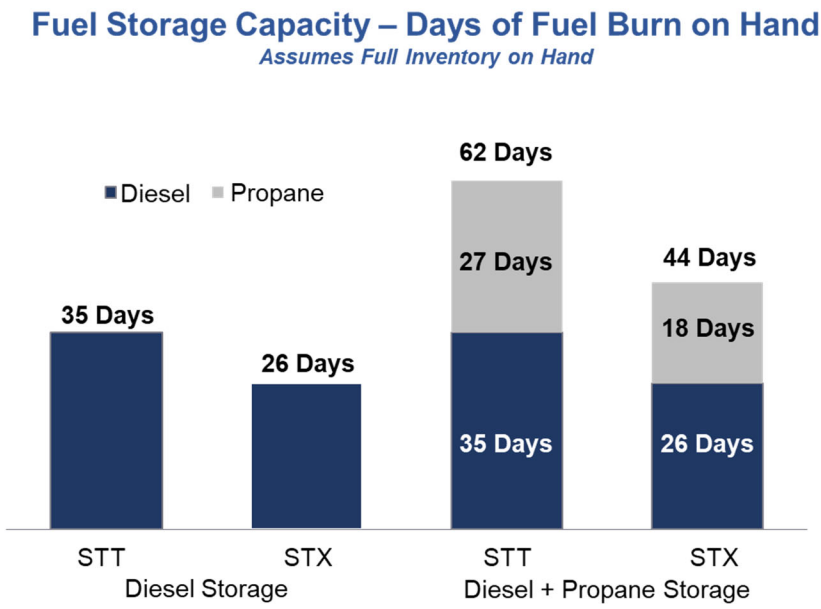


Figure 76 - Fuel Capacity/Storage per District

- **Drinking Water Security** – Ownership of the Propane Supply Infrastructure bolsters the Authority's fuel security as result of several of the benefits of the ownership discussed above. The Authority cannot make potable water without electricity, so improved fuel security also protects the Authority's ability to make drinking water.

- **Improved Reliability** – Ownership of the Propane Supply Infrastructure allows WAPA to take full advantage of its most reliable, modern generators. Without the Propane Supply Infrastructure, WAPA is forced to rely on older, less reliable generation. Relying on less reliable generation results in more frequent power outages for customers. This is especially impactful for the Territory's most vulnerable citizens who rely on home medical care that requires electricity to operate. The first graphic shown below illustrates the age of WAPA's various generators. The next two graphics presented below show

the relative age of generation that WAPA must rely upon to generate electricity when it has access to propane versus when it can only operate on diesel.

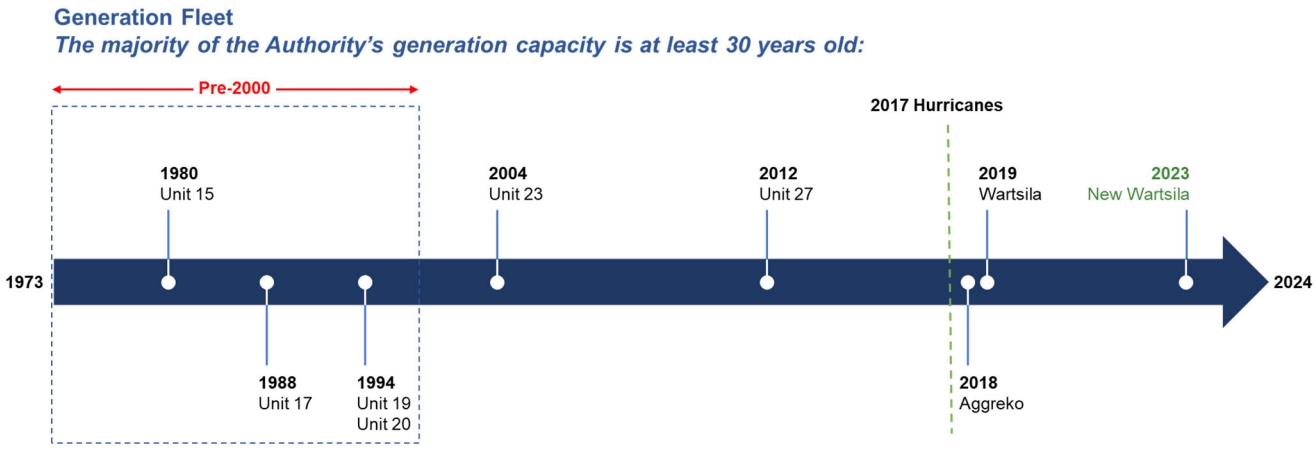


Figure 77 - Age of Generation Infrastructure

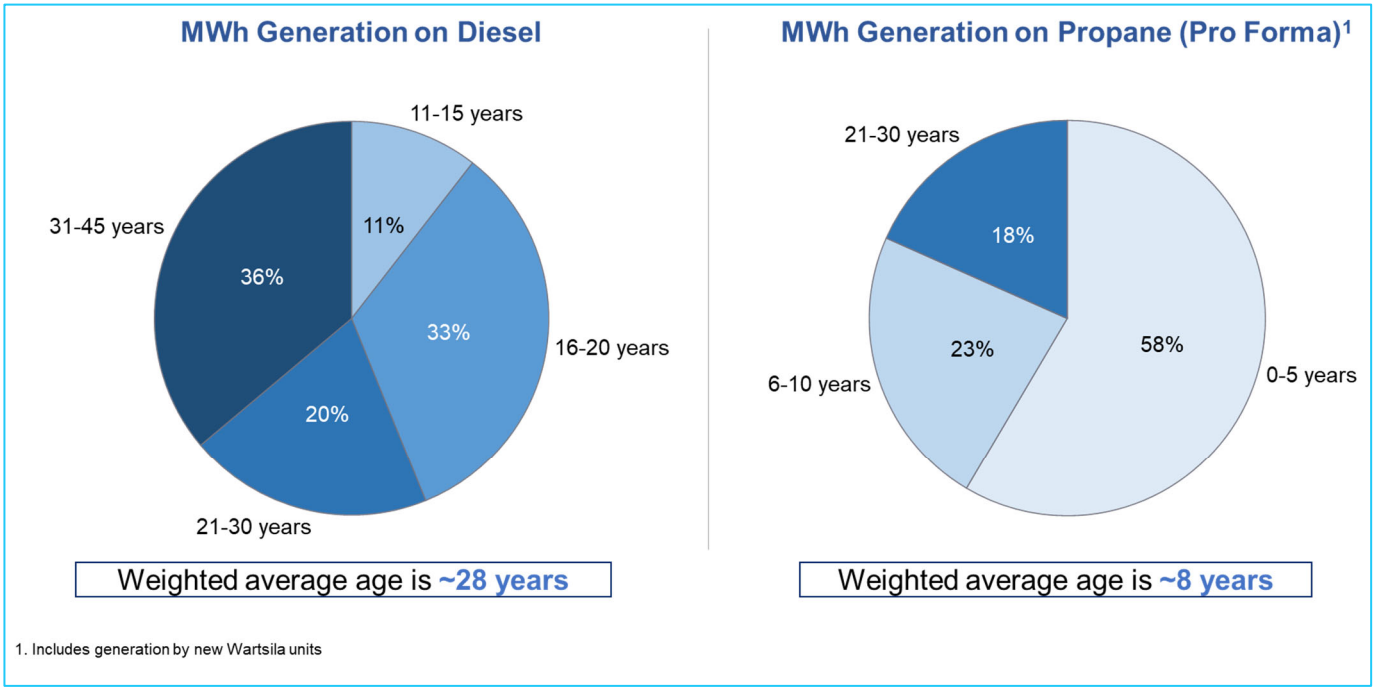
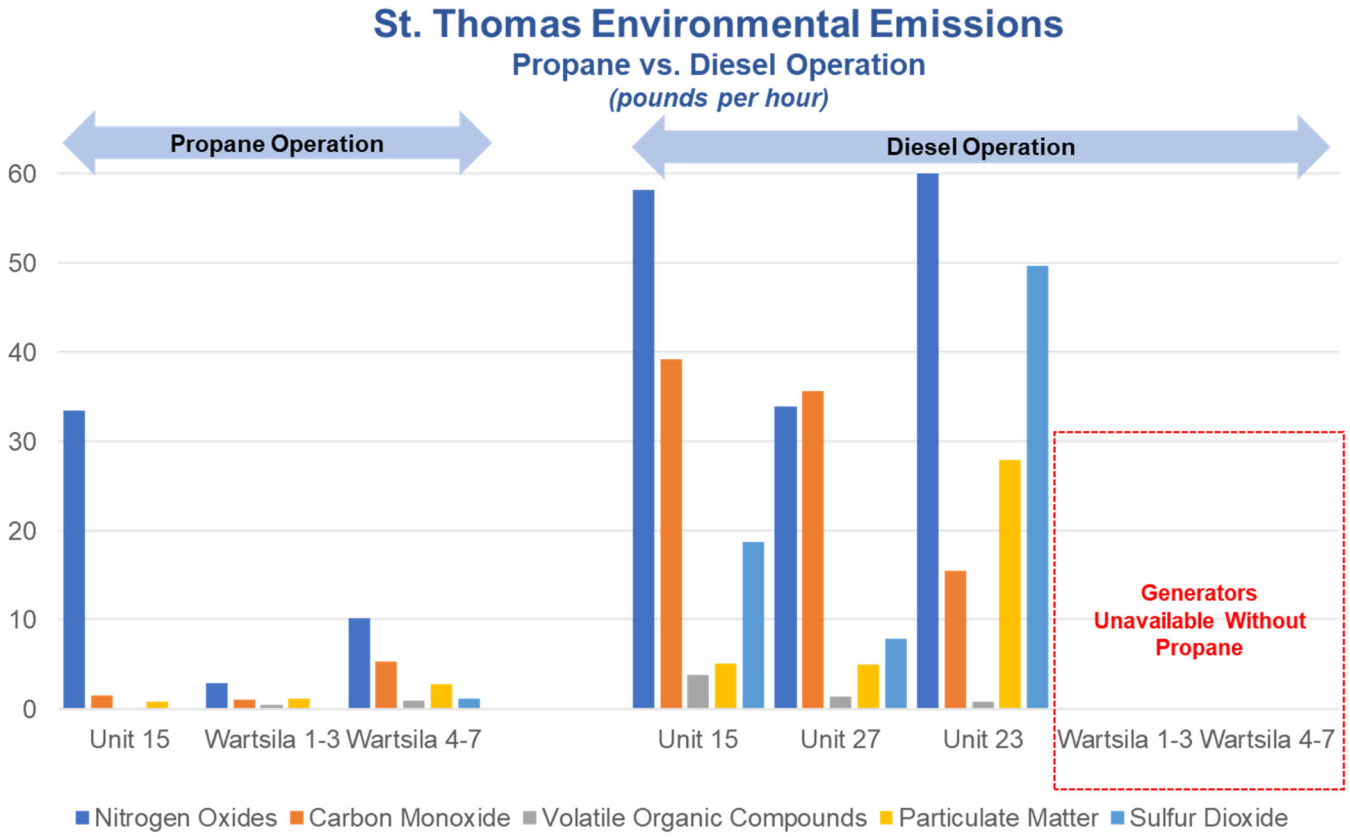
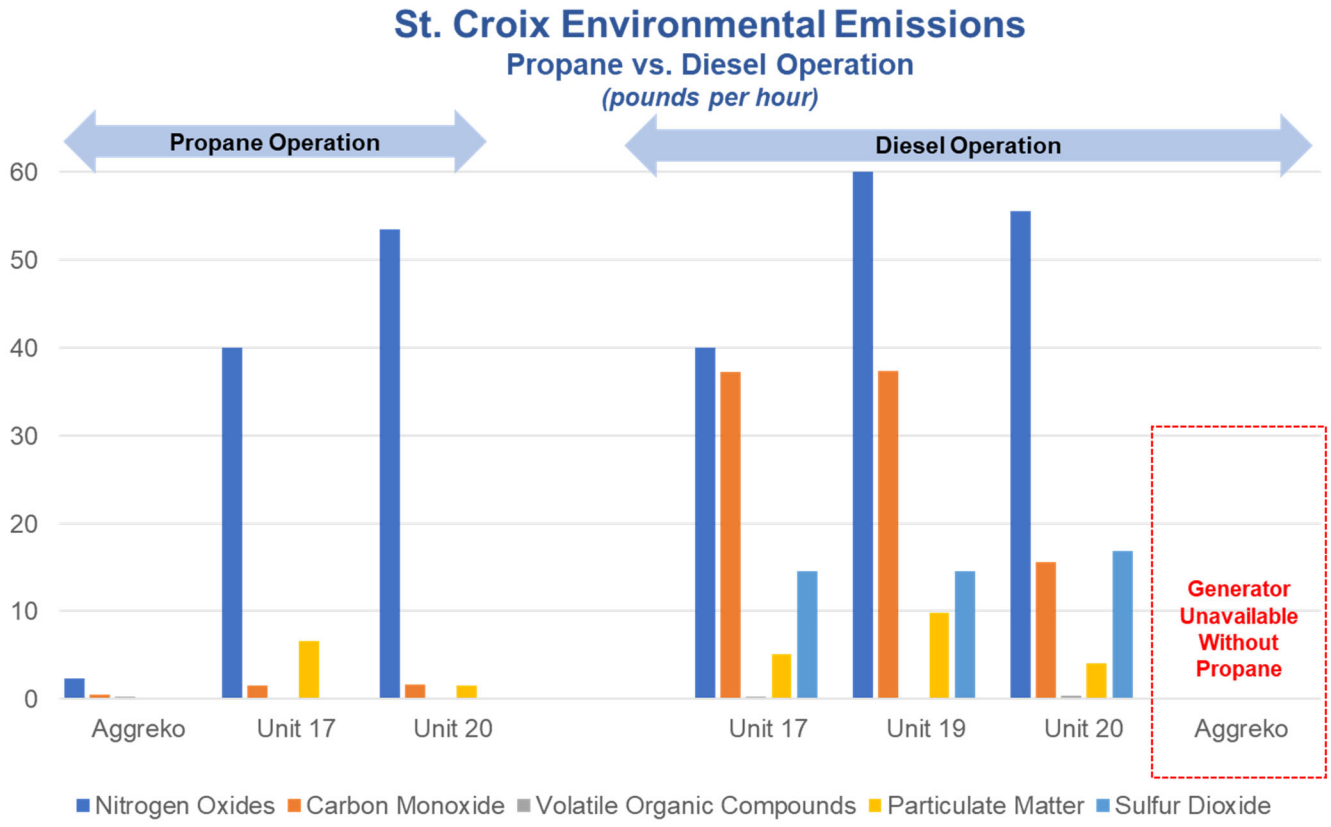


Figure 78 - Comparison of Diesel to Propane on Generation Weighted Average Age

- **Improved Environmental Profile** – Without the Propane Supply Infrastructure, WAPA is forced to burn diesel to generate electricity. Diesel's impact on the environment is worse than burning propane. WAPA's existing US Environmental Protection Agency emissions limits would be exceeded in approximately three months with diesel only operations. The emissions profiles for St. Thomas and St. Croix operating on propane versus diesel are shown below. Environmental emissions are significantly

lower when operating on. On St. Thomas, WAPA's most environmentally friendly generators, Wartsila 1-3 and Wartsila 4-7, are unavailable to without access to propane.





1.3 Propane Supply Infrastructure Detail

Both the St. Croix and St. Thomas propane infrastructures operate in the same fashion. However, there are differences in the physical layout of the two facilities as well as their storage and operating capacities.

Propane is shipped to the Territory via marine transportation in liquid form as LPG. The Propane Supply Infrastructure starts at the fuel dock, which is owned by WAPA. Once a vessel is on the dock, the fuel loading arm, or the alternate supply line, is connected to the vessel. The fuel dock has a fuel loading arm installed as well as an alternate supply line to provide redundancy. Once the propane passes through the connection flange on the vessel into the loading arm or the alternate supply line, the propane has entered the Propane Supply Infrastructure.

Additional details regarding the Propane Supply Infrastructure components are included in Appendix III.

1.3.0 LPG Pipeline from the Fuel Dock to the Storage Tanks

St. Thomas

The pipeline to the storage tanks from the fuel docks are constructed of carbon steel. Given the hazardous nature of storing and transporting LPG, 28% of the welds in the system were inspected whereas the relevant standard, ASME B31.3 stipulates that only 5% of the welds be inspected to meet the standard. In addition to the pipeline, pumps are needed to maintain the flow of LPG. The pumps in St. Thomas include an additional pump stage given the elevation of the LPG storage tanks. The storage tanks on St. Thomas are on top of Grambokola Hill above Krum Bay and the Randolph Harley Power Plant. The storage facility is approximately

200 feet above sea level while the Randolph Harley Power Plant is at sea level. Accordingly, the LPG must be pumped up to the storage facility. This is facilitated by two propane transfer pumps. One pump is designed for 100% duty flow while the second pump serves as a backup to provide redundancy.

St. Croix

The pipeline to the storage tanks from the fuel docks are also constructed of carbon steel. Given the hazardous nature of storing and transporting LPG, 28% of the welds in the system were inspected whereas the relevant standard, ASME B31.3 stipulates that only 5% of the welds be inspected to meet the standard. The storage facility on St. Croix is at the same elevation as the Estate Richmond Power Plant, and both are at sea level, so the St. Croix facility does not have the extra pump stage that is installed on St. Thomas, but pumps are still needed to move the LPG from the fuel dock to the storage facility. Like on St. Thomas, this is facilitated by two propane transfer pumps. One pump is designed for 100% duty flow while the second pump serves as a backup to provide redundancy.

1.3.1 LPG Storage

St. Thomas

The storage facility consists of 10 tanks that were manufactured by Belgium-based Geldof Integrated Steel Solutions. Each of the tanks is approximately 173 feet in length and 21 feet in diameter. The tanks are installed in two separate concrete bunkers with 5 tanks in each bunker. The installation of the tanks on St. Thomas required extensive excavation, including blasting, due to the rocky terrain on St. Thomas and resulted in the removal of approximately 46,000 cubic meters of primarily rock. The storage tanks are encased in bunkers that consist of multiple layers of earth, sand, rock, gravel, and ultimately concrete. The mounding over the storage tanks is to protect the tanks from external damage and fire, while also eliminating oxygen to prevent uncontrolled ignition and store LPG safely. The storage tanks on St. Thomas can hold 84,000 barrels of LPG based on nameplate capacity; however, fuel storage tanks have a low suction point, called “the heel”, that results in some of the nameplate storage capacity being unusable. On St. Thomas, the working capacity of the storage is 77,000 barrels after accounting for the heel. In St. Thomas’ current optimal operating state, the working storage capacity represents 38 days of propane inventory. Once the new Wartsila’s are in service and St. Thomas is operating 100% on propane, as discussed earlier, St. Thomas’ working storage capacity will still represent almost one month of propane in storage, or 27 days.

St. Croix

The storage facility consists of 8 tanks that were also manufactured by Belgium-based Geldof Integrated Steel Solutions. The storage tanks are smaller than St. Croix, with each of the tanks being approximately 157 feet in length and 21 feet in diameter. The tanks are installed in two separate concrete bunkers with 4 tanks in each bunker. The installation of the tanks on St. Croix also required earthworks, with the removal of approximately 9,000 cubic meters of soil. Like St. Thomas, the storage tanks are encased in bunkers that consist of multiple layers of earth, sand, rock, gravel, and ultimately concrete to be able to store LPG safely. The storage tanks on St. Croix can hold 59,000 barrels of LPG based on nameplate capacity. The working capacity of the storage is 54,000 barrels after accounting for the heel. In St. Croix’s optimal operating state, the working storage capacity represents 18 days of propane inventory. St. Croix has less generation capacity than St. Thomas, which accounts for the smaller system in St. Croix.

1.3.3 LPG Pipeline from the Storage Tanks to the Vaporizer

St. Thomas

The vaporizer, discussed below, is the part of the propane infrastructure that converts LPG into gaseous propane that is then burned in the generators. The pipeline from the storage tanks to the vaporizer is constructed of carbon steel and supplies two export pumps. Like the propane transfer pumps that move LPG from the ship to the storage vessels, there are two installed export pumps with one designed to operate at 100% flow while the second pump provides redundancy.

St. Croix

The vaporizer, discussed below, is the part of the propane infrastructure that converts LPG into gaseous propane that is then burned in the generators. The pipeline from the storage tanks to the vaporizer is constructed of carbon steel and supplies two export pumps. Like the propane transfer pumps that move LPG from the ship to the storage vessels, there are two installed export pumps with one designed to operate at 100% flow while the second pump provides redundancy.

1.3.4 Vaporizer

St. Thomas and St. Croix

The vaporizer, as mentioned above, converts LPG into gaseous propane. This is accomplished by essentially boiling the LPG by heating it with steam. St. Thomas and St. Croix each have two vaporizers to provide redundancy to the Propane Supply Infrastructure on each island. The vaporizers are each supported by two Packaged Steam Boilers that provide the steam that is used by the Vaporizer. The vaporizers not only convert the liquid propane to gaseous propane, but the vaporization process also heats the gaseous propane to the specific temperature required by the generators. Transportation of the gaseous propane is via pipeline to WAPA's generators. The pipelines that transport gaseous propane are constructed of stainless steel.

Once the gaseous propane leaves the vaporizer and passes though the manifold to one of WAPA's generators, the propane has left the Propane Supply Infrastructure, enters infrastructure owned by WAPA, and is burned by WAPA to generate electricity.

In industrial processes, a flare serves to vent fuel. A traditional flare has a visible flame at the top of the flare stack, which can be disconcerting to the public. The propane infrastructure vaporizer is accompanied by a flameless flare. The term "flameless" flare is a misnomer; however, because the flare has a flame, but the flame is housed in the body of the flare, and thus, not visible. As discussed above, prior to gaseous propane being sent to a generator, the temperature and pressure of the propane must meet specific levels to avoid damage to the generators. To reach the temperature required, the vaporizer heats the LPG to gaseous form. To aid this process, there must be a flow of propane passing through the vaporizer; however, that flow of propane is not yet at the temperature and pressure where it can be fed to WAPA's generators. The propane flow is vented to the atmosphere via the flare until the propane flow reaches the appropriate temperature and pressure. Once the proper temperature and pressure is reached, the fuel is no longer vented via the flare and is sent to the generator.

Also, if a generator trips offline while operating on propane the generator can no longer take propane. In that case, the propane supply valves to the generator automatically closes, and any remaining propane in the upstream piping is diverted to the flameless flare to safely remove and burn.

1.3.5 Fire Control and Suppression

St. Thomas and St. Croix

Given the hazardous nature of storing, transporting, and vaporizing propane, the Propane Supply Infrastructure has significant leak detection equipment and systems as well as significant fire control and suppression systems. The fire control and suppression systems are fed with seawater and have redundancy built throughout the system. For example, the firewater pumps have a primary pump and a backup pump for redundancy. The systems are operated by electricity, with the primary source of electricity being WAPA's generators; however, the fire control and suppression systems are also supported by standby diesel generators that can power the fire control and suppression systems if WAPA's generators are not supplying electricity.

The fire suppression systems are deluge systems. The jetties include a fire water curtain system that insulates the facility from the vessel and vice versa in the event of a fire. The jetties are also outfitted with manual water cannons for fire suppression. The propane storage tank mounds are also protected by a deluge fire system and manual water cannons. The vaporizers and balance of plant supporting the vaporizers include deluge fire protection systems.

These systems are cyclically tested weekly to ensure that the systems are operational. The maintenance of the systems is also included in the annual operations and maintenance plan.

1.3.5 Offshore Mooring Buoy

St. Thomas and St. Croix

The Propane Supply Infrastructure also includes a permanently anchored mooring buoy so a vessel can be held in place using a permanent mooring instead of being at anchor. This is safer in inclement weather. The mooring buoy facilitates mooring vessels up to the size of a Very Large Gas Carrier, or VLGC. VLGC's carry significant quantities of propane, up to approximately 550,000 barrels, which represents approximately three months of propane supply for the Territory. One advantage of transporting large quantities of propane is the transportation cost per barrel is lower than on smaller ships.

1.4 Availability of Comparable Facilities

1.4.0 Local Resources

There is currently only one utility-scale Propane Supply Infrastructure facility in the Territory on St. Thomas, and only one utility-scale Propane Supply Infrastructure facility in the Territory on St. Croix. Other commercial companies in the Territory (Antilles Gas Company, Polaris, Paradise Gas, etc.) sell propane in the Territory to residential and small commercial users. They do not have the infrastructure in place to provide the quantity of propane that WAPA consumes, nor do they have the infrastructure in place to supply propane at the temperatures or pressures that WAPA requires for its generators.

There are no hydrocarbon resources in the Territory that can be burned for fuel by WAPA's existing generators. One organic material in the Territory that could be burned to produce electricity is biomass (plant debris, etc.). This is currently not a viable alternative because a biomass facility does not currently exist in the Territory and the Territory does not produce sufficient biomass to meet its electricity needs. Constructing a biomass facility would take several years and the Territory would have to import additional biomass to supplement its own biomass.

Another organic material that is produced in that territory that could be burned to produce electricity is municipal household waste, or waste-to-energy. Like biomass, a waste-to-energy facility would have to be built which would take years, and the Territory does not produce sufficient municipal solid waste to meet its electricity needs. The Territory would need to import trash from outside the Territory.

Solar power and wind energy are two naturally occurring resources that are abundant in the US Virgin Islands, and WAPA recently signed Power Purchase Agreements ("PPAs") for both solar power and wind energy. However, both projects are expected to take two or more years to place in service. The contracts in place represent approximately 25% of the Territory's annual energy needs, so significantly more solar power and/or wind energy would need to be developed to fully power the Territory, and that would take years. Finally, solar power and wind energy are intermittent resources. Solar power does not work when the sun is not shining, and wind power does not work when the wind does not blow. Fossil-fuel generation of electricity is needed to keep the lights on in the Territory when renewable resources are not producing. The Propane Supply Infrastructure is a critical element of the fuel supply to WAPA's fossil-fuel generation.

1.4.1 Alternative Fuel Import Options

WAPA currently imports propane through the Propane Infrastructure Supply but could explore other supply options.

One option would be to construct a new Propane Supply Infrastructure. A facility would be required to be built on both St. Thomas and St. Croix. That would take years and cost millions of dollars. Furthermore, why would WAPA build a new Propane Supply Infrastructure when there is existing Propane Supply Infrastructure in the Territory?

A second option would be to develop Liquified Natural Gas ("LNG") facilities. This would require building two separate facilities. One on St. Thomas and one on St. Croix. This would take years and cost millions of dollars. Additionally, because LNG is cryogenic and natural gas is stored at a very cold temperature, LNG storage is energy intensive; and therefore, costly from an operating perspective. Currently, WAPA's generators cannot burn natural gas, so the generators would also have to be converted to be able to burn natural gas to be able to use LNG.

A third option would be to convert to Containerized Natural Gas ("CNG"). This would likely not require material construction; however, it would involve the logistics around moving numerous bullet tanks regularly to the islands full and then removal of the empty containers to be refilled, only to be returned to the Territory to repeat the cycle. Establishing this capability, while likely not requiring material construction, would still have a six-to-twelve-month lead time to establish. Furthermore, the channel into the Estate Richmond Power Plant is narrow and shallow. As a result, CNG would likely need to be delivered to Ocean Point Marine Terminals on the south shore of St. Croix and transported via truck to the Estate Richmond Power Plant to be able to supply sufficient quantities of fuel to the plant. As discussed above, WAPA's generators cannot burn natural gas, so the generators would have to be converted to be able to burn natural gas to be able to use CNG.

1.5 Licenses and Permits

The Propane Supply Infrastructure project received environmental approval, and all associate environmental permits, construction permits, United States Coast Guard permits, etc. prior to construction commencing. Compliance with permitting and related requirements has been maintained throughout the life of the facility, and the Propane Supply Infrastructure currently has all required licenses and permits in place. Permits in place cover air permits, water permits, wastewater permits, US Coast Guard permits, etc. The list of permits is included in Appendix [I].

1.6 Project Milestones

The purchase of the Propane Supply Infrastructure has two major milestones and several interim milestones:

1.6.0 Major Milestone I

Major Milestone 1 is the payment of $45 million was made to Vitol on May 1, 2023 with funds advanced by the Government of the Virgin Islands in anticipation of grant funding for the acquisition. WAPA and the Government of the Virgin Islands executed a Promissory Note coincident with the advance of funding that creates a debt obligation for WAPA to repay the $45 million to the Government of the Virgin Islands.

1.6.1 Interim Milestones:

- **Benefit Cost Analysis** - Targeted completion of the Benefit Cost Analysis. Benefit Cost Analysis received May 23,2023.
- **Third Party Valuation** – KPMG has been engaged to perform an independent valuation of the asset with completion targeted the week ending June 28, 2023.
- **Independent Engineering Assessment** – Kiewit Inc. has been engaged by WAPA to perform an independent assessment of the condition of the Propane Supply Infrastructure on behalf of WAPA. In addition to reviewing engineering specifications, as-built design drawings, maintenance records, etc. the engineering teams visited both St. Thomas and St. Croix in late July to physically inspect the facilities. Preliminary results of the engineering inspection did not identify any material weaknesses or concerns. A report on the results of the inspection was received by WAPA on July 21, 2023. The report indicated that outside of normal wear, the facilities are in good working order.
- **Alternative Propane Supply** - Negotiations for alternative propane supply have been completed.

1.6.2 Major Milestone II

The Major Milestone II is the payment of an additional $100 million initially due on August 14, 2023. The contract was subsequently amended to extend the closing date to December 12, 2023. The acquisition can close prior to December 12, 2023. Milestone II also includes the following:

- Sale of the Propane Supply Infrastructure to WAPA from Vitol.
- Transfer of title, conveyance of all equipment, property, balance of plant, inventory, spares, documentation, etc. to WAPA from Vitol.
- WAPA will assume the existing operations and maintenance contract currently in place between Vitol

and Saintnals, the current third-party operations and maintenance provider, effective upon the sale of the Propane Supply Infrastructure to WAPA.

- WAPA's new fuel supply arrangement with the supplier WAPA selects becomes active.

The achievement of Major Milestone II results in consummating the purchase and sale transaction and the closing of the sale of the Propane Supply Infrastructure by Vitol to WAPA will be complete. WAPA will own the entirety of the Propane Supply Infrastructure and have no residual relationship or obligation to Vitol.

1.7 Project Location

1.7.0 St. Croix

The St. Croix propane storage and fuel gas vaporisation facility (the Propane Supply Infrastructure) is situated adjacent to the Estate Richmond Power Station. WAPA owns the land on which the

Estate Richmond Power Plant is located. WAPA also owns the land on which the Propane Supply Infrastructure is sited. The facility occupies approximately 1.5 acres; however, the site, which was formally used as a cement works, extends to over 2.5 acres.

St Croix Propane Supply Infrastructure facility supplying Richmond Power Station

17º 45' 00.00" North 064º 42' 35.88" West

Aerial picture showing the St. Croix Jetty and propane storage and propane fuel gas vaporiser areas (white with green feature markings) overlaid on the disused and now divested brownfield structures; the footprint of the Richmond Power Plant is outlined in red

1.7.1 St. Thomas

The St Thomas propane storage and fuel gas vaporisation facility (the "Propane Supply Infrastructure") is situated within the Randolph Harley Power Plant. WAPA owns the land on which the Randolph Harley Power Plant is located. WAPA also owns that land on which the Propane Supply Infrastructure is sited. The Propane Supply Infrastructure facility occupies approximately 1.5 acres.

St. Thomas Propane Supply Infrastructure facility supplying Randolph Harley Power Station

18º 19' 42.24" North 064 º 54' 41.96" West

Aerial picture showing the St Thomas Jetty and propane storage and propane fuel gas vaporiser areas (white with green feature markings); the footprint of the Randolph Harley Power Plant is outlined in red.

I. HUD Eligible Activity

The CDBG-eligible activity under the Housing and Community Development Act of 1974 (HCDA) is as follows:

Section 105(a)(2) – The acquisition, construction, reconstruction, or installation (including design features and improvements with respect to such construction, reconstruction, or installation that promote energy efficiency) of public works, facilities (except for buildings for the general conduct of government), and site or other improvements.

WAPA has secured an agreement to acquire the existing Propane Supply Infrastructure on the islands of St. Thomas and St. Croix from Vitol. The Propane Supply Infrastructure was originally developed under a Build, Own, Operate, and Transfer (BOOT) agreement between WAPA and Vitol. Under the BOOT agreement, ownership was intended to transfer from Vitol to WAPA after a period of 10 years. WAPA has struggled to meet its financial obligations under the BOOT agreement for many years, and Vitol has declared WAPA in default. In conjunction with this declaration of default, Vitol has prevented WAPA from utilizing the Propane Supply Infrastructure.

Faced with this situation, WAPA had two options.

- Option 1 – Let Vitol keep the Propane Supply Infrastructure and attempt to operate and serve its customers without the use of the assets.

- Option 2 – Acquire the Propane Supply Infrastructure to ensure continued access to and use of the assets.

WAPA's decision to acquire the Propane Supply Infrastructure and the price it is willing to pay are based on the economic value of the assets to WAPA and the mitigation benefits they provide. The decision and price are not based on the terms of the BOOT agreement. As part of the agreement to transfer ownership of the Propane Supply Infrastructure from Vitol to WAPA, the parties have agreed to release each other from all claims and obligations related to the BOOT agreement.

The economic value of the Propane Supply Infrastructure is driven by the cost of propane compared to WAPA's alternative fuel source, which is diesel. The fuel cost savings provided by ownership of the Propane Supply Infrastructure is the primary factor considered in the Benefit Cost Analysis included in this application. The propane infrastructure assets also provide mitigation benefits that reduce the risk of loss of life and property from future disasters and yield community development benefits. These benefits are described in greater detail in the project summary and national objective sections of this application.

2.1 Project Cost

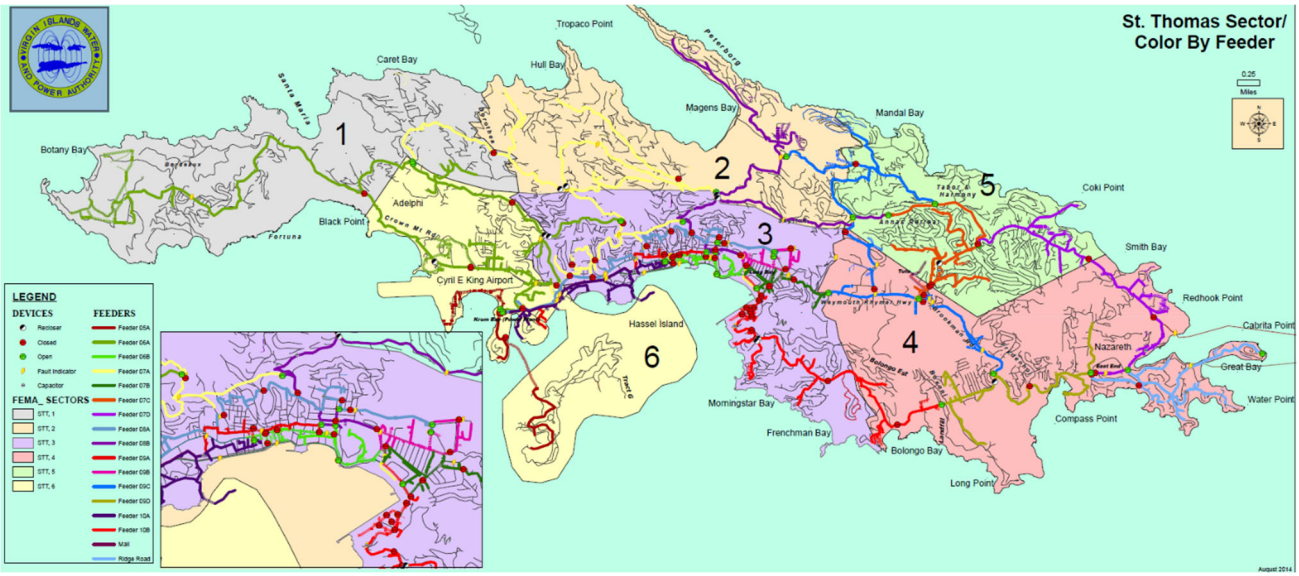
The procurement of the Propane Supply Infrastructure is in accordance and compliance with the procurement and other related policies of WAPA.

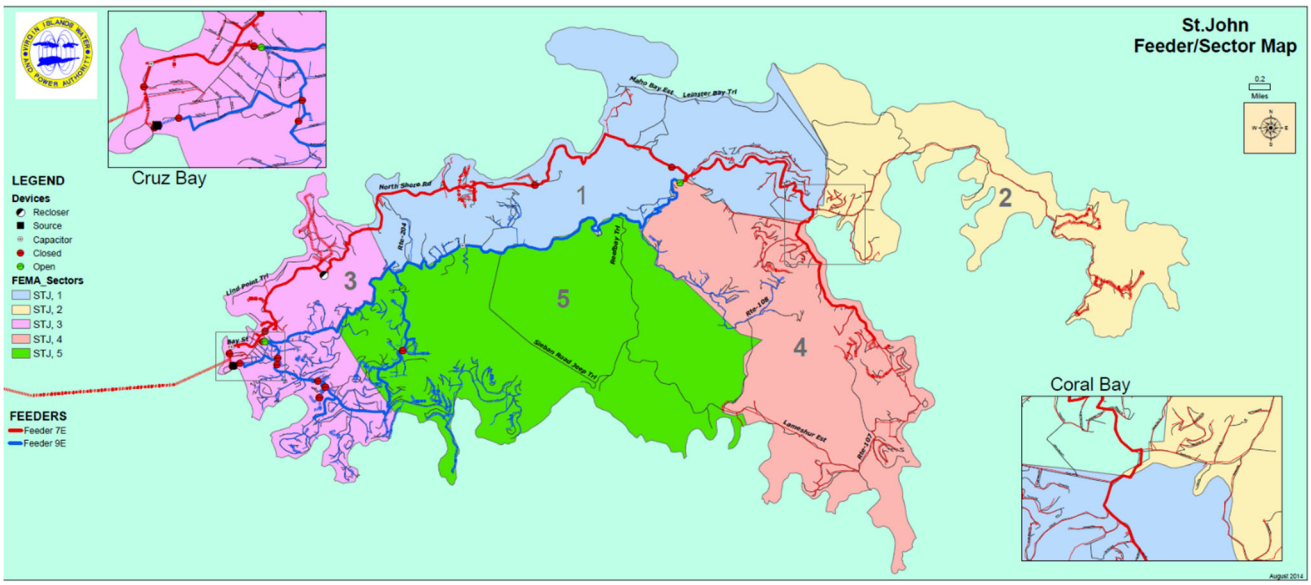
The project cost of $145,000,000 is the agreed upon purchase price between the seller, Vitol, and the buyer,

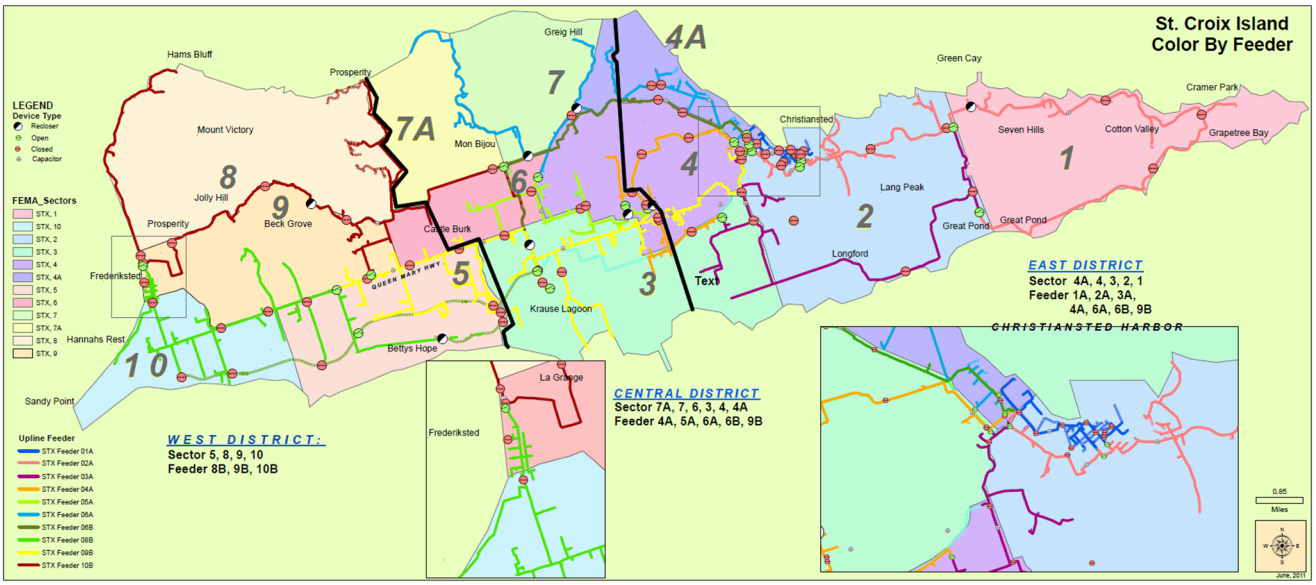
WAPA, for acquisition of the Propane Supply Infrastructure. WAPA arrived at the purchase price after extensive negotiations. WAPA's analysis and calculation of the value of the facility was the primary factor in determining the negotiated purchase price. The Benefit Cost Analysis, discussed later in this document, as well as a valuation analysis performed by an independent valuation firm, KPMG, support the value proposition in the purchase price versus the value of the Propane Supply Infrastructure.

2.2 Area of Impact

The LPG Infrastructure on both St. Thomas and St. Croix complement the distribution of VIWAPA's generation assets. The St. Thomas Infrastructure is physically located at Krum Bay which is a part of the Charlotte Amalie West Census Tract (9608) and abuts VIWAPA's Randolph Harley Power Plant. The St. Croix Infrastructure is physically located at Estate Richmond which is a part of the Sion Farm Subdistrict Census Tract (9703) and abuts VIWAPA's Estate Richmond Power Plant. Although the assets are located in those respective areas, the fuel that they provided is used by VIWAPA's generators to produce energy that is distributed across each island district via various feeders shown below. Considering the nature of the project's use, the acquisition of these assets will service all communities and census tracts in the territory.







2.3 Impacts to the Population

Basic household necessities such as food refrigeration cannot be avoided, which requires electricity. Medical conditions can necessitate the use of air conditioning or operation of medical equipment. Insulin requires refrigeration. Accordingly, electricity costs are highly regressive in their impact on household finances and can have a material adverse impact on LMI households as LMI households spend a significant percentage of monthly income on electricity.

The decline in population and electricity sales in the Territory exacerbates the adverse impact of the cost of electricity on LMI households, and vulnerable populations. The Authority has a fixed amount of infrastructure that it must install, maintain, and operate. For example, its transmission and distribution system does not get 20% smaller when the population shrinks by 20%. Accordingly, the Authority's operating costs do not change

materially, despite a smaller population. However, the Authority is a municipal utility, and its only source of revenue is its customers. When the Authority's customer base shrinks, it must then collect essentially the same amount of revenue from fewer customers, which increases each customer's costs.

Securing the Territory's fuel supply by acquiring the propane infrastructure provides dependable, lower cost fuel to make electricity. Without the Propane Supply Infrastructure, the Authority would rely on burning diesel to make electricity. Diesel is currently significantly more expensive than propane on an energy-equivalent basis (converting the cost to $ per mmbtu, or million British Thermal Units), so operating only on diesel would significantly increase the price that the Authority would need charge its customers for electricity.

2.4 Resilient or Mitigative Elements

The Propane Supply Infrastructure was constructed to meet the applicable industry standard for the relevant component as outlined in the table below.

Component	Design Code/Standard	Component	Design Code/Standard
Overall Design	• API 2510	**Piping Integrity**	• ASME B31.3 design and class 300 • Liquid Piping – A333 • Gas Piping – 304L
Hazardous Area Classification	• API RP 505	**Piping Materials and Equipment**	• ASTM • API • ANSI
Tank Design and Inspection	• ASME VIII Div 2	**Electrical Design and Installation**	• National Electrical Code
Mound Design and Loadings	• EEMUA • API/ASME do not cover mounding	**Electrical Materials and Equipment**	• UL / FM / NEMA
Seismic and Wind Design	• ASCE 7-10	**Fire Fighting Design and Installation**	• NFPA
Piping Design and Installation	• ASME B31.3	**Fire Fighting Materials and Equipment**	• UL / FM

2.4.1 Owning the Propane Supply Infrastructure Mitigates Significant Risk

Owning the propane infrastructure is critical to the community of the Virgin Islands because it significantly improves the Territory's energy resilience and energy security due to several key reasons. Owning the Propane Supply Infrastructure is also critical to WAPA fulfilling its FEMA Community Lifelines role in the event of a natural disaster.

Note that as discussed previously, the Propane Supply Infrastructure is currently used by WAPA, so the factors discussed below result from WAPA no longer having use of the Propane Supply Infrastructure.

II. Consistency with Mitigation Needs Assessment

The US Department of Homeland Security's Federal Emergency Management Agency ("FEMA") utilizes a Community Lifelines framework to identify fundamental services in the community that must be stabilized following a disaster to enable all other aspects of society to function. Energy, Fuel, and Electric Grid are a specific Community Lifeline identified by FEMA. Additionally, other FEMA Community Lifelines depend on the Energy, Fuel, and Electric Grid Community Lifeline being in place. Community Lifelines that depend on the Energy, Fuel, and Electric Grid Community Lifeline include Food, Water, and Shelter (as discussed, the Authority makes potable water for the Territory and the Authority requires electricity to make potable water), Health and Medical, Communications, and Transportation, all of which need electricity to be fully functional. The Virgin Islands Territorial Emergency Management Agency ("VITEMA") follows the FEMA Community Lifeline framework.

Ownership of the Propane Supply Infrastructure mitigates several risks that WAPA would face in the event of a natural disaster, as discussed, that could limit or completely impair its ability to make electricity and drinking water and maintain the Energy, Fuel, and Electric Grid Community Lifeline.

III. Analysis of Energy Lifeline Mitigation

The USVI drafted the Territorial Hazard Mitigation Plan (HMP) in 2019 and it was most recently updated in April 2021 to incorporate the introduction to FEMA-Lifelines and USVI Hazard mitigation planning elements that addresses a wide range of natural and human-caused hazards. A fuel supply interruption will adversely affect the energy lifeline. It can occur in three (3) primary ways:

1. Physical Damage: A hurricane can inflict tremendous physical damage to fuel storage infrastructure. This is because most fuel is stored in above-ground tanks and supply piping is typically installed on pipe racks that are also above ground. These can be easily damaged by windblown debris as was the case with Tank #10 on St. Thomas. Damage to the exposed storage infrastructure will result in both a fuel supply interruption and have serious adverse environmental impacts by releasing harmful petrochemicals into the environment. Hazardous Material Release is one of the human-caused hazards that is identified in the HMP.
2. Equipment failure: Fuel is moved from one place to using various pumps and the flow is controlled via various types of valves. While equipment failure can be mitigated by having secondary supply lines or by bypassing damaged equipment, there are circumstances when a single point of failure can interrupt the entire operation. Having a fuel supply that utilizes an entirely different delivery system can significantly reduce the risk of a single point of failure interrupting fuel delivery.
3. Supply chain disruption: The pandemic has revealed that the supply chains are very delicate and susceptible to a wide variety of shocks that can render them inoperable. For example, imagine a fuel vessel en route to the territory when it is discovered that one of the crew members has an infectious disease and that in order to get the crew member the appropriate medical attention the crew is forced to immediately divert the vessel to alternate port. Thus, the vessel doesn't arrive to the territory on time and the on-island fuel inventory is depleted. As has been demonstrated in the pandemic era, such a scenario is entirely plausible.

VIWAPA recognizes that the primary resource that enables it to fulfill its responsibility of providing reliable and resilient power to the USVI is its access to fuel. Simply stated, power cannot be generated without fuel. While VIWAPA has control over the diesel inventory, it does not currently have direct control over the LPG inventory. This places the Authority in a vulnerable position as without access to LPG, power generation for the territory

will be dependent on a single fuel source. Additionally, all VIWAPA's diesel storage tanks on both islands are above ground and each plant has one dock/jetty by which to receive fuel shipments. Should those tanks or docks become compromised, the Authority's ability to generate power will be seriously imperiled. The more inventory that the Authority has under its control, the more time it has to respond, and the likelihood of a service interruption decreases dramatically.

This project furthers VIHFA's assertion that CDBG-MIT funding should prioritize mitigation of risk to key lifeline assets that once secured, contribute significantly to the territory's resilience. Energy is the backbone of most lifelines and investing in securing an alternative fuel source that is almost impervious to damage from hurricanes for the territory's sole power provider has a theoretically infinite return. This project will also reduce the risk of loss of life by ensuring that VIWAPA has the fuel necessary to power the most reliable units thus resulting in fewer power outages on average.

IV. Compliance with National Objective for Covered Projects

The national objective met by this activity is the Urgent Need Mitigation (UNM) national objective. To meet the alternative criteria for the UNM national objective, the activity must (i) address the risks identified in the Mitigation Needs Assessment; and (ii) result in a measurable and verifiable reduction in the risk of loss of life and property.

The acquisition of the Propane Supply Infrastructure addresses the risk to the Energy Lifeline as identified in the Mitigation Needs Assessment. The Propane Supply Infrastructure is one of the most critical parts of the Energy Lifeline as the assets are used to currently supply over 80% of the fuel used for power generation in the US Virgin Islands, and The Territory's power generation fleet has been specifically designed to utilize these assets. The Propane Supply Infrastructure will soon be used to supply 100% of the fuel used for power generation in the US Virgin Islands once the new Wartsilas are in service on St. Thomas in 2023. Over almost sixty megawatts of WAPA's newest and most efficient existing generation can only operate on propane. Sixty megawatts of capacity is enough capacity to power the entire St. Thomas District. The thirty-six-megawatt Wartsila generation project, which is funded by HUD CDBG-DR funds, is at risk of becoming a stranded asset if the Propane Supply Infrastructure is lost. These units can run primarily on diesel, but the emissions system requires a steady supply of propane, even when operating on diesel as the primary fuel. Addressing risk to the Energy Lifeline also directly addresses risk to other critical lifelines as they rely on electric services from WAPA. Examples include (i) Safety & Security, (ii) Communications, (iii) Food, Water, and Sheltering, (iv) Health & Medical.

The acquisition of the Propane Supply Infrastructure reduces the risk of loss of life and property from future disasters by providing a more resilient Energy Lifeline. The drivers of this risk reduction include:

Risk Reduction Driver	Proposed Performance Measure	Proposed Performance Measure Data
Maintain access to propane as a fuel for power generation. Without the propane supply infrastructure, VIWAPA will be reliant on diesel as a single fuel for power generation. This	Demonstrate continued access to propane and diesel as fuels for power generation.	• # of barrels of propane and diesel delivered • Confirmation of existence of propane and diesel supply contracts

increases the risk of fuel supply chain disruptions caused by a future disaster.		• Confirmation of existence of propane facility O&M agreement
Maintain access to increased fuel storage. The propane supply infrastructure includes approximately 27 days of fuel storage on St. Thomas and 18 days of fuel storage on St. Croix. Having additional fuel storage capacity reduces the impact of potential fuel supply disruptions caused by a future disaster.	Demonstrate continued access to current fuel storage capacity.	• Monthly total propane and diesel storge capacity (barrels) • Monthly average propane and diesel inventory (barrels)
Increase available efficient generation capacity. Having more operational generation units provides redundancy in the event units are damaged in a future disaster. Have more efficient generation units reduces the amount of fuel needed to operate if fuel supply chains are disrupted by a future disaster.	Demonstrate an increase in available efficient generation capacity.	• Monthly progress/status report on Wartsila 4-7 project • Monthly available generation capacity by unit including capacity, fuel, and heat rate • Monthly generation report by unit

These benefits are described in greater detail in the project summary section of this application.

5.1.0 Long-term Efficacy and Sustainability of the Project

5.1.1 Financial Resources to Pay Ongoing Operations and Maintenance Expenses

The Virgin Islands Water and Power Authority is a rate-regulated municipal utility, and the rates it is allowed to charge its customers are determined by the Virgin Islands Public Services Commission ("PSC"). The regulated rate that WAPA charges customers is WAPA's only source of revenue, and WAPA's rates are set such that the rates WAPA charges its customers are intended for WAPA to recover its costs. The rate WAPA charges its customers is comprised of two components.

1. The Levelized Energy Adjustment Clause, or LEAC, is to recover WAPA's cost of fuel and other marginal costs of energy supply such as energy purchased under Power Purchase Agreements.

2. The Base Rate is to recover operating costs such as salaries, maintenance, and other operating costs and debt service.

Separating components in utility rates into rates for fuel recovery and recovery of operating expenses is a

common construct in the utility industry.

The PSC conducts a periodic review of WAPA's operating costs and sets the Base Rate to cover WAPA's operating costs. The monthly operations and maintenance fee that WAPA currently pays for operation and maintenance services of the Propane Supply Infrastructure is included in WAPA's base rate, and WAPA has been making monthly payments to Vitol for the third-party operations and maintenance. WAPA is current on these payments and there are no past due amounts outstanding for the monthly operations and maintenance fee. The operations and maintenance expenses related to the Propane Supply Infrastructure is not a new cost to WAPA. WAPA has historically recovered these costs via its customers rates and successfully paid for ongoing operation and maintenance expenses.

The collection in customer rates for the monthly operations and maintenance cost for the Propane Supply Infrastructure represents approximately $0.03 per kWh, or approximately 15% of WAPA's $0.19 per kWh Base Rate and approximately 7% of WAPA's total rate (Base Rate + LEAC, or $0.41 per kWh). The remaining $0.17 per kWh in WAPA's base rate is intended to cover all of WAPA's other operating costs, including salaries and benefits, generator maintenance and repair, automated metering infrastructure, vehicles, materials and supplies, real estate leases, generator leasing expense (Aggreko generation is leased), and debt service. WAPA's regulated rate does not include components of its rate that have line-of-sight to line-item spending. WAPA's operating costs are reflected in rates in aggregate and are not earmarked for specific costs. The order of magnitude of the Propane Supply Infrastructure annual Operations and Maintenance expense in customer rates is shown in the chart below.

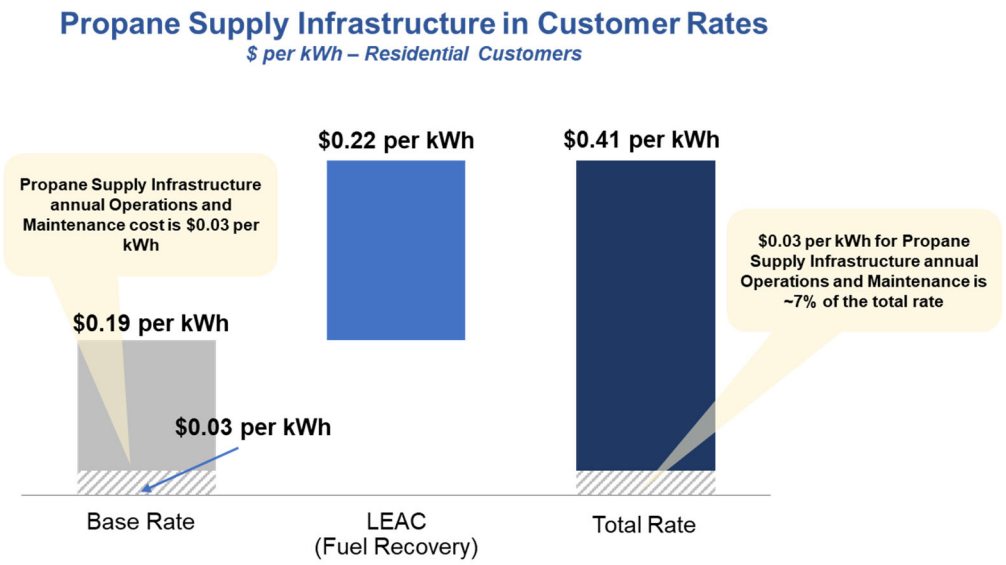


Figure 79 Customer Rates Relative to Project Activities

The Propane Supply Infrastructure is a large industrial asset; however, the system does not include a significant amount of moving equipment, or rotating stock. The bulk of the Propane Supply Infrastructure is piping and storage. The moving equipment component of the system is comprised primarily of pumps. The package boilers do not have a significant number of moving points, but rather essentially boil water. The vaporizer also does not have a significant number of moving parts as it is essentially a heat exchanger, whereby steam is piped through the vaporizer adjacent to a pipe with LPG to apply heat to the LPG and convert the liquid propane to gaseous

propane. Accordingly, the Propane Supply Infrastructure does not have a significant Major Maintenance component to its maintenance. Instead, most of the maintenance of the facilities is ongoing routine maintenance and captured in the $0.03 per kWh in rates described above. For example, over the next 20 years, identified Major Maintenance represents approximately 3% of the total operations and maintenance expense for the Propane Supply Infrastructure.

Finally, WAPA has Bond Resolutions in place associated with its outstanding debt. The Bond Resolutions stipulate that all operating costs are to be paid before any interest or principal payments for WAPA's debt service can be paid. Accordingly, in a situation where WAPA faced a significant shortfall of funds for some reason, paying the operations and maintenance of the Propane Supply Infrastructure is prioritized under the Bond Resolutions before any payments for interest or principal on WAPA's debt.

The operations and maintenance of the Propane Supply Infrastructure has been outsourced to a third-party since the project was placed in service. WAPA intends to continue to outsource the operations and maintenance to a third party for the foreseeable future. The contract to purchase the Propane Supply Infrastructure includes a provision for WAPA to assume the contract that is currently in place between Vitol and the third-party operations and maintenance provider. WAPA intends to assume the contract upon transaction close to ensure continuity of operations. The existing operations and maintenance agreement is included in Appendix II.

The excerpt from the purchase contract for the Propane Supply Infrastructure reflecting the ability of WAPA to assume the contact is included below (underlined emphasis added).

> *12. O&M Agreement. During the Interim Period, Seller shall not terminate the Facilities Services Agreement dated June 14, 2022 between Seller and Saintnals, LLC (as amended, supplemented and/or modified from time to time, the "O&M Agreement"). Furthermore, Seller shall not unreasonably withhold its consent in connection with the assignment of the O&M Agreement by Seller to WAPA under the terms of Section XIII(F) of the O&M Agreement.*

Infrastructure Maintenance Program

The maintenance of the Propane Supply Infrastructure includes various recurring inspection/maintenance activities as outlined in the table below. Furthermore, the facilities are managed under a Process Safety Management system ("PSM"). PSM is intended to be utilized when certain hazardous materials are being stored and/or utilized in operations. PSM stipulates inspection and/or maintenance at various intervals much like a commercial jetliner - i.e., certain activities are performed at various time intervals or activity thresholds (after a certain number of takeoffs or landings, for example).

Propane Supply Infrastructure Inspection Cycle

Facility	Inspection Activity	Inspection Frequency	Type of Maintenance
Superstructures	Benchmark	On build completion and then every 5 years	Detailed inspection of every part of the structure and condition record
	General	2 yearly from completion	A visual inspection from ground level of the structure and condition record
	Operational	Daily	At any time the structure is visited by operational or technical staff either for operational reasons or cyclic maintenance
	Special	Ad-hoc	In response to the raising of special concerns such as impact damage
Equipment and Facilities	Benchmark	On commissioning with manufacturer in attendance	Detailed inspection of every part of the equipment and condition record
	Yearly – thorough	Yearly	Thorough cyclic maintenance in accordance with the planned maintenance schedule
	6 monthly – visual	6 monthly	Cyclic maintenance in accordance with the planned maintenance schedule
	Physical testing	Weekly	Cyclic testing of elements of the safety systems to ensure they are operational. To be carried out at the same time each week
	Operational	Daily	At any time the equipment is visited by operational or technical staff either for operational reasons or cyclic maintenance
	Special	Ad-hoc	In response to the raising of special concerns or breakdown of the equipment
Miscellaneous	Tank cleaning	5 years	Inspection and cleaning of tanks
	Painting / refurbishment	10 years	Painting and major refurbishment of the facility outside of normal maintenance

Operations and Maintenance Projected Budget

Operations and maintenance expenses have been estimated on an annual basis based on current conditions, and the estimated operations and maintenance expense is incorporated in the BCA analysis provided in the Demonstration of Benefit section. Development and maintenance of the O&M plan will be monitored in accordance with HUD requirements and industry standards.

Historically, since the Propane Supply Infrastructure was placed in service, WAPA has spent approximately $63 million on operations and maintenance of the facility. In the past two years, WAPA's annual operations and maintenance expense was approximately $12 million in fiscal year 2022 (July 1, 2021 through June 30, 2022), and its annual operations and maintenance expense will total approximately $14.5 million in fiscal year 2023 (July 1, 2022 through June 30, 2023).

The Propane Supply Infrastructure is a large industrial asset; however, the system does not include a significant amount of moving equipment, or rotating stock, and the bulk of the Propane Supply Infrastructure is piping and storage. The moving equipment component of the system is comprised primarily of pumps. The package boilers do not have a significant number of moving points, but rather essentially boil water. The vaporizer also does not have a significant number of moving parts as it is essentially a heat exchanger, whereby steam is piped through the vaporizer adjacent to a pipe with LPG to apply heat to the LPG and convert the liquid propane to gaseous propane. Accordingly, the Propane Supply Infrastructure does not have a significant Major Maintenance component to its maintenance. Instead, most of the maintenance of the facilities is ongoing routine maintenance. For example, over the next 20 years, identified Major Maintenance represents approximately 3% of the total operations and maintenance expense for the Propane Supply Infrastructure.

The projected operations and maintenance budget for the next 20 years of operation and maintenance of the

Propane Supply Infrastructure is shown below. Note that the first period shown represents a partial year as the acquisition of the Propane Supply Infrastructure is anticipated to close in August 2023, so the operations and maintenance budget was developed assuming WAPA takes ownership of the assets in August 2023, and the first full forecast month is September 2023.

Propane Supply Infrastructure Operations and Maintenance Budget

Start Date	9/1/2023	1/1/2024	1/1/2025	1/1/2026	1/1/2027	1/1/2028	1/1/2029	1/1/2030	1/1/2031	1/1/2032	1/1/2033
End Date	12/31/2023	12/31/2024	12/31/2025	12/31/2026	12/31/2027	12/31/2028	12/31/2029	12/31/2030	12/31/2031	12/31/2032	12/31/2033
Calendar Year	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Operating Year	7	8	9	10	11	12	13	14	15	16	17
STT and STX Combined											
Personnel Costs	$1,298,553	$3,973,572	$4,053,043	$4,134,104	$4,216,786	$4,301,122	$4,387,144	$4,474,887	$4,564,385	$4,655,673	$4,748,786
Saintnals Operations Fee	421,615	1,290,143	1,315,946	1,342,265	1,369,110	1,396,492	1,424,422	1,452,910	1,481,969	1,511,608	1,541,840
Fixed Costs	**$1,720,168**	**$5,263,715**	**$5,368,989**	**$5,476,369**	**$5,585,896**	**$5,697,614**	**$5,811,566**	**$5,927,798**	**$6,046,354**	**$6,167,281**	**$6,290,626**
Office Supplies	$26,764	$81,897	$83,535	$85,206	$86,910	$88,648	$90,421	$92,230	$94,074	$95,956	$97,875
Training & Education	10,728	32,827	33,484	34,153	34,836	35,533	36,244	36,969	37,708	38,462	39,231
Materials & Misc. Spare Parts	482,452	1,476,303	1,505,829	1,535,945	1,566,664	1,597,997	1,629,957	1,662,557	1,695,808	1,729,724	1,764,318
Vehicle Fuel & Maintenance	41,072	125,679	128,193	130,756	133,372	136,039	138,760	141,535	144,366	147,253	150,198
Boiler Fuel and Consumables	53,775	164,551	167,842	171,199	174,623	178,115	181,677	185,311	189,017	192,797	196,653
Communications	57,710	176,594	180,126	183,728	187,403	191,151	194,974	198,873	202,851	206,908	211,046
Personal Protective Equipment	17,497	53,541	54,612	55,704	56,818	57,954	59,113	60,296	61,501	62,731	63,986
Travel	24,595	75,261	76,766	78,301	79,867	81,465	83,094	84,756	86,451	88,180	89,944
Other Prof Services (HR, Legal, Tax)	86,005	263,174	268,438	273,807	279,283	284,868	290,566	296,377	302,305	308,351	314,518
Security Services & Rentals	176,598	540,389	551,196	562,220	573,465	584,934	596,633	608,565	620,737	633,151	645,814
Maintenance & Repairs	1,869,908	5,721,917	5,836,356	5,953,083	6,072,145	6,193,587	6,317,459	6,443,808	6,572,685	6,704,138	6,838,221
Software Expenses	82,637	252,868	257,926	263,084	268,346	273,713	279,187	284,771	290,466	296,276	302,201
Technical Support	0	0	0	0	0	0	0	0	0	0	0
Environmental Compliance	20,000	61,200	62,424	63,672	64,946	66,245	67,570	68,921	70,300	71,706	73,140
Propane Testing & Sampling	100,000	306,000	312,120	318,362	324,730	331,224	337,849	344,606	351,498	358,528	365,698
Insurance: Property & Liability	218,647	669,059	682,440	696,089	710,011	724,211	738,695	753,469	768,538	783,909	799,587
Variable Costs	**$3,332,122**	**$10,196,295**	**$10,400,221**	**$10,608,225**	**$10,820,389**	**$11,036,797**	**$11,257,533**	**$11,482,684**	**$11,712,338**	**$11,946,584**	**$12,185,516**
Fixed & Variable Costs	$5,052,291	$15,460,009	$15,769,210	$16,084,594	$16,406,286	$16,734,411	$17,069,100	$17,410,481	$17,758,691	$18,113,865	$18,476,142
BIR Gross Receipts Tax	252,615	773,000	788,460	804,230	820,314	836,721	853,455	870,524	887,935	905,693	923,807
BIR Income Tax	57,761	176,750	180,285	183,890	187,568	191,319	195,146	199,049	203,030	207,090	211,232
Total O&M	**$5,362,666**	**$16,409,759**	**$16,737,955**	**$17,072,714**	**$17,414,168**	**$17,762,451**	**$18,117,700**	**$18,480,054**	**$18,849,655**	**$19,226,648**	**$19,611,181**
Major Maintenance											
Propane Transfer Pump	$160,000	$0	$0	$179,587	$0	$0	$0	$0	$0	$0	$0
Propane Export Pump	300,000	0	0	336,725	0	0	0	0	0	0	0
Compressor	160,000	0	0	84,897	0	0	0	0	0	0	0
Propane Vaporizer - Shell and Tube HEX	0	816,000	832,320	0	0	0	0	0	0	0	0
Steam Condensate Accumulator	0	306,000	0	0	0	0	0	0	0	0	0
Steam Generator	400,000	400,000	0	0	0	0	0	0	0	0	0
Deaerator Drum	200,000	0	0	0	0	0	0	0	0	0	0
Flare Unit	0	0	0	0	0	0	0	0	937,328	0	0
Tanks for Flare Gas	0	0	0	42,448	0	0	0	0	0	0	0
Firefighting Pumping System	900,000	969,000	0	147,295	0	0	0	0	0	0	0
Emergency Power Generator Set	0	0	0	955,087	0	0	0	0	0	0	0
Major Maintenance	**$2,120,000**	**$2,491,000**	**$832,320**	**$1,746,039**	**$0**	**$0**	**$0**	**$0**	**$937,328**	**$0**	**$0**
Total O&M and Major Maintenance	**$7,482,666**	**$18,900,759**	**$17,570,275**	**$18,818,752**	**$17,414,168**	**$17,762,451**	**$18,117,700**	**$18,480,054**	**$19,786,983**	**$19,226,648**	**$19,611,181**

Propane Supply Infrastructure Operations and Maintenance Budget									
Start Date	1/1/2034	1/1/2035	1/1/2036	1/1/2037	1/1/2038	1/1/2039	1/1/2040	1/1/2041	1/1/2042
End Date	12/31/2034	12/31/2035	12/31/2036	12/31/2037	12/31/2038	12/31/2039	12/31/2040	12/31/2041	12/31/2042
Calendar Year	2034	2035	2036	2037	2038	2039	2040	2041	2042
Operating Year	18	19	20	21	22	23	24	25	26
STT and STX Combined									
Personnel Costs	$4,843,762	$4,940,637	$5,039,450	$5,140,239	$5,243,044	$5,347,904	$5,454,863	$5,563,960	$5,675,239
Saintnals Operations Fee	1,572,677	1,604,131	1,636,213	1,668,937	1,702,316	1,736,363	1,771,090	1,806,512	1,842,642
Fixed Costs	**$6,416,439**	**$6,544,768**	**$6,675,663**	**$6,809,176**	**$6,945,360**	**$7,084,267**	**$7,225,952**	**$7,370,471**	**$7,517,881**
Office Supplies	$99,832	$101,829	$103,866	$105,943	$108,062	$110,223	$112,427	$114,676	$116,970
Training & Education	40,016	40,816	41,633	42,465	43,315	44,181	45,064	45,966	46,885
Materials & Misc. Spare Parts	1,799,605	1,835,597	1,872,309	1,909,755	1,947,950	1,986,909	2,026,647	2,067,180	2,108,524
Vehicle Fuel & Maintenance	153,202	156,266	159,391	162,579	165,831	169,147	172,530	175,981	179,501
Boiler Fuel and Consumables	200,586	204,598	208,690	212,864	217,121	221,464	225,893	230,411	235,019
Communications	215,267	219,572	223,964	228,443	233,012	237,672	242,425	247,274	252,219
Personal Protective Equipment	65,266	66,571	67,903	69,261	70,646	72,059	73,500	74,970	76,469
Travel	91,742	93,577	95,449	97,358	99,305	101,291	103,317	105,383	107,491
Other Prof Services (HR, Legal, Tax)	320,808	327,224	333,769	340,444	347,253	354,198	361,282	368,508	375,878
Security Services & Rentals	658,731	671,905	685,343	699,050	713,031	727,292	741,838	756,674	771,808
Maintenance & Repairs	6,974,985	7,114,485	7,256,775	7,401,910	7,549,949	7,700,948	7,854,966	8,012,066	8,172,307
Software Expenses	308,245	314,410	320,698	327,112	333,654	340,328	347,134	354,077	361,158
Technical Support	0	0	0	0	0	0	0	0	0
Environmental Compliance	74,602	76,095	77,616	79,169	80,752	82,367	84,014	85,695	87,409
Propane Testing & Sampling	373,012	380,473	388,082	395,844	403,761	411,836	420,072	428,474	437,043
Insurance: Property & Liability	815,579	831,891	848,528	865,499	882,809	900,465	918,474	936,844	955,581
Variable Costs	**$12,429,226**	**$12,677,811**	**$12,931,367**	**$13,189,994**	**$13,453,794**	**$13,722,870**	**$13,997,328**	**$14,277,274**	**$14,562,820**
Fixed & Variable Costs	$18,845,665	$19,222,578	$19,607,030	$19,999,171	$20,399,154	$20,807,137	$21,223,280	$21,647,745	$22,080,700
BIR Gross Receipts Tax	942,283	961,129	980,351	999,959	1,019,958	1,040,357	1,061,164	1,082,387	1,104,035
BIR Income Tax	215,457	219,766	224,161	228,644	233,217	237,882	242,639	247,492	252,442
Total O&M	**$20,003,405**	**$20,403,473**	**$20,811,543**	**$21,227,774**	**$21,652,329**	**$22,085,376**	**$22,527,083**	**$22,977,625**	**$23,437,177**
Major Maintenance									
Propane Transfer Pump	$0	$0	$0	$0	$0	$0	$0	$0	$0
Propane Export Pump	0	0	0	0	0	0	0	0	0
Compressor	0	0	0	0	0	0	0	0	0
Propane Vaporizer - Shell and Tube HEX	0	0	1,034,885	0	0	0	0	0	0
Steam Condensate Accumulator	0	0	194,041	0	0	0	0	0	0
Steam Generator	0	0	2,069,771	0	0	0	0	0	0
Deaerator Drum	0	0	258,721	0	0	0	0	0	0
Flare Unit	0	0	0	0	0	0	0	0	0
Tanks for Flare Gas	0	0	0	0	0	0	0	0	0
Firefighting Pumping System	0	0	0	0	0	0	0	0	0
Emergency Power Generator Set	0	0	0	0	0	0	0	0	0
Major Maintenance	**$0**	**$0**	**$3,557,418**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Total O&M and Major Maintenance	**$20,003,405**	**$20,403,473**	**$24,368,961**	**$21,227,774**	**$21,652,329**	**$22,085,376**	**$22,527,083**	**$22,977,625**	**$23,437,177**

Site Management

Staffing of the Propane Supply Infrastructure is the responsibility of the third-party operations and maintenance services provider. Current staffing at the facility is sufficient for the third-party operator to manage the operations and maintenance of the Propane Supply Infrastructure safely and effectively. A summary of staffing, staff roles, and years of experience is shown below.

Propane Supply Infrastructure Maintenance and Operations Staffing

	Title	Facility	Years of Service	Description of Role
1	Terminal Director	STT	0.7	Responsible for all operations and maintenance of the facilities
2	Operations Manager	STX	1.7	Manager of both facilities - responsible for day to day facility operations
3	Operations Supervisor	STX	7.8	Supervisor of all Operators on STX
4	Operations Supervisor	STT	4.4	Supervisor of all Operators on STT
5	Administrative Assistant	STT	0.2	Office support

1	Lead Operator	STT	8.0	Terminal shift operator with extensive experience and knowledge
2	Lead Operator	STX	8.4	Terminal shift operator
3	Senior Operator	STT	4.8	Terminal shift operator
4	Senior Operator	STX	4.8	Terminal shift operator
5	Operator	STT	5.0	Terminal shift operator
6	Operator	STT	5.0	Terminal shift operator
7	Operator	STT	5.0	Terminal shift operator
8	Operator	STT	4.2	Terminal shift operator
9	Operator	STT	5.0	Terminal shift operator
10	Operator	STT	5.2	Terminal shift operator
11	Operator	STT	4.6	Terminal shift operator
12	Operator	STT	0.3	Terminal shift operator
13	Operator	STX	4.8	Terminal shift operator
14	Operator	STX	8.7	Terminal shift operator
15	Operator	STX	7.9	Terminal shift operator
16	Operator	STX	4.8	Terminal shift operator
17	Operator	STX	7.4	Terminal shift operator
18	Operator	STX	6.1	Terminal shift operator
19	Operator	STX	0.3	Terminal shift operator
20	Operator	STT	0.3	Terminal shift operator
21	Junior Operator	STT	0.3	Terminal shift operator

Operating Hours

WAPA operations are continuous. Its power generation and water production, and thus the Propane Supply Infrastructure that provides the fuel to WAPA's generators, operates 24 hours per day, 7 days per week, 365 days per year.

Security

The Randolph Harley and Estate Richmond Power plants have contiguous fencing around each plant's permitter. Access is controlled by armed guards, and visitor access must be approved by the appropriate plant personnel. WAPA also has numerous security monitoring cameras that provide surveillance for its facilities. The Propane Supply Infrastructure at each plant is within each plant's permitter and the Propane Supply Infrastructure also has contiguous fencing around the facilities with electronically controlled access. Finally, because both plants have marine fuel docks, a number of employees are also required to obtain the Transportation Worker Identification Credential ("TWIC") from the US Transportation Security Administration ("TSA"). WAPA performs background checks on all new hires; however, employees must pass an additional

TSA background check to obtain TWIC clearance.

5.1.2 Changing Environmental Conditions

Changing environmental conditions such as sea level rise or more frequent and severe weather events will be monitored by the operations staff and addressed by incorporating risk assessment activities into the O&M plan for the facility. Risk assessment will be conducted in part by:

1) Identifying the risks related to changing environment.
2) Assessment of Consequences. Assess the consequences of the natural hazard events resulting in disaster.
3) Assess the probability. Establish the probability of a specific event occurring.
4) Risk Characterization. Ranking of risk according to severity and potential consequences.

The O&M Plan will be amended and updated according to the results of the risk assessment.

5.2.0 Demonstration of Benefit to Most Impacted and Distressed Area[5]

Benefit Cost Analysis

BCA Methodology

The covered project's benefit cost analysis (BCA) has been completed for the request of HUD CDBG-Mitigation funds.

Under HUD Guidelines, benefit-cost analyses for Covered Projects may employ the FEMA standardized methodology unless one (1) or more of the following conditions is met:

1. A BCA has already been completed or is in progress pursuant to BCA guidelines issued by other Federal agencies such as the Department of Energy;
2. It addresses a non-correctable flaw in the FEMA-approved BCA methodology; or
3. It proposes a new approach that is unavailable using the FEMA BCA Toolkit.

The FEMA-approved methodology and Toolkit have been developed geared toward analyzing major natural hazards such as earthquakes, fires, floods, hurricane winds, and tornados.

The propane supply infrastructure was evaluated with the FEMA Benefit Cost Analysis (BCA) toolkit as a hazard, uncategorized with the damage and frequency relationship based on professional expected damages. The BCA for this project has not been previously submitted, nor has it been denied on any other platform.

The inputs to the BCA are as follows:

Cost Estimation	
Project Useful Life	20 Years
Project Cost	$145,000,000

Annual Maintenance Cost	$20,400,000
Number of Maintenance Years	20 Years
Pre-mitigation Impact	
Annual Fuel Cost	$88,200,000
Recurrence Interval	1 Year
Post Mitigation Impact	
Annual Fuel Cost	$30,200,000
Recurrence Interval	1 Year

The outputs of the BCA are as follows:

Benefit Cost Summary	
Total Standard Mitigation Benefits	$529,700,659
Total Mitigation Project Cost	$361,117,891
Benefit Cost Ratio – Standard	1.47

Project Useful Life

The propane supply infrastructure was placed into service in 2017 and has an initial useful life of approximately 30 years. The Project Useful Life input to the BCA is the remaining useful life which is conservatively estimated as 20 years.

Project Cost

The Project Cost input to the BCA of $145,000,000 is the acquisition price for the propane supply infrastructure as agreed between WAPA and Vitol.

Annual Maintenance Cost

The Annual Maintenance Cost input to the BCA of $20,400,000 is based on a maintenance cost schedule for the propane supply infrastructure over its remaining useful life of 20 years. The maintenance cost schedule is based on the most recent operating & maintenance cost budget for the facilities adjusted to include incremental costs for major maintenance requirements. $20,400,000 is the average annual maintenance cost for the 20-year period from 2024 to 2043. 2023 was not included in the average as it represents a partial year.

The maintenance cost schedule is attached in the file “BCA Model 05.26.2023”.

Pre-mitigation Impact

If WAPA does not acquire the propane supply infrastructure, WAPA will not be able to rely on propane as a generation fuel and will be forced to rely on diesel fuel alone. The measurable impact of not acquiring the propane supply infrastructure is the resulting increase in fuel costs.

Fuel costs have been projected over the remaining useful life of the propane supply infrastructure assuming diesel only operations. The Pre-mitigation Annual Fuel Cost input to the BCA of $88,200,000 is the average diesel only fuel cost for the 20-year period from 2024 to 2043. 2023 was not included in the average as it represents a partial year. The Annual Fuel Cost over the remaining useful life of the propane supply infrastructure is based on the amount of diesel fuel required to supply electricity to WAPA's customers and forward diesel fuel market pricing. The projection also considers future penetration of renewable generation which reduces the amount of diesel fuel required over time.

The Recurrence Interval input to the BCA for the Pre-mitigation Impact is 1 year as the Annual Fuel Cost is a yearly occurrence.

The projected pre-mitigation annual fuel cost is attached in the file "BCA Model 05.26.2023".

Post Mitigation Impact

If WAPA acquires the propane supply infrastructure, WAPA will be able to rely on propane and diesel fuel as generation fuel. The economic benefit and measurable impact of acquiring the propane supply infrastructure is the resulting decrease in fuel costs compared to the pre-mitigation scenario.

Fuel costs have been projected over the remaining useful life of the propane supply infrastructure assuming operations utilizing both propane and diesel. The Post Mitigation Annual Fuel Cost input to the BCA of $38,200,000 is the average fuel cost for the 20-year period from 2024 to 2043. 2023 was not included in the average as it represents a partial year. The Annual Fuel Cost over the remaining useful life of the propane supply infrastructure is based on the amount of propane and diesel fuel required to supply electricity to WAPA's customers and forward propane and diesel fuel market pricing. The projection also considers future penetration of renewable generation which reduces the amount of propane and diesel fuel required over time.

The Recurrence Interval input to the BCA for the Post Mitigation Impact is 1 year as the Annual Fuel Cost is a yearly occurrence.

The projected post mitigation annual fuel cost is attached in the file "BCA Model 05.26.2023".

Non-measured Impact

The acquisition of the propane supply infrastructure provides other benefits not measured in the BCA including, but not limited to the following:

- Prevents a major reduction in available generation capacity – WAPA currently operates generators totaling approximately 40 megawatts (MW) that can only operate on propane. An additional 36 MW of new generators will be placed into operation in 2023. The new generators can operate primarily on propane or diesel fuel but require a steady supply of propane for the emissions system when operating primarily on diesel fuel. This combined generation capacity will become stranded assets if the propane supply infrastructure is not acquired.
- Maintains access to fuel storage capacity – The propane supply infrastructure provides 27 days of fuel storage of St. Thomas and 20 days of fuel storage on St. Croix which will be lost if not acquired.
- Maintains access to multiple fuels for power generation –WAPA's risk of fuel supply chain disruption is

increased if it must rely on a single fuel for power generation.

These benefits increase WAPA's resiliency and reliability in the event of future disasters and reduce the risk of prolonged territory wide electrical outages. FEMA's BCA model ascribes the following value to lost electrical service days:

Utility Properties	
Type of Utility	Electric
Number of Customers	100,000
Value of Unit of Service	$182 / Customer / Day
Total Value of Service per Day	$18,200,000

The number of customers is based on the approximate population of the US Virgin Islands as WAPA provides electric service to the vast majority of residents. If the benefits above were measured in the BCA, each day of avoided territorial electric service interruption would increase project benefits by $18,200,000.

V. Consistency with Other Mitigation Activities

The infrastructure activity category detailed in the body of this action plan proposed two programs to bolster the proper functioning of the territories' infrastructure systems. Specific areas that were highlighted are energy, transportation, and telecommunications as it was evident that these systems failed in the aftermath of the 2017 storms.

The acquisition of the Propane Supply Infrastructure clearly reduces the risk of loss of life or property and satisfies the intent of the Critical & Natural Infrastructure Resilience Program as it bolsters the resiliency of both the power and water supply by hardening the territory's fuel storage capacity. Neither energy nor water can be produced without fuel thus, hardening the fuel supply lessens the threat posed by identified risks including that of natural disasters.

Additionally, a more resilient Energy Lifeline makes anticipated benefits of direct investments in other community lifelines possible. Resilient power and water supply directly reduces the risks to other community lifelines including Food, Water & Shelter, Health & Medical, Safety & Security, and Communications. Without investment in the Energy Lifeline, activities carried out to bolster the other lifelines may not realize their full potential. As such, the acquisition of the Propane Supply Infrastructure is consistent with other proposed mitigation activities in the Territory thus ultimately reducing the risk of loss of life or property to all residents.

VI. APPENDIX 1- Propane Supply Infrastructure Permits

	Names of Permits/Documents	**Statutes & Regulations**
1	CZM Major Land Permits (I.PG Terminals Only)	12 VIC§ 910 12 VIR&R Subchapter 910
2	Air Construction Permits (including regasification) Air Operation Permits	12VIC § 206 12 VIR&R Subchapter 206

	Names of Permits/Documents	Statutes & Regulations
3	Air Construction Permits (Turbine Conversions) Air Operating Permits (Turbine Conversions)	12VIC § 206 12 VIR&R Subchapter 206
4	Demolition Permits	29VIC § 294
5	Electrical Permits	29VIC § 294
6	Plumbing Permits	29 VIC§ 311
7	Building Permits	29VIC § 294
8	TPDES General Stormwater Discharge Permits (Construction)	12VIC § 185 12 VIR&R Subchapter 184
9	CZM Major Water/USACE 404 Permits - St. Croix (Dock Modifications)	12 VIC§ 910 12 VIR&R Subchapter 910
10	CZM Major Water/USACE 404 Permits - St. Thomas (Dock Modifications - currently has no CZM Permit for dock)	12 VIC§ 910 12 VIR&R Subchapter 910
11	USCG Lightering Operations Manual	
12	USCG Letter of Recommendation	33 CFR Part 127, Subpart A
13	CZM Major Water Permit (Vessels- may include Long-Term Mooring permit)	12 VIC§ 910 12 VIR&R Subchapter910
14	TPDES Multi-Sector General Stormwater Discharge Permits (LPG Terminal Operations Only)	12VIC § 185 12 VIR&R Subchapter 184
15	TPDES Multi-Sector General Stormwater Discharge Permits (LPG Terminal Operations - modification to WAPA's existing permits)	12VIC § 185 12 VIR&R Subchapter 184
16	Waste (Hazardous) Generator Permits (LPG Terminals Only)	19 VIC§ 1560 12 VIR&R Subchapter 1560
17	Waste (Hazardous) Generator Registrations (LPG Terminals Only)	RCRA Subtitles C & D
18	Terminal Facility Licenses (LPG Terminals Only)	12 VIC§ 706
19	Terminal Facility License Financial Assurances (LPG Terminals Only)	12 VIC§ 714
20	Pollution Prevention Plans (LPG Terminals Only)	40 CFR Part 112
21	Facility Response Plan for Power Plant and Dock - St Croix (WAPA's existing plan for St. Croix to be modified to accommodate LPG, if required; any other aspects of	33 CFR Part 154, Subpart F 40 CFR. Part 112, Subpart D

	Names of Permits/Documents	Statutes & Regulations
	existing plan will remain the responsibility of WAPA)	
22	Emergency Response Action Plan for Power Plant and Dock - St. Croix (WAPA's existing plan for St. Croix to be modified to accommodate LPG, if required; any other aspects of existing plan will remain the responsibility of WAPA)	33 CFR Part J54, Subpart F 40 CFR Part 112. Subpart *D*
23	Facility Security Plans (including Facility Security Assessment Reports) (Docks)	33 CFR Part 105, Subparts C&D
24	Facility Operations and Emergency Manuals (apply to docks; description of transfer system at dock and emergency response procedures)	33 CPR Part 127. Subpart 33 CPR Part 154
25	Spill Prevention Control, and Countermeasure Plan - St. Thomas (LPG Terminal Only)	40 CPR Part 112, Subpart A
26	Spill Prevention Control, and Countermeasure Plan - St. Croix (LPG Terminal Only)	40 CPR Part 112, Subpart A
27	Spill Prevention Control, and Countermeasure Plan - St. Croix (WAPA's existing plan for St. Croix to be modified to accommodate LPG if required; any other aspects of existing plan will remain the responsibility of WAPA)	40 CFR Part 112, Subpart A
28	Vessel Security Plans (including Vessel Security Assessment Reports)	33 CFR Part 104, Subparts C&D

DEPARTMENT OF PUBLIC WORKS
VETERAN'S DRIVE COVERED PROJECT ANALYSIS & DESCRIPTION

I. Project Description and Eligibility

Introduction

Veterans Drive has routinely experienced flooding during major storms and hurricanes, resulting in hazardous traffic conditions. FEMA Mitigation Assessment Team Report: Hurricanes Irma and Maria in the U.S. Virgin Islands points to localized ponding and water runoff after severe storms and hurricanes due to inadequate drainage infrastructure. The proposed project area has insufficient drainage infrastructure, impervious walkways, few catchment basins along the streets, undersized culverts, and inadequate use of green infrastructure which result in significant stormwater flooding along curbs and streets during and after major storm events, interfering with traffic, and pedestrian and traffic safety issues.

The United States Virgin Islands (USVI) Department of Public Works (DPW) plans to implement a series of transportation infrastructure and pedestrian improvements along the Island of St. Thomas's primary east-to-west highway, Veterans Drive (Route 30), in the capital city of Charlotte Amalie, to increase the resilience and reliability of the transportation system during and following hurricanes and other disaster events to mitigate risks of loss of life and injury. These mitigation investments are part of the more prominent Charlotte Amalie Waterfront Revitalization Project. The Phase II Veterans Drive (Route 30) Project includes a suite of transportation improvements that will rebuild the city of Charlotte Amalie's bayside transportation facilities to alleviate localized street flooding as well as enhance a sense of place. The Project will increase the resiliency of the waterfront district's critical roadway, Veterans Drive, by increasing roadway capacity and reducing congestion; improving access to evacuation routes, transportation facilities, and community lifelines; improving stormwater and drainage infrastructure; hardening retaining wall infrastructure; and enhancing pedestrian walkways which will better enable Low- and Moderate- Income (LMI) residents to access community lifelines during major storm events.

The Phase II Veterans Drive Mitigation Improvements Project is eligible for CDBG-Mitigation funding in accordance with the following criteria:

- The proposed project will provide improvements to public infrastructure to mitigate risk to transportation lifelines and reduce the risk of storm water, runoff erosion, and flood exposure as identified in the Mitigation Needs assessment and USVI Hazard Mitigation Plan. These proposed improvements meet the definition of mitigation activities as they advance long-term resilience to natural disasters and reduce the risk of loss of life, injury, damage to and loss of property, and hardship by lessening the impact of future disasters.

- The Mitigation Needs Assessment identifies hazards that would have a high impact on Transportation Lifelines, which include riverine and coastal flooding, as well as erosion associated with flooding. The Veterans Drive improvements will mitigate these risks through drainage improvements, erosion control Best Management Practices (BMPs), and infrastructure hardening of the sea wall. The project utilizes green and natural infrastructure components and techniques compatible with ASFPM's NAI approach to ensure effective design. The proactive and multifunctional design integrates community infrastructure for flood damage reduction and open/green space for improved mobility. Additionally, the project aligns with the region's planned capital improvements and disaster recovery efforts, as outlined in the USVI CDBG-Mitigation Action Plan and USVI Hazard Mitigation Plan

- The construction, reconstruction and installation of public works and site or other improvements are eligible for CDBG activities. Veterans Drive is a public facility owned by the US Virgin Islands Department of Public Works. The project is therefore an eligible HUD activity under Section 105(a)(2)

– Public Facilities and improvements of Title I of The Housing and Community Development Act of 1974 (HCDA).

- The Veterans Drive Mitigation Improvement Project would meet the HUD National Objective for benefit to low- and moderate- income (LMI) persons. The project's resilience, roadway, and pedestrian improvements will benefit all LMI residents in the service area and therefore qualifies under the LMI area benefit category, as detailed below. Within the project service area, 63.18 percent of beneficiaries are LMI residents, exceeding the area benefit threshold of 51 percent and meeting the HUD national objective for benefit to LMI persons.

- DPW has prepared an Operation and Maintenance (O&M) Plan, as well as a detailed Benefit Cost Analysis (BCA), which was conducted in accordance with the benefit-cost methodology as recommended by the U.S. Department of Transportation (USDOT) in the 2023 Benefit-Cost Analysis Guidance for Discretionary Grant Programs. In 2021 dollars, the Project is expected to generate $90.85 million in 2021 dollars in discounted benefits using a 7 percent discount rate. The Project creates these quantitative benefits primarily by reducing roadway congestion on Veterans, resulting in fewer roadway crashes, faster travel times and reduced emissions. This leads to an overall project Net Present Value of $7.37 million and a Benefit Cost Ratio (BCR) of 1.09. A detailed BCA narrative is included in Section VI. **Demonstration of Benefit to Most Impacted and Distressed Area**, and the BCA backup documentation is attached as an Appendix.

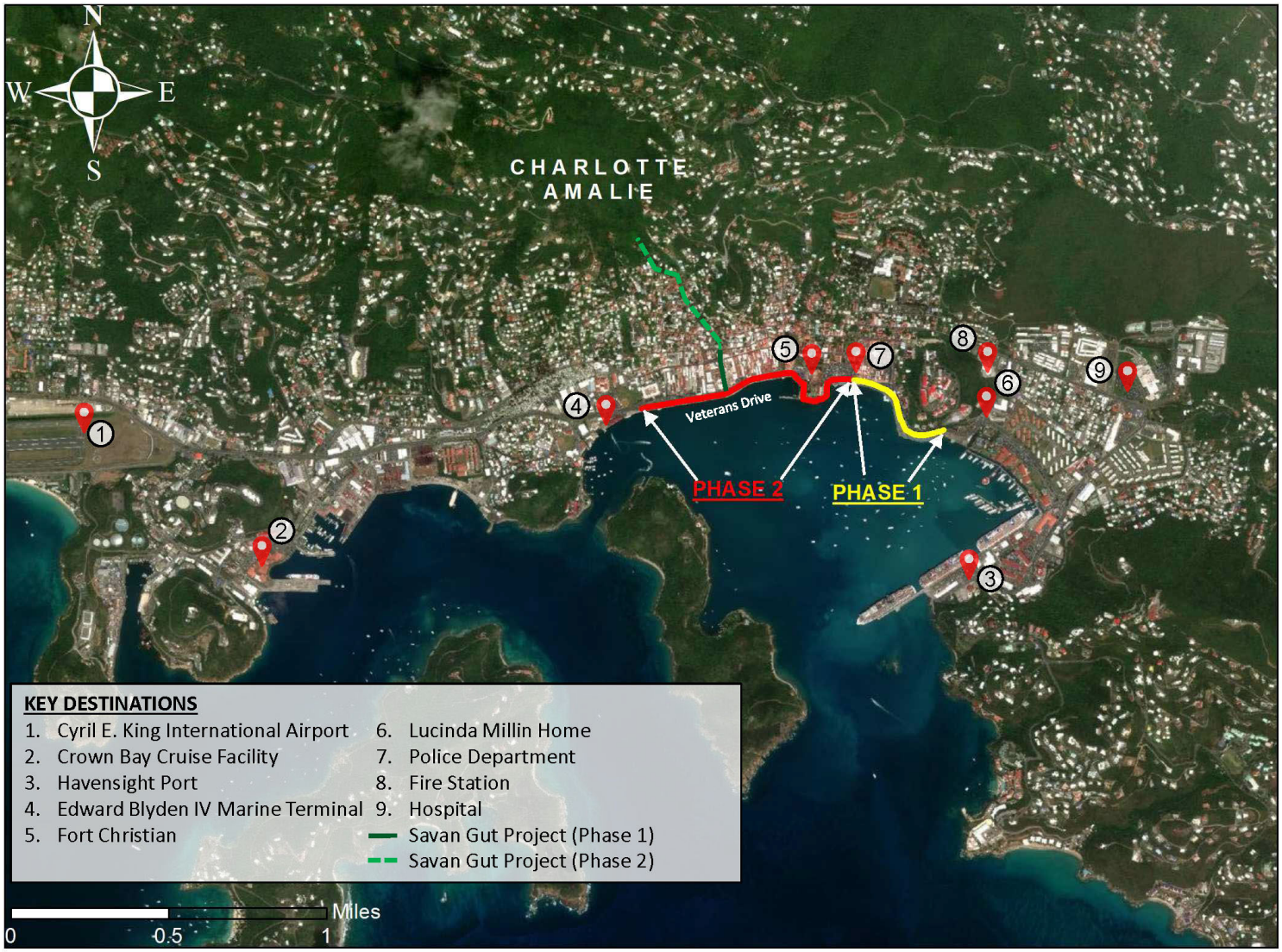
- The NEPA Environmental Assessment was approved in 2017, thus meeting HUD's requirements for environmental review. Phase II of Veterans Drive has obtained all necessary permits and endorsements from both the Territorial and Federal regulatory agencies.

In order to make these mitigation improvements, DPW is respectfully requesting $124.21 million in CDBG-Mitigation funds to match the $25 million in funding already secured through USDOT Rebuilding American Infrastructure with Sustainability and Equity (RAISE) funding to complete the $166.21 million Veterans Drive Mitigation Improvements Project.

Project Location

The proposed project will be located on Veterans Drive (Route 30), with the western terminus located at west of Kronprindsens Tvaer Gade (west of Winward Passage Hotel) and the eastern terminus located at Hospital Gade, an approximate distance of about 0.9 mile (see *Figure 80*). Phase 1 of the Veterans Drive Mitigation Improvement project has already been completed and is located on Veterans Drive between Hospital Gade on the west and Long Bay Road on the east.

Figure 80: Project Location



Project Scope

The Phase II Veterans Drive Mitigation Improvements Project will fortify the waterfront area, safeguarding the island's most critical roadway from flooding and erosion; reduce congestion for vehicular travelers, enhancing access to community lifelines and evacuation routes and decreasing travel times for first responders; and create multimodal transportation alternatives that will enhance walkability, safety, and community mobility after storm events. The Phase II Veterans Drive Mitigation Improvements Project builds off of and extends the mitigation improvements from Phase I of the project, which was completed in 2021 (see Figure 81).

Figure 81: Phase I Veterans Drive Mitigation Improvements Project Construction Complete

Resiliency Improvements

As recently experienced during Hurricane Irma and Maria, the existing infrastructure is ill equipped to handle sustained period of heavy rain and rise in the water level from the Harbor. Skirting the Charlotte Amalie Harbor makes Veterans Drive more vulnerable than most transportation infrastructure projects to natural hazards, particularly flooding, erosion, and sea level rise. Being the main connection between the western and eastern sections of the Island, flooding on Veterans Drive makes travelling from one side of the Island to the other quite onerous and hinders the ability of first responders to respond to emergencies in a timely way.

According to the USVI CDBG-Mitigation Action Plan, ineffective draining can exacerbate riverine flooding, causing shallow flooding in the business district of Charlotte Amalie and surrounding neighborhoods, which are served by Veterans Drive. The neighborhoods adjacent to the business district have a high population of LMI residents; within the census tracts surrounding the immediate project corridor, over 70 percent of households are LMI households. Furthermore, the roadway provides access to the Lucinda Millin Home, a public housing apartment complex for seniors, on the eastern end of Veterans Drive, as shown in *Figure 80*. These demographic characteristics increase the social vulnerability of these communities, thus compounding the flooding risks and necessitating resiliency improvements. LMI population is discussed in more detail in Section IV and shown in *Figure 87*.

In order to address flooding and erosion risks, the project includes improvements to the existing sea wall, stormwater systems, and drainage infrastructure. The proposed design will replace the existing rip-rap (man-placed rubble and rocks) wall with a reinforced concrete counterfort wall. Proposed stormwater improvements include installing permanent erosion/pollution control BMPs prior to non-point source discharge into the harbor. Stormceptors®, for the removal of free oil and suspended solids from stormwater, are proposed as part of the roadway drainage system prior to each proposed discharge point. The improvements will reduce peak stormwater flow for a 25-year, 24-hour design storm event.

The existing drainage system impacted by the proposed roadway improvements will be removed and replaced with the new proposed drainage system. The proposed storm drain system, consisting of curb inlets, storm drains and pollution/sediment control devices has been designed to collect and convey stormwater runoff for a 10-year storm event. The required criteria for this type of roadway facility is a 3-year storm event. Designing for a 10-year instead of 3-year will equip the storm drain system with additional capacity for future roadway improvements and sufficient storage capacity to minimize impact of storm surge into the roadway. All cross drains have been sized to allow for future roadway widening and the

hydraulic grade line in the system has been designed to provide a minimum of 1.5 foot of clearance between the elevations of the hydraulic gradient for design storm conditions and the theoretical gutter elevation including minor losses. Tideflex valves are proposed at all outfall locations to prevent backflow into the system and reduce maintenance operations. The proposed drainage design has been oversized to significantly reduce the risk of flooding.

Roadway Capacity Upgrades

Transportation infrastructure was damaged after hurricanes Irma and Maria. Flooding, high wind and windborne debris resulted in damage traffic signals, streetlights, and signs. Debris from the storm impacted Veterans Drive and blocked emergency access and traffic flow. The hurricanes exacerbated existing traffic conditions on Veterans Drive, which are naturally bottlenecked by the road's transition from four lanes to two, east of Fort Christian. This constriction increases gridlock along Veterans Drive, which provides access to the island's major transportation facilities – Cyril E. King Airport, Crown Bay port, and Edward Blyden IV Marine Terminal to the west, and Havensight Port to the east – and Charlotte Amalie's residential neighborhoods, as well as a substantial number of community lifelines, particularly schools and energy lifelines (see Figure 84 and Figure 85). Veterans Drive also provides access to many tsunami evacuation routes (see Figure 83), which are critical infrastructure for the entire population, but are especially important for connecting LMI populations to safe shelter, food, and other critical lifelines during and after significant weather events. The project reduces the long-term risk of loss of life and injury by providing increased roadway capacity which will allow pedestrians and vehicles to navigate around debris more easily on the roadway during and after major storm events. The increased roadway capacity also reduces the risk of loss of life and injury by reducing travel time, thus improving emergency response times and access to critical community facilities before, during, and after a hurricane. Furthermore, the decreased congestion resulting from roadway capacity improvements will reduce greenhouse gas emissions, minimizing global warming impacts that produce more intense hurricanes.

Roadway capacity upgrades include widening the current two-lane sections on either side of the promontory to provide for four lanes and creating a new four-lane section around the promontory where the Legislative Building resides. The new facility will provide for much needed capacity on the most critical segment of the transportation network on the Island. The roadway will include a median to accommodate landscaping using low maintenance and native trees. The substandard lane-widths will be increased to AASHTO standards and will improve safety by separating auto traffic from pedestrians, reducing bottlenecks that cause sudden breaking, and reducing the frequency of standing water on the roadway. These improvements will reduce travel time on the roadway, facilitating faster response time for emergency responders and improved access to community lifelines.

During hurricanes Irma and Maria, entire sections of roadways were impacted, leading to dangerous driving conditions, limited roadway access, and costly recovery efforts. Aging infrastructure has an increased risk of failure during a hurricane or other extreme event. The existing Veterans Drive roadway was built in the 1950s, well past its useful life. The project roadway improvements will increase resiliency and reduce the long-term risk to loss of life, injury, and damage to property by replacing the existing aging facility, which will decrease the risk of structural failures that threaten safety and increase recovery costs. The construction of the new facility around the promontory and reconstruction of the approaches to the promontory provide much needed updates to the infrastructure of the area. With the current alignment, Veterans Drive dissects the area between Fort Christian and the Legislature Building. The construction of the roadway will realign Veterans Drive from its current route to a path along the coastal perimeter of Legislature Peninsula, which is home to the USVI Legislature and a United States Coast Guard pier. The design calls for the current Veterans Drive alignment to be replaced with a pedestrian street, creating a walkable space between the two buildings of historical significance. The realignment will also reduce long-term risk of property damage to Fort Christian, the oldest standing structure on the island, by reducing vibration from vehicles traveling close to the fort.

Green Infrastructure Improvements

As climate change creates more frequent, extreme weather events, green infrastructure can help manage both localized and riverine floods. The project will incorporate components of green streets infrastructure design to reduce the long-term risk of loss of life and injury by addressing stormwater management and flooding problems on Veterans Drive. The green streets infrastructure design elements, which include street trees and a landscaped median will supplement the proposed mitigation improvements to the drainage infrastructure system. The project plans call for the planting of a dense tree canopy along a new, landscaped median dividing the travel lanes, as well as along the sidewalk and pedestrian promenade. Local support was identified for a combination of palm trees (Phoenix Sylvestris and Puerto Rican Royal Palm trees) and native shade trees (Pitch Apple/Autograph tree). Street trees also provide additional benefits beyond flood mitigation and stormwater management. Planting street trees helps to define road boundaries, which protects pedestrians and motorists. Furthermore, the shade trees located along the pedestrian promenade and sidewalk and will minimize the urban heat island effect, mitigating the risk of extreme heat.

Streetscape and Pedestrian Improvements

The ability to efficiently evacuate prior to a storm is key to preventing loss of life and injury and requires not only appropriate vehicular facilities, but also pedestrian facilities. This need is elevated on St. Thomas, where 18.8 percent of households lack access to a vehicle. On Veterans Drive, current high-speed vehicular traffic and limited, poorly marked crosswalks limit mobility and pose safety risks to pedestrians even when no natural hazards are present. These safety risks are further exacerbated leading up to a natural hazard event, when people may need to evacuate to remove themselves from harm's way. Hurricane damage can also result in fuel shortages, as was the case following Hurricane Maria, requiring more people to utilize pedestrian facilities to access critical services after a storm. The Phase II Veterans Drive Mitigation Improvements Project includes infrastructure improvements that will improve pedestrian safety and mobility, thus reducing risks to pedestrian safety prior to and following a natural hazard. The proposed improvements will incorporate a 20- to 40-foot, tree-lined, pedestrian promenade immediately adjacent to the waterfront. The promenade will feature regular crosswalks providing connections to the commercial district and neighborhoods immediately to the north. A sidewalk will also be constructed on the north side of Veterans Drive, and the corridor will be equipped with lighting to improve vehicular and pedestrian/cyclist safety during evening and nighttime. The physically separated pedestrian promenade planned for both sides of the road, combined with frequent pedestrian crosswalks and the extended sidewalk, will create a safer and more inviting environment for pedestrians. Additionally, the landscaped median separating oncoming traffic drastically reduces the occurrence of crashes and provides additional refuge for pedestrians crossing to the waterfront promenade.

Summary of Improvements

In summary, the Veterans Drive Mitigation Improvements project will increase resilience to disasters and reduce the long-term risk of loss of life, injury, damage to and loss of property, by providing:

- Stormwater improvements that will reduce peak stormwater flow and minimize erosion and pollution through best management practices.
- Modern drainage infrastructure that exceeds design standards to reduce current and future flooding risks.
- Hardened sea wall infrastructure that will improve the resiliency of the roadway and waterfront corridor.
- Increased roadway capacity and decreased congestion, thus increasing access and reducing travel time to critical transportation, safety and security, and energy lifelines that need to be accessed in preparation of and in response to disaster events, as well as tsunami evacuation routes.
- A safe, resilient transportation facility that will be built in compliance with the AASHTO Design

standards and is replacing an aging facility that has far exceeded its useful life.

- Street trees along the pedestrian promenade and sidewalk that offer multiple green infrastructure benefits, including flood mitigation and urban heat island mitigation.
- Multimodal improvements and reduced congestion that will reduce greenhouse gas emissions, which contribute to more intense storm events driven by global warming.
- Pedestrian safety improvements that will enhance pedestrian mobility and safety prior to and following a disaster.

Permits

Phase II of Veterans Drive has obtained all necessary permits and endorsements from both the Territorial and Federal regulatory agencies. DPW received the SAJ-1996-01459(SP-JCM) from the USACE after review from National Marine Fisheries Services (NMFS), Protected Resource Division (PRD), and Habitat Conservation Division (HCD), Fish and Wildlife Service (FWS), Environmental Protection Agency (EPA) and the State Historic Preservation Office (SHPO). The project has been approved by the Department of Planning and Natural Resources (DPNR), Division of Coastal Zone Management (CZM), CZT-3-12 (L&W), after review by DPNR Division of Fish and Wildlife (DFW), Division of Environmental Protection (DEP) and SHPO. And has received a Water Quality Certificate (WQC) from DEP.

The project has approved environmental and water quality monitoring plans which were implemented in Phase I and will be implemented through the completion of the project.

Project Schedule

The project schedule for the Phase II Veterans Drive Mitigation Improvements Project is shown below in *Table 46*.

Table 46: Phase II Veterans Drive Mitigation Improvements Project Schedule

Project	Begin	End
Milestone I: Veterans Drive Phase II Project Kick Off and Coordination with Stakeholders	7/26/2019	7/31/2023
Milestone II: Permitting	10/11/2019	4/27/2020
Milestone III: Phase II Plans Submittal (30%)	10/1/2019	1/29/2020
Milestone IV: Phase II Plans Submittal (60%)	4/26/2021	7/26/2021
Milestone V: Phase II Plans Submittal (90%)	7/27/2021	6/28/2023
Milestone VII: Phase II Plans Submittal (100%)	6/29/2023	10/6/2023
Milestone VIII: Project Construction	10/1/2024	9/30/2028

HUD Eligible Activity

Construction of the Veterans Drive Mitigation Improvement Project (Phase II) is an eligible HUD activity under Section 105(a)(2) – Public Facilities and improvements of Title I of The Housing and Community Development Act of 1974 (HCDA). The construction, reconstruction and installation of public works and site or other improvements are eligible for CDBG activities. Veterans Drive is a public facility owned by the US Virgin Islands Department of Public Works.

Project Cost

The Phase II Veterans Drive Mitigation Improvement Project is estimated to cost $166.2 million. This cost estimate is based on the Engineer's Preliminary Level Opinion of Probable Construction Cost, which utilized a mile cost approach similar to the Phase I cost estimate. This cost estimate was updated and used for the Phase II Veterans Drive Mitigation Improvements Project 2022 RAISE Grant application submittal. To account for rising costs since the RAISE Grant submittal, the CPI Inflation calculator was used to update the cost estimate, using a 7.04 percent inflation rate for 2021 and a 6.45 percent inflation rate for 2022. Contingency costs account for 20 percent of total project costs to factor in any unexpected costs as well as costs associated with potential project risks, such as increased material and labor costs due to COVID-19 and the potential need to bring in materials from outside the island. The contingency is within FHWA's appropriate range for the design phase of the project and will be adjusted as the project progresses and the final engineers cost estimate is developed.[5]

Phase 1 of the project utilized a competitive bid process and followed all federal requirements for competitiveness (Uniform Grant Policy 2CFR Part 200). Phase II will follow the same process, including an independent cost estimate and competitive bid process to ensure cost reasonableness. The current cost estimates are shown in *Table 47* below. An engineer's cost estimate will be provided in concurrence with submittal of 90 percent design plans.

Table 47: Project Costs

Category	Project Category Description	Cost (2023$)
1	Construction – Roadway and Pedestrian Improvements, Traffic Control, Contractor Survey, Testing, Erosion and Sediment Control	$22.0 M
2	Construction – Utilities	$6.0 M
3	Construction – Structural (Reinforced concrete counterfort wall, Promenade)	$69.4 M
4	Streetscape Improvement (Hardscape, Landscaping)	$14.1 M
5	Construction – Drainage	$32.5 M
6	Construction – Electrical, Signalization	$22.4 M
	Total (2023$)	**$166.2 M**

DPW has already secured $25 million in RAISE funding through submittal of a 2022 RAISE grant application. The remaining project costs are proposed to be funded through the requested CDBG-MIT funds, as shown

[5] https://www.fhwa.dot.gov/majorprojects/cost_estimating/guidance.cfm

below in *Table 48*.

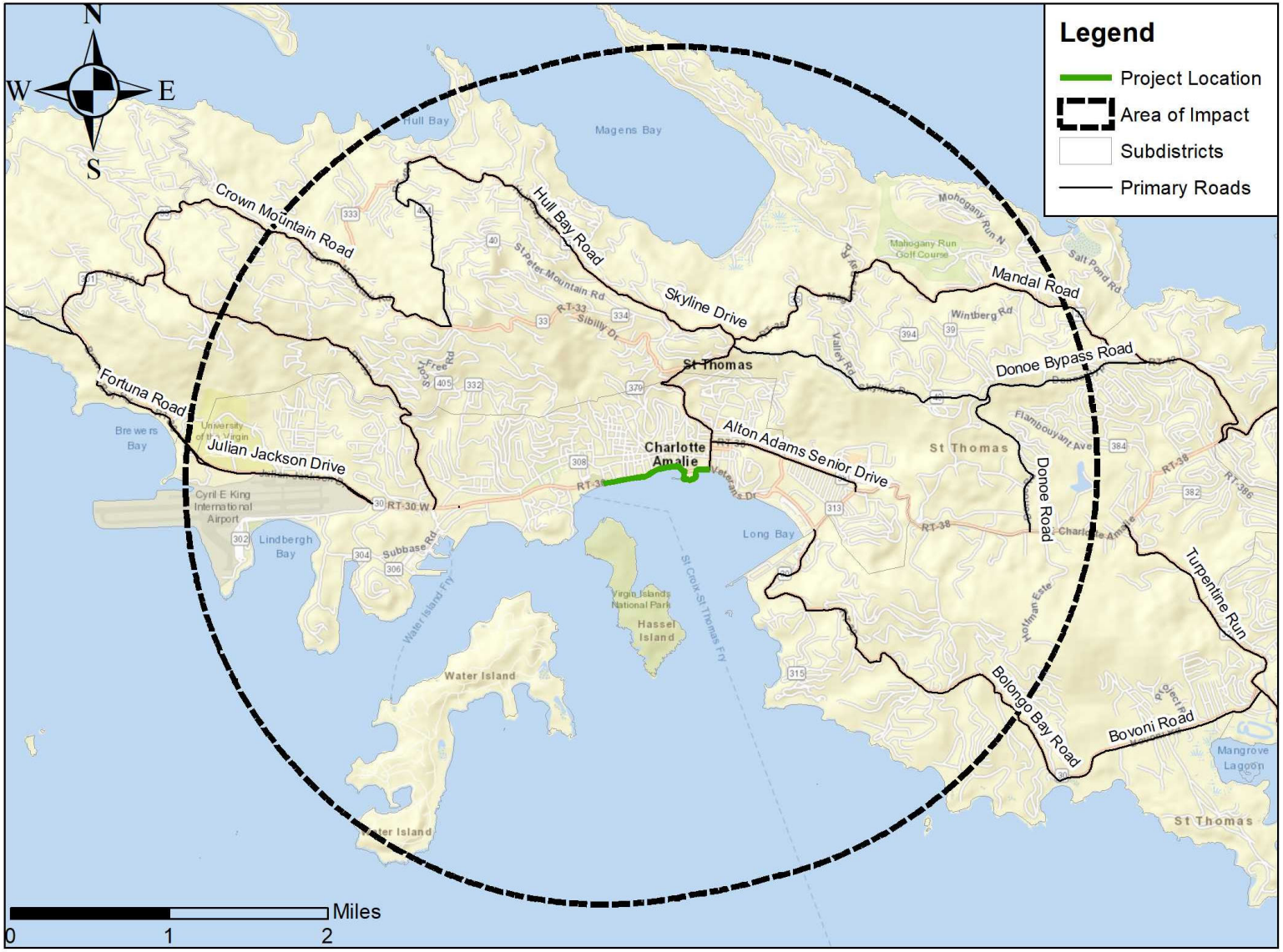
Table 48: Project Funding

Project Cost Category	RAISE Funds	FEMA	CDBG-MIT Requested
Construction – Roadway and Pedestrian Improvements, Traffic Control, Contractor Survey, Testing, Erosion and Sediment Control			$22.0 M
Construction – Utilities			$6.0 M
Construction – Structural (Reinforced concrete counterfort wall, Promenade)	$25.00 M	$5.0 M	$39.4 M
Streetscape Improvement (Hardscape, Landscaping)			$14.1 M
Construction – Drainage		$12.0 M	$20.5 M
Construction – Electrical, Signalization			$22.4 M
Sub-Total	**$25.00 M**	**$17.00 M**	**$124.4 M**
Total (2023$)		**$166.2 M**	

Area of Impact

The project impact area spans a substantial portion of the island, providing benefits to communities and lifeline assets well beyond the project corridor. Not only is Veterans Drive the island's primary east-west roadway, it also provides crucial connections to transportation, safety and security, and energy lifelines. Alternate routes have limited capacity and are circuitous, leading to longer response times for emergency services. Furthermore, Veterans Drive is an important link in the island's tsunami evacuation network. Considering these factors, a 2.5-mile buffer around the project corridor was identified as the area of impact for the project, as shown below in *Figure 82*. While the entire island stands to benefit from the improvements on Veterans Drive due to the access it provides to critical lifelines and services, the 2.5-mile buffer was selected as a more conservative area of impact.

Figure 82: Area of Impact



Impacts to the Population

The primary beneficiaries of the project are those that reside within the area of impact, or 2.5 miles around the project corridor. To assess which populations would benefit from the project, demographics were analyzed for census tracts that have at least 50 percent of their geography within 2.5 miles of the project corridor. Within these block groups, 63.18 percent of the population are considered Low- and Moderate-Income[6].

The project may also yield benefits to those beyond the area of impact, as Veterans Drive is the island's primary east-west roadway and provides important linkages to major destinations that serve the entire island. Across the entirety of St. Thomas, 59.83 percent of residents are considered Low- and Moderate-Income. Visitors to the island also stand to benefit from the project.

The project benefits include:

- Increased resiliency of the roadway to flooding and storm surge due to drainage, green infrastructure, and sea wall improvements.
- Ability for more effective evacuations as a result of increased capacity and decreased congestion as well as multimodal improvements.
- Improved mobility to major destinations, including transportation hubs and downtown Charlotte Amalie as well as energy lifelines, safety and security lifelines, and tsunami evacuation routes, due to increased capacity and decreased congestion.
- Expedited recovery efforts, including distribution of food, medicine, emergency services, and other supplies following a natural hazard event, due to increased capacity and reduced travel time on the roadway.
- Improved vehicular and pedestrian mobility after a natural hazard event, as the additional roadway capacity will lessen the impact of storm debris that can make roadways unnavigable.
- Improved pedestrian mobility and safety, particularly for residents who do not have access to a vehicle.
- Reduced greenhouse gas emissions and environmental pollutants due to less vehicle idling stemming from congestion.
- Reduced urban heat island effect due to the inclusion of shade trees along the pedestrian promenade and sidewalks.

Acquisition

No right-of-way acquisitions are necessary for construction of this project.

Resilient or Mitigative Elements

The resilient or mitigative elements of the project include drainage, stormwater, and seawall improvements to address flooding; shade trees, which increase pedestrian safety, and reduce the urban heat island affect; and increased roadway capacity and decreased congestion, which reduces travel time to access community lifelines, improves mobility for evacuations, recovery efforts, and provision of emergency services, and decreases greenhouse gas emissions caused by idling.

This project will comply with all Federal regulations for Highway and Bridge construction. Federal Highway Administration's (FHWA) Federal Lands Highway publications (FLH) are the primary resources to be used for

[6] FEMA IA Low- and Moderate-Income Data

design criteria, along with AASHTO and MUTCD design standards:

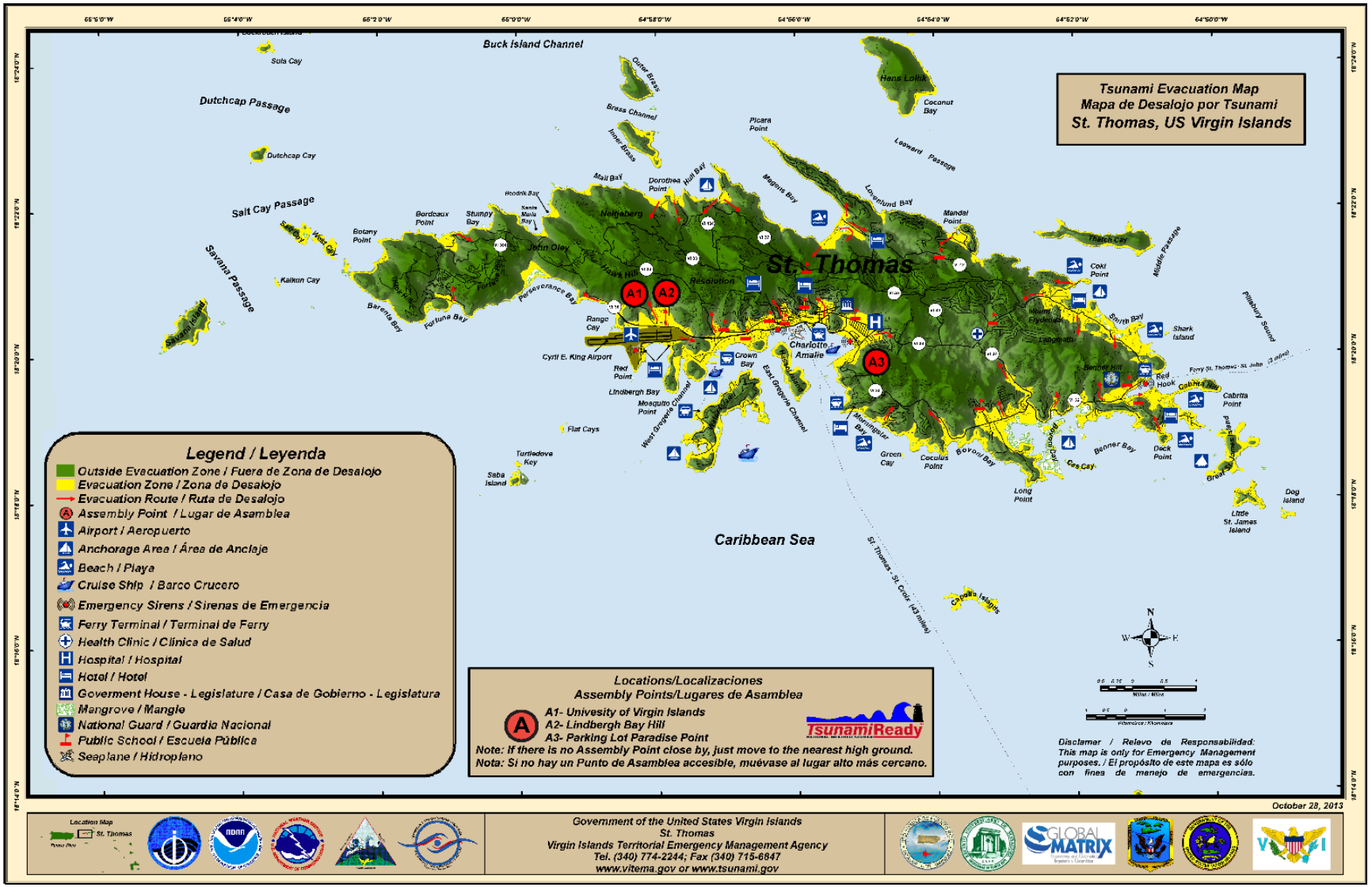
Normative/Standard	Application
FLH Project Development and Design Manual (PDDM), 2018	Primary source of design criteria for all disciplines of this roadway project. The PDDM is intended to be used with current engineering practices and procedures issued by FHWA and the American Association of State Highway and Transportation Officials (AASHTO).
Additional FLH publications	FLH Standard Drawings (Latest supplemented with the Eastern Federal Lands Highway Division (EFLHD) English Detail Drawings) FLH Standard Specifications (FP-14)
AASHTO Design Standards	"A Policy on Geometric Design of Highways and Streets". AASHTO. 2011. "Roadside Design Guide". AASHTO. 2011. "A Guide for Achieving Flexibility in Highway Design". AASHTO. 2004. "AASHTO Guide for Design of Pavement Structures", 4th Edition, Volume 1 (1993). 3rd Edition, Volume 2 (1986). 4th Ed., Supplement (1998). AASHTO LRFD Bridge Design Specifications (2015).
MUTCD 2009	"Manual on Uniform Traffic Control Devices (MUTCD)". FHWA. 2009.
FHWA	"Standard Highway Signs". FHWA. 2004. "Flexibility in Highway Design". FHWA.
United States Virgin Islands	"Virgin Islands Environmental Protection Handbook (VIEPH". University of the Virgin Islands Cooperative Extension Service. 2002. Disaster Programs Office Government of the US Virgin Islands

II. Consistency with Mitigation Needs Assessment

The USVI Mitigation Needs Assessment evaluated the impact that each hazard would have on community lifelines. The assessment identified riverine flooding, coastal flooding, hurricane winds, and tsunamis as hazards having a high impact on transportation lifelines and called for projects that include hardening public infrastructure in order to mitigate the risks to these hazards. The Phase II Veterans Drive Mitigation Improvements Project addresses flooding and erosion risks by hardening infrastructure through construction of an enhanced drainage system that exceeds design requirements and provides additional capacity to account for future roadway upgrades and to minimize storm surge impacts; a reinforced concrete counterfort sea wall that replaces the existing rip-rap wall, and stormwater BMPs that will help manage erosion and pollution and reduce peak stormwater flow for a 25-year/24-hour storm event. The 2019 Virgin Islands Hazard Mitigation Plan specifically identified actions to address flooding issues on Veterans Drive through drainage improvements, which this project will accomplish. Furthermore, this project is already included in Appendix G: Proposed Projects List for Potential Consideration Under CDBG-MIT Funding in the USVI Mitigation Action Plan, noting that it could mitigate risk to Transportation Lifelines.

While the resiliency improvements primarily address flooding and erosion risks, the improvements also address risks associated with high winds and tsunamis. The project will provide increased roadway capacity, allowing pedestrians and vehicles to more easily navigate around debris on the roadway as a result of high winds. Additionally, Veterans Drive is a crucial component of the tsunami evacuation route network, as it provides access to numerous evacuations routes (see *Figure 83*). Therefore, this project is consistent with the Mitigation Needs Assessment as it proposes improvements that will mitigate the most high-impact hazards to transportation lifelines.

Figure 83: St. Thomas Tsunami Evacuation Map



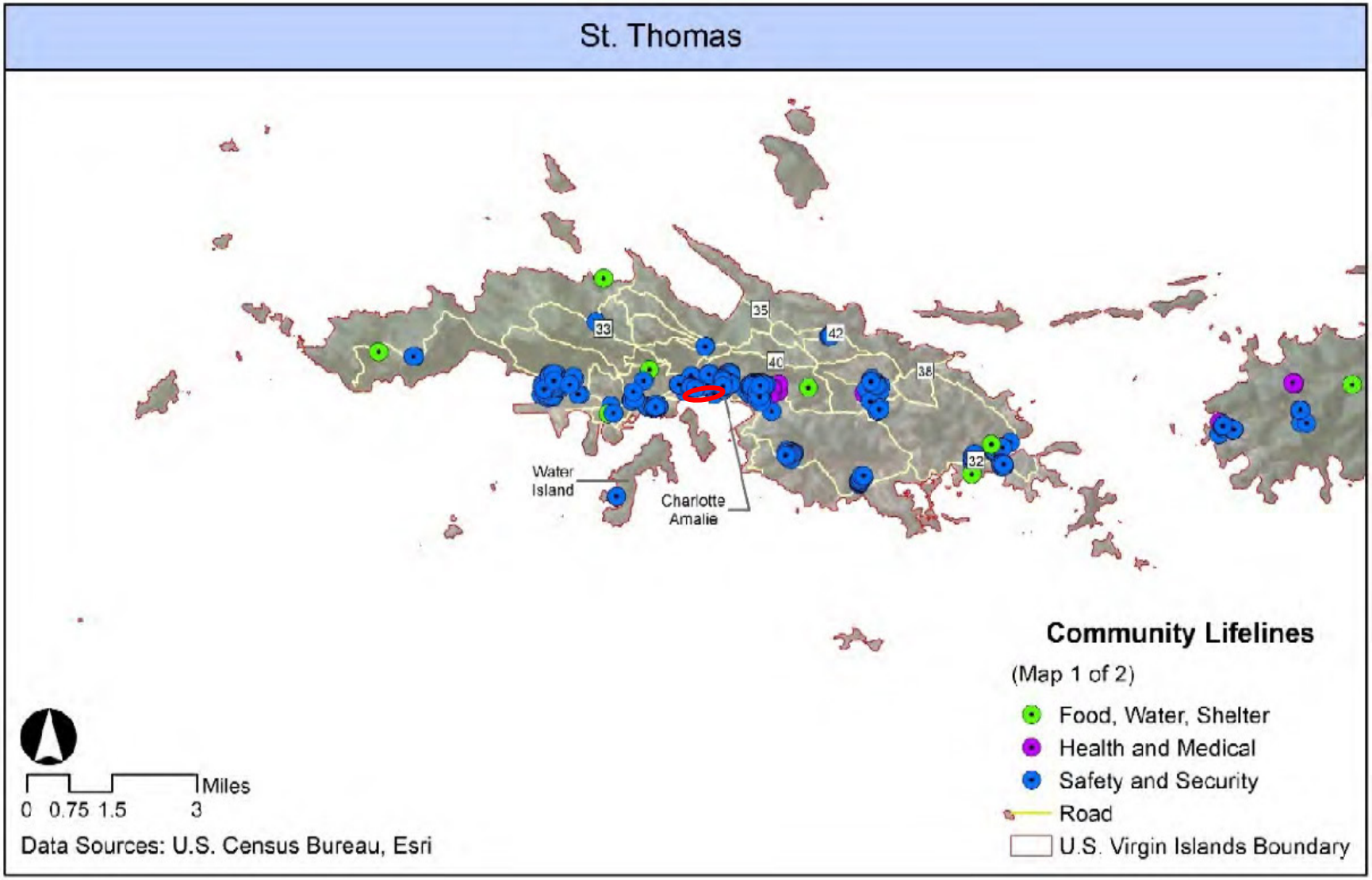
Source: Virgin Islands Territorial Emergency Management Agency

III. Analysis of Transportation Lifeline Mitigation

Resilient Corridors for Connections to Community Lifelines

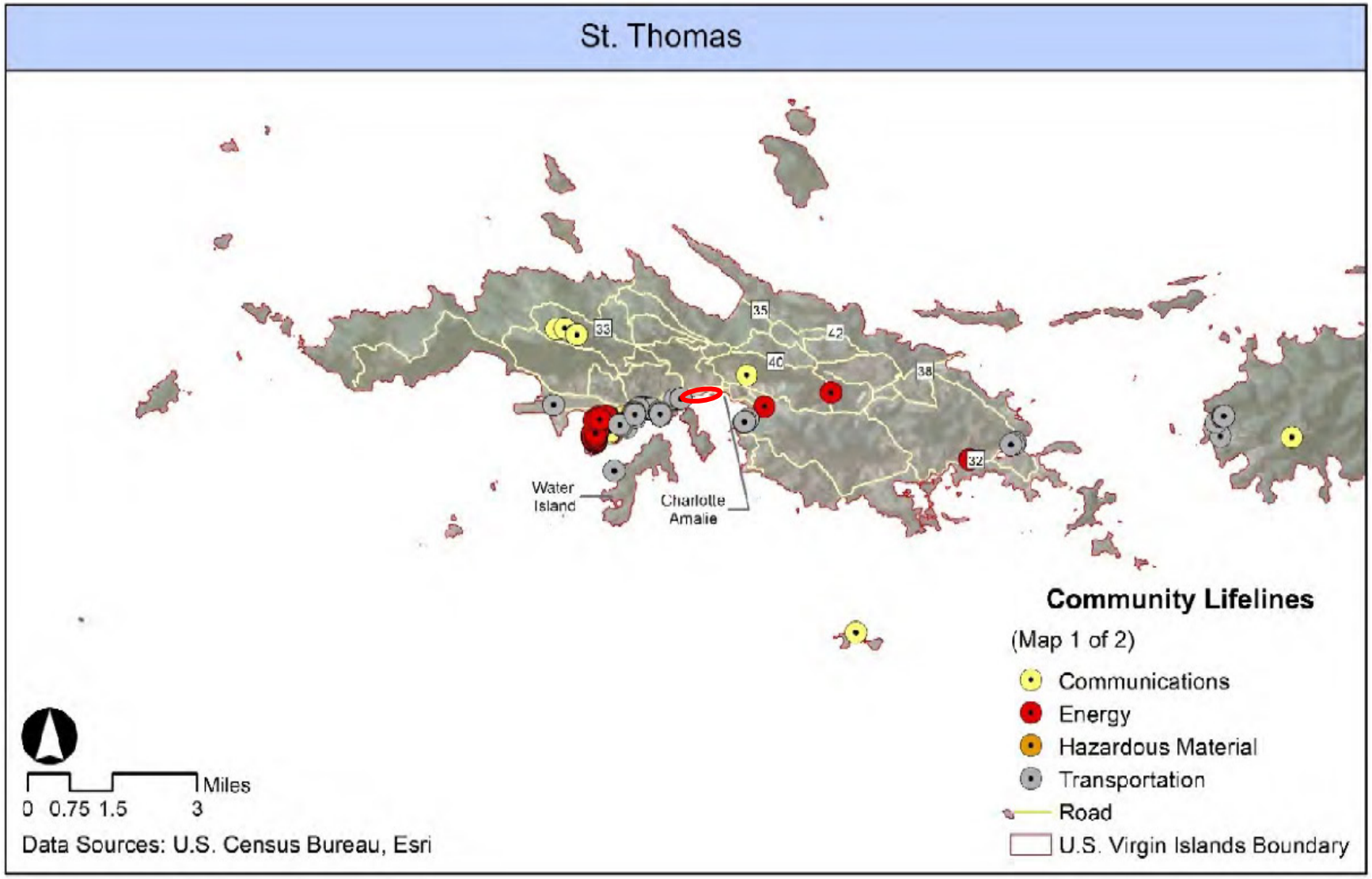
Transportation lifelines are critical to the efficient movement of people and goods. Veterans Drive is a key east-west roadway on St. Thomas and provides connections to major destinations, including many community lifelines. *Figure 84* depicts the location of food, water, and shelter, health and medical, and safety and security Community Lifelines, with the red circle identifying the project location. The safety and security community lifelines—primarily schools—are clustered along the southern coastline near Charlotte Amalie, where the project corridor is located. *Figure 85* shows the location of communications, energy, hazardous material, and transportation lifelines. Transportation and energy lifelines are primarily located on the coast between the airports and ports. The project corridor, noted by the red circle, is a crucial link between these lifelines.

Figure 84: St. Thomas Community Lifelines Part 1



Source: United States Virgin Islands CDBG-Mitigation Action Plan

Figure 85: St. Thomas Community Lifelines Part 2

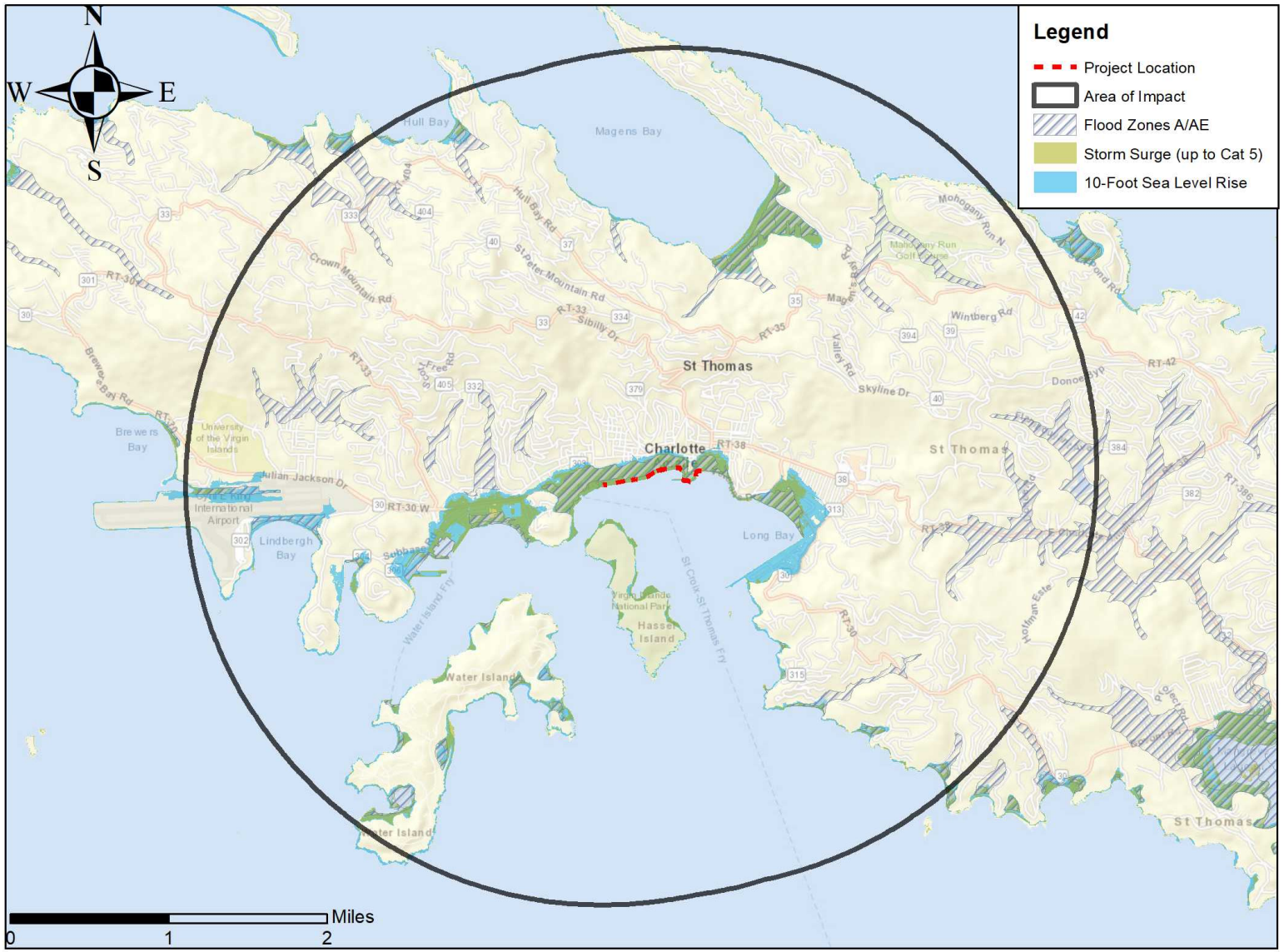


Source: United States Virgin Islands CDBG-Mitigation Action Plan

Investing in Resilient Corridors

This project supports the Mitigation Action Plan's prioritization of projects that will harden public infrastructure and mitigate risks to public health and safety. The Phase II Veterans Drive Mitigation Improvements Project will harden public infrastructure through the construction of an enhanced drainage system, a new reinforced concrete counterfort sea wall, and stormwater BMPs. These enhancements are critical not only due to the importance of the roadway in context of other community lifelines and evacuation routes, but also due to the project corridor's vulnerability to flooding. As shown below in *Figure 86*, the project corridor is located in an area that is vulnerable to both riverine and coastal flooding. Therefore, investing in the resilience of the roadway is important to the community's overall resilience.

Figure 86: Project Exposure to Flood Risk



IV. Compliance with National Objective for Covered Projects

The Veterans Drive Project meets the LMA National Objective. LMA area benefit activity benefits all residents in a particular area where at least 51 percent of the residents are LMI persons. Veterans Drive infrastructure activities help all LMI residents in the service area delineated and therefore qualify under the LMI area benefit category to meet a national objective, as detailed below. The proposed project will provide improvements to public infrastructure to mitigate risk to transportation lifelines and reduce the risk of storm water, runoff erosion, and flood exposure as identified in the Mitigation Needs assessment and USVI Hazard Mitigation Plan.

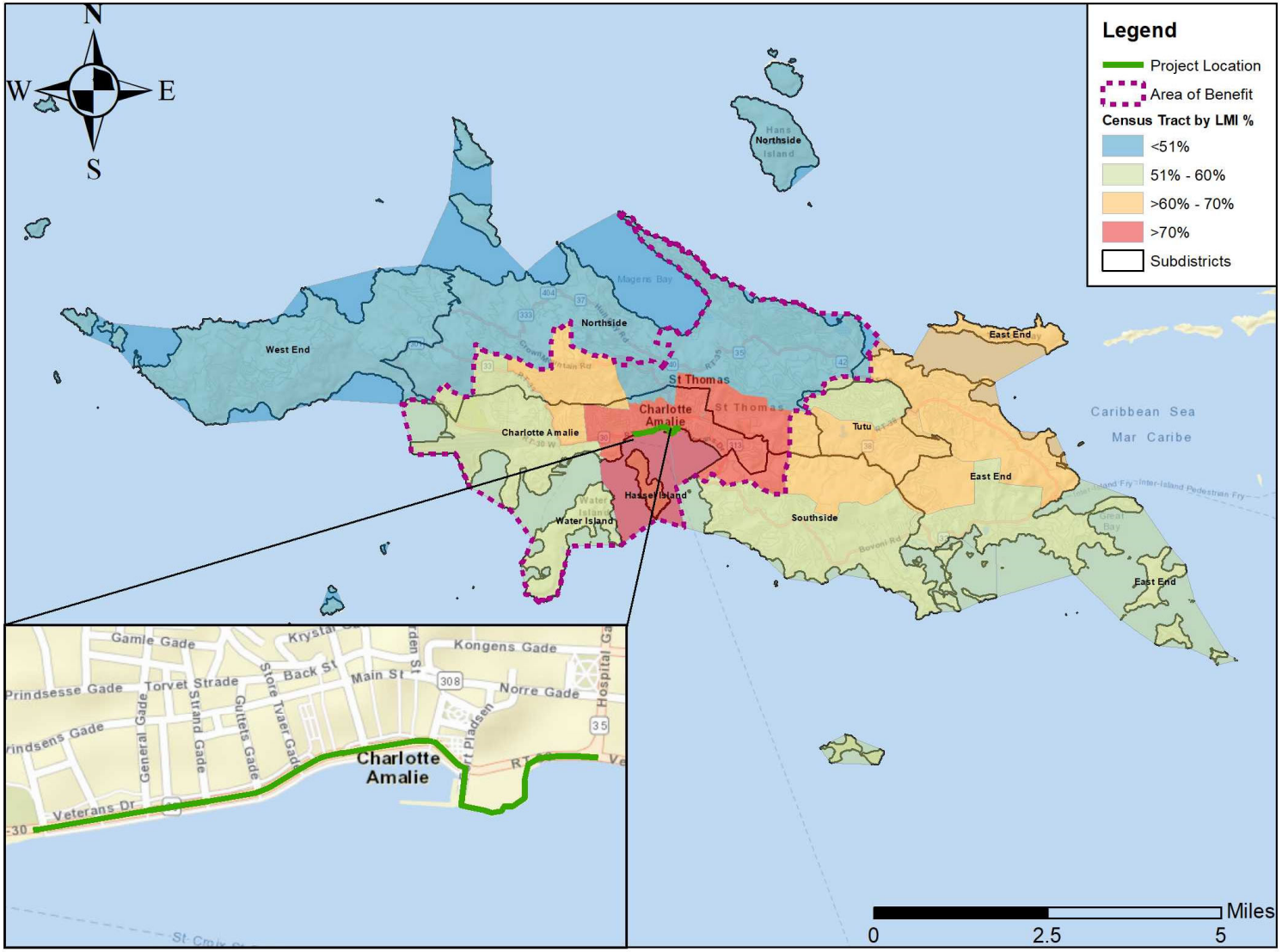
The proposed project will be located on Veterans Drive, from Kronprindsens Tvaer Gade to Hospital Gade, in the City of Charlotte Amalie. The project area of impact encompasses a 2.5-mile buffer around the project corridor, as shown in *Figure 82*. In order to determine the percentage of LMI beneficiaries within the area of impact, all census tracts with at least 50 percent of their geography within the 2.5-mile buffer were considered to be part of the Area of Benefit, or service area, as shown below in *Figure 87*. The geographic boundaries of the service area include the following census tracts (based on FEMA IA data): 9604, 9606, 9608, 9610, 9611, and 9612.

The service area was determined by assessing the nature and location of the roadway improvements, as well as the importance of the roadway to accessing other critical lifelines on the island, which benefit residents well beyond the immediate project corridor. Transportation is identified as a community lifeline in the USVI CDBG-Mitigation Action Plan, as transportation infrastructure facilitates the mobility of people and goods and provides access to other community lifelines. Veterans Drive is located in Charlotte Amalie, the largest and most densely populated city on St. Thomas. While the buildings directly on Veterans Drive are largely commercial in nature, the service area as a whole is primarily residential, with much of the population concentrated just to the north of the project corridor (see *Figure 88*). However, the majority of residential streets are narrow and circuitous, so Veterans Drive is often utilized as a faster and more direct route. As the island's primary east-west roadway, Veterans Drive is a crucial connection for residents to access services in downtown Charlotte Amalie, as well as community lifelines like schools (see *Figure 84*) and other critical transportation lifelines such as the Cyril E. King airport and the Crown Bay and Havensight ports. Veterans Drive also provides access to the island's evacuation routes and to key emergency services; the USVI police department is located on the eastern segment of Veterans Drive, and the fire department and hospital are both within a half-mile of the roadway.

The Veterans Drive Mitigation Improvements Project will benefit all residents within the service area, which includes a high percentage of LMI residents. In order to determine the percentage of LMI residents within the service area, Low- and Moderate-Income Summary Data supplied by FEMA was analyzed at the census tract level. *Figure 87* below shows the percentage of LMI residents in the census tracts within the Area of Benefit. *Table 49* identifies the total number of beneficiaries, total number of LMI beneficiaries, and the percentage of LMI beneficiaries served by the Phase II Veterans Drive Mitigation Improvements Project. As 63.18 percent of beneficiaries are LMI residents, this project exceeds the area benefit threshold of 51 percent and meets the HUD national objective for benefit to LMI persons. Furthermore, when considering a broader service area that includes the entire island, 59.83 percent of beneficiaries are considered Low-Moderate Income, thus still meeting the area benefit threshold.

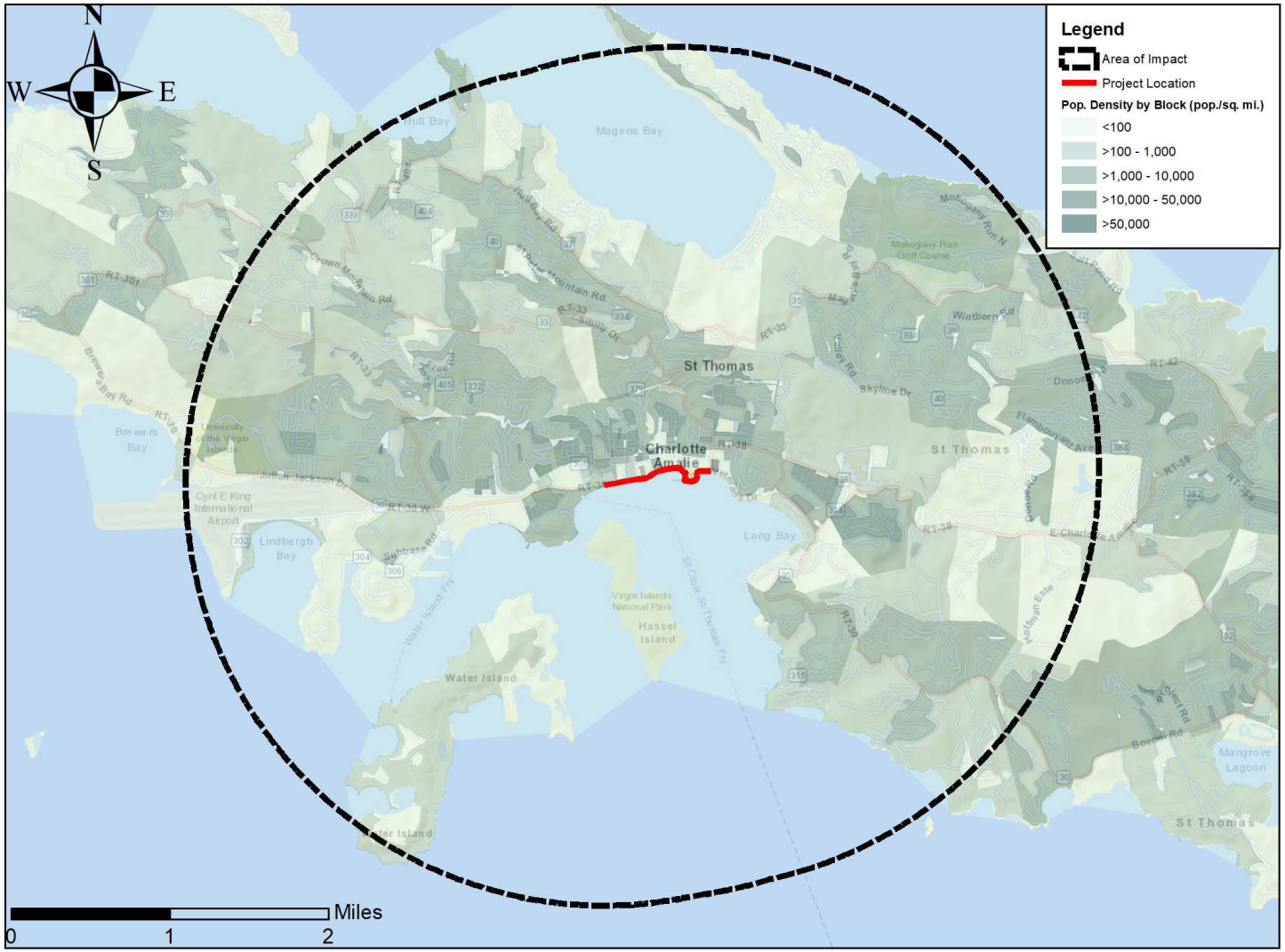
Of note, the Phase II Savan Gut project, which is proposing improvements to address flooding risk, is also located within the Phase II Veterans Drive Mitigation Improvements project service area, north of the Veterans Drive project (see *Figure 80*). The Phase II Savan Gut project will connect to Phase I of the Savan Gut project, which was constructed in 1989 and includes drainage infrastructure that flows underneath the Phase II Veterans Drive project segment and into the harbor. The Phase II Veterans Drive improvements will extend the existing culvert from the Phase I Savan Gut project to the southern limits of the project, which will support the Savan Phase II Gut project by updating the downstream infrastructure.

Figure 87: Low- and Moderate-Income Area Benefit Map



Source: FEMA IA Low- and Moderate-Income Data

Figure 88: Population Density on St. Thomas



Source: 2010 Census Data

Table 49: LMI Persons Within Project Service Area and Island-Wide

Total Persons, Total LMI Persons, and Percentage of LMI Persons Served			
	Total Persons	Total LMI	Percentage LMI
Service Area	25,176	15,907	63.18%
St. Thomas	51,634	30,891	59.83%

Source: FEMA IA Low- and Moderate-Income Data

V. Long-term efficacy and sustainability of the project

A detailed O&M Plan will be developed as follows:

1. Require a draft O&M plan as part of submittal and review process (see *Table 50* below).
2. Require final O&M plan as part shall include:
    a. Schedules and projections of O&M tasks, staffing, and estimated costs for the useful life of the project.
    b. How O&M for CDBG-MIT project is anticipated to be funded and resourced including borrowing authority, retargeting of existing financial resources, proposed changes to tax policy or practices that would be required, or any State or local resources identified to pay for or provide O&M costs. Annual appropriations for project O&M costs are estimated at $10,000 starting in 2028, as shown in the Build Scenario in *Table 50* below.
    c. Signed Commitment of Responsible Entity/Entities towards funding and carrying out required O&M, including any MOUs, Service, or other agreements, as necessary, when multiple parties are involved.
3. Infrastructure Maintenance
    a. Short Term Maintenance
    b. Long Term Maintenance
4. Site Management
    a. Roles and Responsibilities
    b. Hours of Operation
    c. Staffing
    d. Security
    e. Visitation
    f. Communication Plan

O&M has been estimated on an annual basis based on current conditions.[7] This estimate is incorporated

[7] The USDOT methodology requires that all dollars be adjusted to a single base year. Maintenance costs are estimated to begin in 2028; costs for the second and third periods have been inflation adjust to the first period annual values.

in the BCA analysis provided in the Demonstration of Benefit section. Development and maintenance of the O&M plan will be monitored in accordance with HUD requirements and industry standards.

Table 50: Schedule of Operations and Maintenance Costs (in undiscounted 2021 Dollars)

	No-Build		Build	
Year	O&M	R&R	O&M	R&R
2023	$15,000	$495,000	-	-
2024	-	-	-	-
2025	-	-	-	-
2026	-	-	-	-
2027	-	-	-	-
2028	-	-	$10,000	-
2029	$15,000	$495,000	$10,000	-
2030	-	-	$10,000	-
2031	-	-	$10,000	-
2032	-	-	$10,000	-
2033	-	-	$10,000	-
2034	-	-	$10,000	-
2035	$15,000	$495,000	$10,000	-
2036	-	-	$10,000	-
2037	-	-	$10,000	-
2038	-	-	$10,000	-
2039	-	-	$10,000	-
2040	-	-	$10,000	$672,612
2041	$15,000	$495,000	$10,000	-
2042	-	-	$10,000	-
2043	-	-	$10,000	-
2044	-	-	$10,000	-
2045	-	-	$10,000	-

	No-Build		Build	
Year	O&M	R&R	O&M	R&R
2046	-	-	$10,000	-
2047	$15,000	$495,000	$10,000	-
2048	-	-	$10,000	-

Upon completion of Veterans Drive Phase II, the operations and maintenance costs for the project will include regular landscaping and harbor maintenance and resurfacing after 13 years. The estimated annual costs of operating and maintaining the proposed facility were based on current O&M costs per mile on typical facilities in the USVI. Operating and maintenance costs are expected to start in 2028 and resurfacing is estimated to take place in 2040, 13 years after opening.

Operations and maintenance costs for existing conditions assumes periodic resurfacing of the pavement and minor general roadway improvements. The existing facility was constructed in the 1950s and is beyond its useful life cycle. Several types of initial asset investments will therefore need to be replaced or rehabilitated under the existing conditions. St. Thomas spends approximately $550,000/mile every 6 years for rehabilitation and resurfacing. Resurfacing and Rehabilitation (R&R) cost of $495,000 every 6 years was estimated to maintain the existing facility.

Changing environmental conditions such as climate sensitive events, more frequent and severe weather events, and localized hazardous events, will be addressed by incorporating risk assessment activities into the O&M plan for the project. Risk assessment for changing climatically conditions will allow:

1. Identification of the Risks related to changing environment. For example, change in frequency of occurrence of natural hazards.

2. Assessment of Consequences. Assess the consequences of the natural hazard events resulting in disaster.

3. Assess the probability. Establish the probability of a specific event occurring.

4. Risk Characterization. Ranking of risk according to severity and potential consequences. The O&M Plan will be amended and updated according to the results of the risk assessment.

VI. Demonstration of Benefit to Most Impacted and Distressed Area[8]

The entire Territory of the US Virgin Islands has been declared a most impacted and distressed (MID) area under 84 FR 47528. The covered project's benefits have been quantified through a benefit cost analysis (BCA), which has been completed for the request of HUD CDBG- Mitigation funds. No other federal agency has reviewed or rejected the prepared BCA.

BCA Methodology

A BCA Has Already Been Completed Pursuant to BCA Guidelines

[8] See 84 FR 35838, section II. C. Most Impacted and Distressed Areas. The entire Island of St. Thomas is considered most impacted and distressed area.

Under HUD Guidelines, benefit-cost analyses for Covered Projects may employ the FEMA standardized methodology unless one (1) or more of the following conditions is met:

1. A BCA has already been completed or is in progress pursuant to BCA guidelines issued by other Federal agencies such as the Army Corps or the United States Department of Transportation (USDOT);

2. It addresses a non-correctable flaw in the FEMA-approved BCA methodology; or

3. It proposes a new approach that is unavailable using the FEMA BCA Toolkit.

The Virgin Islands Department of Public Works submitted and successfully secured a $25 million federal grant from the U.S. Department of Transportation's Rebuilding American Infrastructure with Sustainability and Equity (RAISE) FY 2022 Grant Program[9]. Funds for the RAISE Grant Program are awarded on a competitive basis for surface transportation infrastructure projects that improve safety, environmental sustainability, quality of life, mobility and community connectivity, economic competitiveness and opportunity including tourism, state of good repair, partnership and collaboration, and innovation.

As a part of the RAISE Grant application, a benefit cost analysis (BCA) was conducted for Phase II of Charlotte Amalie Waterfront Revitalization Program, the *Veterans Drive (Route 30) Improvements* Project ("the Project") for submission to the U.S. Department of Transportation (USDOT) as a requirement of the discretionary grant application for the FY 2022 RAISE grant program. The application included analysis and estimated benefits/costs using standard data and qualitative information consistent with the methodology outlined in Benefit-Cost Analysis Guidance for Discretionary Grant Programs.

USDOT Methodology Overview for Veterans Drive Phase II

Based on HUD Guidelines, since a BCA analysis was previously completed based on the BCA guidelines issued by USDOT, the BCA analysis methodology to request HUD CDBG-Mitigation funds utilizes the recommendations made in USDOT Benefit-Cost Analysis Guidance for Discretionary Grant Programs 2023 Update[10]. The USDOT document dictates that any methodology used should show benefits and costs as quantifiable data. The guidelines also indicate that data should be as localized and current as possible, and national or state level data should only be used whenever specific localized data is not available. Whenever methods or data from other sources are used, the source of the method or data is cited and detailed within this narrative. Links to methods and data available online are contained as footnotes, and datasets, reports, or other data sources used are included as supplemental documents with the grant application. Both costs and benefits have been inflation-adjusted to 2021 dollars. All benefits and costs in this analysis are calculated using the yearly compounding discount rate of seven percent (7%).

Factors Considered in the BCA

The BCA framework involves defining a Base Case or "No Build" Case, which is compared to the "Build" Case, where the grant request is awarded, and the project is built as proposed. The BCA assesses the incremental difference between the Base Case and the Build Case, which represents the net change in welfare. BCAs are forward-looking exercises which seek to assess the incremental change in welfare over a project life-cycle. The importance of future welfare changes is determined through discounting, which is meant to reflect both the opportunity cost of capital as well as the societal preference for the present.

[9] https://www.transportation.gov/sites/dot.gov/files/2022-09/RAISE%202022%20Award%20Fact%20Sheets_1.pdf

[10] https://www.transportation.gov/mission/office-secretary/office-policy/transportation-policy/benefit-cost-analysis-guidance

The analysis was conducted in accordance with the benefit-cost methodology as recommended by the USDOT in the 2023 Benefit-Cost Analysis Guidance for Discretionary Grant Programs. This methodology includes the following analytical assumptions:

- Defining existing and future conditions under a No Build base case as well as under the Build;
- Assessing benefits with respect to each of the primary selection criteria defined by the USDOT;
- Estimating benefits and costs during project construction and operation, including 20 years of operations beyond the Project completion when benefits accrue;
- Using USDOT recommended monetized values for reduced fatalities, injuries, property damage, travel time savings, and emissions, while relying on best practices for monetization of other benefits;
- Providing dollar values for outcomes over time in present values, discounting future amounts back to 2021 after first adjusting all cost estimates or benefit unit prices to constant 2021 dollars (including inflating any values from prior years to 2020 using the Inflation Adjustment Factors noted in the USDOT BCA guidance); and
- Applying a real discount rate of 7 percent for all present value discounting of future benefits and costs, consistent with USDOT guidance.

The "No-Build" case includes recently completed Phase I of the Charlotte Amalie Waterfront Revitalization program as completed but excludes Phase II improvements. The "No Build" case assumes that congestion, collisions, and other societal costs of increasing traffic will continue to grow without any planned safety or capacity improvements. Construction-related closures and early year disbenefits are not assumed to occur.

In the "Build" Case, the project includes improvements proposed as a part of Phase II, as follows:

- A realigned resurfaced Veterans Drive roadway that meets current design standards;
- Increased vehicular capacity and congestion reduction by the widening on the eastbound and westbound travel lanes, providing a median, installing improved traffic signaling, street lighting and removing the potential for illegal parking along the waterfront;
- An enhanced pedestrian experience with improved and well separated facilities along the waterfront adjacent to Veterans Drive; and
- Streetscape improvements designed to enhance the corridor's aesthetic appeal and promote economic development with a continuous pedestrian connection to the waterfront and the local shops, restaurants, and tourist attractions.

The BCA implements a conservative approach. Each assumption or valuation was chosen to reflect this conservative approach. Some of these conservative assumptions include:

- Travel time savings from the reduction of congestion exclusively reflect AM and PM peak period travel time within the proposed project limits, which is adjusted by a factor of 0.25 assuming that travel time savings only occur for 6 hours of the day. Typical traffic conditions from Google traffic reveal that the peak periods are longer than the assumed 6 hours,
- The posted speed limit on Veterans Drive is 20 mph and takes 3 minutes to travel the project area in free flow conditions. During peak periods the travel time can take up to 12 minutes or more to travel the project area. The analysis does not capture travel time savings, reduced vehicle-miles traveled or any other benefit beyond the immediate project area (Phase 1 – 0.9 miles), despite quantitative evidence of traffic queuing further east beyond the intersection of Veterans Drive at Edward Wilmot Blyden Road, 0.5 miles away due to capacity reduction from four lanes to two lanes at Veterans Drive at Forte Strade,
- The projected reduction in safety incidents by 55% used in the analysis is based on the study "NCHRP Report 794: Median Cross-Section Design for Rural Divided Highways" - CMF ID: 7093. Even though

the project improvements include several crash reduction mitigation measures such as increasing lane widths from 9 ft to 11 ft, signal improvements, raise speed table for pedestrian crossing, pedestrian and roadway lighting, the crash reduction factor assumed in the benefits estimation is primarily related to reduction in crashes as a result of installation of median on a rural four-lane undivided roadway,

- The number of crashes that occurred within the project area was estimated at 7% for the analysis based on the project length (0.9 miles) compared to the overall facility length (Route 30 - 14.5 miles). However, the project area traverses the downtown core of the island, while the remainder of the facility is more rural. Therefore, 7% is a conservative estimate, as the percentage of crashes that occurred within the project area is likely higher due to the land use context,
- In the "Build" case, emissions benefits were derived as a result of reduced congestion and faster speeds. Vehicle miles travelled (VMT) was assumed to remain unchanged between No-Build vs Build scenarios despite evidence of vehicles using alternate routes to avoid congestion in downtown core; and
- Active transportation and health benefits were calculated based on Visitors (Cruise & Air passengers) and Residents (living in Town of Charlotte Amalie) walking to Downtown Charlotte Amalie. Local resident pedestrian counts were not included in health benefits estimation due to lack of pedestrians counts. Vendors plaza, several restaurants, shops, hotels, and government buildings are located within the project limits.

The BCA evaluation period totals 24 years, which comprises a 4-year period of construction, delivery, and inspections covering Q2 FY 2024 through Q1 FY 2028 plus an operational evaluation period of 20 years for partial-year benefits overlapping with the final year of construction in FY 2028 through partial-year benefits in FY 2048.

Project Benefits from Hazard Mitigation

While the project's resiliency benefits were not quantified in the BCA, the Veterans Drive Mitigation Improvements Project provides important hazard mitigation benefits. In particular the project will provide hazard mitigation benefits by directly addressing flooding and erosion risks. The project corridor is located within a flood zone and is vulnerable to sea level rise and storm surge, as shown in *Figure 86*. The project improvements include replacing the existing rip-rap (man-placed rubble and rocks) wall with a reinforced concrete counterfort wall to fortify the waterfront; installing permanent erosion/pollution control BMPs prior to discharging into the harbor; and replacing the existing drainage system with new drain infrastructure that will be oversized to reduce the risk of flooding.

In addition to hardening the public infrastructure, the roadway capacity improvements are expected to reduce congestion and travel time on the roadway, thus enhancing mobility for evacuations, emergency response, and accessing critical community lifelines. The roadway improvements will also allow for more rapid repairs and recovery efforts following a natural disaster.

The multimodal improvements will provide critical benefits, particularly to residents without access to a vehicle. The expanded sidewalk and pedestrian promenade increase mobility options for residents before and after a natural hazard event, improving their ability to safety access key services and community lifelines. The addition of shade trees along the sidewalk and pedestrian promenade provide another valuable benefit, as they will reduce the urban heat island effect, offering a safer and more comfortable experience for pedestrians.

Project Costs

The estimated capital cost of implementation of Veterans Drive Phase II Project is $124.21 million in undiscounted 2022$ (equivalent to $116.68 million in undiscounted 2021 dollars, using an inflation

adjustment factor of 6.45 percent[11]). Initial project investment costs include construction engineering and inspection services, construction, other capital costs and contingency factors. Total capital costs of $116.68 million (2021$) was utilized in the BCA analysis and the project schedule assumes beginning of construction in Q2 of 2024 and ending in Q1 of 2028, as shown in *Table 51*.

As a reminder, as part of the BCA analysis, these capital costs are discounted back to 2021 as required by USDOT Guidance.

Costs for the Project were available in 2020 dollars as estimated and included in FY 2022 RAISE Grant Application. These costs were adjusted to 2021 dollars using an average estimated inflation adjustment factor of 7.04 percent[12]. The improved facility is expected to be open and operational in Q2 of 2028.

Table 51: Project Schedule and Costs, Millions of 2021 Dollars

Variable	Unit	Value
Construction Start	Year	Q4 2024
Construction End	Year	Q3 2028
Construction Duration	Years	4
Project Opening	Year	Q3 2028
Capital Cost – Construction	2021$ M, Undiscounted	$116.68

Source: WSP USA

Additional Economic Impacts

This section details only the benefit categories that have been monetized as part of the BCA. Other benefit categories such as resiliency and environmental readiness are described qualitatively in prior sections.

The benefits of the project improvements can be described as user benefits, including travel time savings and social benefits, including the reduction in damage to property and injuries as the result of fewer roadway collisions. The analysis covers the following benefit categories:

- Safety Benefits
- Reduced Emissions
- Travel Time Savings
- Active Transportation
- Health Benefits
- Agency Net O&M and R&R Costs

The analysis uses standardized factors provided by governmental and industry sources to efficiently determine the monetized value of user and social benefits resulting from the project improvements. These

[11] https://www.bls.gov/data/inflation_calculator.htm

[12] https://www.bls.gov/data/inflation_calculator.htm

benefits include the reduction of existing costs, or the prevention of future costs related to the operation and use of the existing road facility.

Safety

The safety benefits assessed in this analysis include a reduction in fatalities and injuries, as well as a reduction in other property damage crash costs resulting directly from the project. Due to Veterans Drive being one of the major east-west connections, the traffic of the project area includes personal vehicles, freight trucks, bicyclists and pedestrians. The constriction from four lanes to two lanes, substandard lane widths, inadequate lighting and insufficient pedestrian infrastructure results in frequent crashes from inattention, merging traffic and impatient driving, especially during peak period. In 2019, a total of 2,895 crashes occurred in St. Thomas out of which 539 were serious injuries and 8 were fatalities. Veterans Drive tops the list on the high crash locations with almost 48 percent of the total crashes in St. Thomas occurring on Veterans Drive. Seven (7) percent (ratio of project length 0.9 miles compared to the overall facility length of Route 30 - 14.5 miles) of the total crashes occurring on Veterans Drive was assumed to occur within the project extents downtown core, while the remainder of the roadway has a more rural land use context, but seven percent was assumed to align with the conservative approach to the analysis.

The expansion of the roadway and changes in roadway geometry on Veterans Drive, in addition to the improved facilities for bicycles and pedestrians, are projected to reduce crashes by an average of about 55 percent. The projected reduction in the analysis is based on Crash Modification Factors Clearinghouse (CMF ID: 7093) data based on the study "NCHRP Report 794: Median Cross-Section Design for Rural Divided Highways". Even though the project improvements include several crash reduction mitigation measures such as increasing lane widths from 9 ft to 11 ft, signal improvements, raise speed table for pedestrian crossing, pedestrian and roadway lighting, the crash reduction factor assumed in the benefits estimation is primarily related to reduction in crashes as a result of installation of median on a rural four-lane undivided roadway. The prevention of these crash incidents is calculated to be $42.79 million in discounted 2021 dollars.

Table 52: Safety Estimation of Benefits, Millions of 2021 Dollars

Benefit	Project Opening Year		Project Lifecycle	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
Fatality Reduction	$2.61	$1.62	$54.80	$18.84
Injury Reduction	$3.11	$1.94	$65.28	$22.45
Property Damage Reduction	$0.21	$0.13	$4.37	$1.50
Total Safety Benefits	$5.93	$3.69	$124.46	$42.79

Source: WSP USA

The assumptions used in the estimation of safety benefits are presented in the following table.

Table 53: Safety Benefits Assumptions and Sources

Variable	Unit	Value	Source

Cost per Fatal Crash	2021$	$13,046,800	US DOT Guidance, January 2023
Cost per Injury Crash	2021$	$307,800	US DOT Guidance, March 2022
Cost per Property-Damage Only Crash	2021$	$4,800	US DOT Guidance, March 2022

Environmental Sustainability

This project will create environmental and sustainability benefits relating to reduction in air pollution associated with decreased automobile and commercial truck travel and reduction in environmental damages. The analysis assumes a given level of pollutant emissions are released for each vehicle mile traveled, and that these vary by whether the vehicle is an automobile or a truck, and by the speed driven. Even though the vehicle miles travelled (VMT) marginally increases in the Build Scenario, the benefits derived are based on significant increase in average vehicle speed. Additionally, the completion of sidewalks and lanes for bicyclists and pedestrians may induce residents to switch modes of travel for commuting or to complete short local trips by foot or bike as an alternative to driving a car, thereby avoiding those vehicle-borne emissions, though this benefit is not quantified in this analysis.

Four forms of emissions were identified, measured and monetized, including: nitrous oxide (NOx), particulate matter (PM2.5), sulfur dioxide (SO2), and carbon dioxide (CO2).

Table 54: Emissions Reduction Estimation of Benefits, Millions of 2021 Dollars

Benefit	Project Opening Year		Project Lifecycle	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
CO2 Emissions Reduction	$0.008	$0.006	$0.122	$0.078
NOx Emissions Reduction	$0.00	$0.00	$0.00	$0.00
SOx Emissions Reduction	$0.00	$0.00	$0.00	$0.00
PM Emissions Reduction	$0.00	$0.00	$0.00	$0.00
Total Emissions Reduction	$0.008	$0.006	$0.122	$0.078

The assumptions used in the estimation of emissions reductions benefits are presented in the following table.

Table 55: Emissions Reduction Benefits Assumptions and Sources

Variable	Unit	Value	Source
Cost of CO2 emissions	2021$ per metric ton	$56 (in 2022) - $88 (in 2050)	US DOT Guidance, January 2023
Cost of NOx emissions	2021$ per metric ton	$16,600 (in 2022) - $18,900 (in 2050)	US DOT Guidance, January 2023

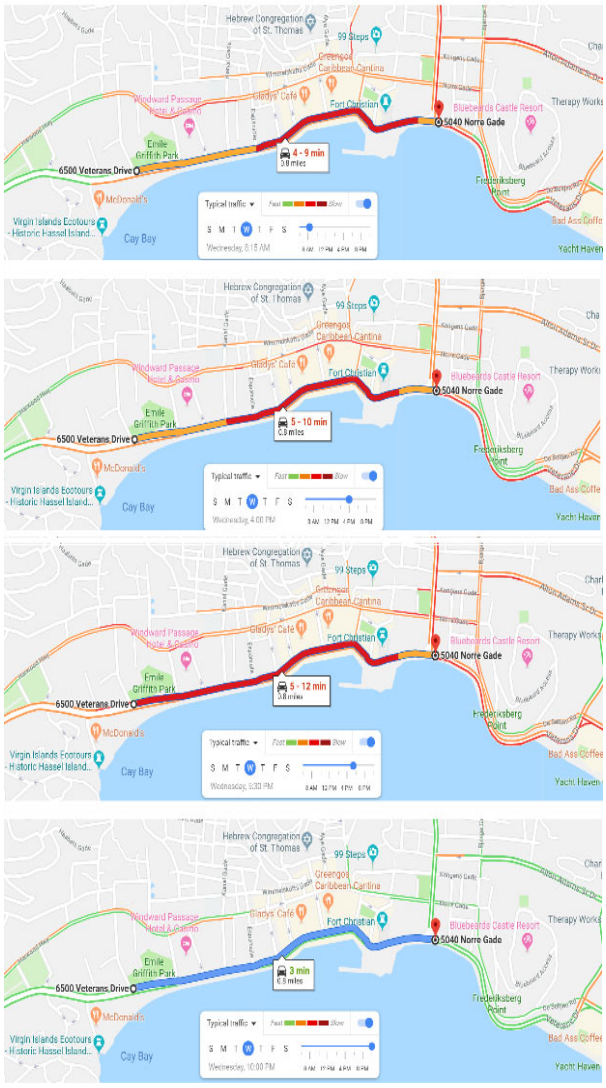
Variable	Unit	Value	Source
Cost of PM2.5 emissions	2021$ per metric ton	$796,700 (in 2022) - $907,600 (in 2050)	US DOT Guidance, January 2023
Cost of SOx emissions	2021$ per metric ton	$44,300 (in 2022) - $51,300 (in 2050)	US DOT Guidance, January 2023
Emissions per VMT	Grams per VMT	Varies by year, vehicle type, speed, and emission type	California Air Resources Board EMFAC Database, 2021

Travel Time Savings

Travel time savings includes in-vehicle travel time savings for auto drivers and passengers and truck drivers. Travel time is considered a cost to users, and its value depends on the disutility that travelers attribute to time spent traveling. A reduction in travel time translates into more time available for work, leisure, or other activities. The Project will provide additional capacity on a vital connector in the region, alleviating peak-hour congestion on adjacent arterials with reduced travel time and higher travel speeds for commuters, freight traffic and recreational users throughout the region. The reduction in travel time for the project is calculated to be $41.7 million in discounted 2021 dollars.

Travel time savings were developed based on a comparison of the baseline conditions without the proposed improvements and when the improvements are in place. Existing travel time was obtained from Google Map travel times on a typical weekday, as shown illustrated in the figure. The posted speed limit on Veterans Drive is 20 mph and takes 3 minutes to travel the project segment (0.8 miles) in free flow conditions. During congested conditions the travel time can take up to 12 minutes or more to travel the entire project length. Existing congestion is due to substandard lane widths, outdated signal timings, on-street parking interference, and bottleneck created as a result of 4 lanes dropping to 2 lanes.

Figure 89: Congested Period Through the Day



The proposed project reduces congestion by widening on the eastbound and westbound travel lanes, providing a median, installing improved traffic signaling, street lighting and removing the potential for illegal parking along the waterfront. The entire project segment will be 2 lanes in each direction, thereby eliminating the traffic bottleneck at Forte Strade. Build travel times for the project segment (0.9 miles) were estimated by applying a 50 percent reduction to the existing congested travel times to account for the various congestion management strategies proposed as a part of this project. The travel time savings benefit resulting from the implementation of various strategies were derived from the Institute of Transportation Engineers (ITE) publication "A Toolbox for Alleviating Traffic Congestion and Enhanced Mobility ".

The person hours travelled (PHT) savings were estimated using the resulting travel time and traffic counts collected on Veterans Drive. USVI traffic counts data was collected in 2009 by Parsons Brinckerhoff. AADT on Veterans drive was observed to be 18040 vehicles with an average truck percentage of 20.35 percent. Travel time savings are accrued by individuals and not per vehicle. An average number of individuals per vehicles is therefore needed to calculate the number of person-hours and vehicle-hours traveled. Based on the household survey conducted in 2009 for the USVI, the rate of occupancy is slightly higher than the national average due to the high rate of visitors to the Territory. A rate of 2.2 was used for the analysis. Travel time savings from the reduction of congestion exclusively reflect AM and PM peak period travel time within the proposed project limits, which is adjusted by a factor of 0.25 assuming that travel time savings only occur for 6 hours of the day.

It should also be noted that while the realignment of the roadway will cause a minimal increase in the facility length of about 0.1 miles, this element of the project includes widening the current two-lane sections on either side of the promontory to provide for four lanes and creating a new four-lane section around the promontory where the Legislative Building resides. The new facility will provide for much needed capacity in the core of the business district and on the most critical segment of the transportation network on the Island.

The resulting travel time saving was prorated to reflect the fact that greater savings will occur at the onset of the project and lesser savings towards the design year. A reduction of half a minute of travel time savings per vehicle was assumed every five years.

Table 56: Travel Time Savings Estimation of Benefits, Millions of 2021 Dollars

Benefit	Project Opening Year		Project Lifecycle	
	Undiscounted	Discounted (7%)	Undiscounted	Discounted (7%)
Travel Time Savings - Auto	$5.04	$3.14	$98.35	$34.72
Travel Time Savings - Truck	$1.01	$0.63	$19.68	$6.95
Total	$6.05	$3.77	$118.03	$41.67

Source: WSP USA

The assumptions used in the estimation of travel time savings benefits are presented in the following table.

Table 57: Travel Time Savings Assumptions and Sources

Variable	Unit	Value	Source
Value of Travel Time Savings – All Purposes	2021$ per person hour	$18.80	US DOT Guidance, January 2023
Value of Travel Time Savings - Truck	2021$ per person hour	$32.40	US DOT Guidance, January 2023

State of Good Repair

The state of good repair condition benefits assessed in this analysis include maintenance and repair savings, and deferral of replacement cost savings. The proposed improvements were designed to minimize operating and maintenance costs. The proposed maintenance program includes resurfacing the newly constructed roadway 13 years after opening year and providing regular periodic maintenance of the promenade amenities and look-out features in addition to general roadway maintenance items such as signalization. In addition, the maintenance program will include keeping the Charlotte Amalie Harbor's underwater flora and fauna in pristine conditions. Costs for current maintenance are based on investments made by the Department in the past five years and consist of resurfacing the roadway every five years.

Project improvements resulting in reductions in agency costs related to the operation, maintenance, repair or rehabilitation of an asset can be the result of improved management processes or the replacement of underperforming equipment. Over the analysis period, the proposed project improvements will result in a decrease in routine O&M and R&R costs of $1.16 million in undiscounted 2021 dollars and $0.46 million in discounted 2021 dollars.

Quality of Life / Livability

This project could create quality of life / livability benefits which includes health benefits associated with encouraging pedestrian and bicyclists traffic and improving ADA access on Veterans Drive for greater mobility. Extending and completing pedestrian infrastructure to increase connectivity within the community has been shown to induce foot and bicycle traffic for commuting and recreation. Additionally, the project improvements would build pedestrian and bicycle connections to local recreational and social amenities, including Fort Christian and Vendors Plaza. These pedestrian improvements are critical for the local community, as 42 percent of Charlotte Amalie households did not have access to a vehicle as of the 2010

Census13.

The proposed promenade will provide direct access to Downtown Charlotte Amalie from the WICO dock at Havensight. Downtown Charlotte Amalie has several tourist attractions including the Vendor's Plaza, Fort Christian, the Legislature Building, Blackbeard's Castle, Estate Catherineberg, Harbor Seaplane Base, several Restaurants, Shops, Hotels, and Government Buildings. In 2019, close to 1.4 million cruise passengers and 0.48 million airline passengers arrived in St. Thomas. USVI Household Travel Survey indicates that 40% of short-term visitors and 19 percent of long-term visitors walk to tourist destinations. Based on the visitors' survey, annual cruise/airline passenger data and assuming that 40 percent of the tourist will visit downtown Charlotte Amalie, the promenade will be used by close to 683 visitors a day. Town of Charlotte Amalie residents walking to working was determined using 2010 Census data and determined to be 1,190 residents walking to work (places of employment) located along Veterans Drive within the project area. Active transportation and health benefits for the project is calculated to be $5.86 million in discounted 2021 dollars.

Economic Vitality

This project would contribute to increasing the economic vitality of regional businesses and the national economy through improvements in the mobility of people and goods in the study area. The economic vitality benefits are quantified in this analysis primarily using travel time savings.

With the reduction of roadway congestion resulting from the project improvements, travel time savings are a significant direct benefit for users of the road facility. The user benefits represent a reduction of future costs related to the personal and commercial use of the roadway. The reduction in time delays allows residents to reach local employment centers, retail businesses and health facilities, while freight trucks can deliver materials and finished goods to industrial facilities and commercial firms in a cost- and time-efficient manner, impacting economic industries throughout the region. In St. Thomas, a reduction in travel time is even more critical as this allow for cruise passengers to book multiple activities during the short timeframe on the island.

BCA Results

The benefit cost analysis converts potential gains (benefits) and losses (costs) from the Project into monetary units and compares them. The following common benefit cost evaluation measures are included in this BCA:

Net Present Value (NPV): NPV compares the net benefits (benefits minus costs) after being discounted to present values using the real discount rate assumption. The NPV provides a perspective on the overall dollar magnitude of cash flows over time in today's dollar terms.

Benefit Cost Ratio (BCR): The evaluation also estimates the benefit cost ratio; the present value of incremental benefits is divided by the present value of incremental costs to yield the benefit cost ratio. The BCR expresses the relation of discounted benefits to discounted costs as a measure of the extent to which a project's benefits either exceed or fall short of the costs.

Economic Rate of Return (ERR): The ERR (sometimes referred to as the Internal Rate of Return or IRR) equates to the discount rate at which the NPV from the Project equals zero. In other words, it is the discount rate at which the project benefits and costs are equal. Generally, the greater the ERR, the more desirable the project.

The table below presents the evaluation results for the project. Results are presented in undiscounted 2021

[13] United States Census Bureau. Decennial Census of Island Areas [DECENNIALVI2010]. 2010. Retrieved from https://data.census.gov/cedsci/table?q=0%20vehicles&g=1600000US7816300,7818100,7819000

dollars and 2021 dollars discounted at 7 percent, as prescribed by the U.S. DOT. All benefits and costs were estimated in constant 2021 dollars over an evaluation period extending 20 years beyond system completion in 2028.

The total benefits from the project improvements within the analysis period are calculated to be $90.85 million in discounted 2021 dollars. The total capital costs are calculated to be $83.48 million in discounted 2021 dollars. The difference of the discounted benefits and costs equal a net present value of $7.37 million in discounted 2021 dollars, resulting in a benefit-cost ratio (BCR) of 1.09. The internal rate of return for the project is 1.0 percent.

Table 58: Benefit Cost Analysis Results, Millions of 2021 Dollars

BCA Metric	Project Lifecycle	
	Undiscounted	Discounted (7%)
Total Benefits	$261.22	$90.85
Total Costs	$116.68	$83.48
Net Present Value (NPV)	$144.53	$7.37
Benefit Cost Ratio (BCR)	2.24	1.09
Internal Rate of Return (IRR)	1.0%	

Source: WSP USA

A sensitivity analysis was conducted to evaluate the impact of adjusting key assumptions on the BCR and NPV. The various scenarios analyzed include: 1. Percentage of crashes occurring within the project extents of the total crashes occurring on Veterans Drive – 10% (BCR – 1.32), 2. Percentage of crashes occurring within the project extents of the total crashes occurring on Veterans Drive – 15% (BCR – 1.64), 3. Build Crash Reduction Factor – 60% (BCR – 1.11), 4. Cumulative percentage reduction in travel time/speed benefit due to various congestion management strategies – 40% (BCR – 1.09), and 5. Number of Pedestrians visiting Downtown Charlotte Amalie – Increases by 25% (BCR – 1.2). Through multiple sensitivity analysis, DPW determined the Veterans Drive Phase II project to have a benefit cost ratio (BCR) between a range of 1.09 and 1.64. The project is therefore eligible for funding as it has been determined to deliver a BCR above one (1), demonstrating according to BCA standards that the project produces more benefit than it costs.

Consistency with Other Mitigation Activities

The construction of Phase II of the Veterans Drive Mitigation Improvements Project does not increase the risk of loss of life or property or undermine the benefits from other uses of CDBG-MIT funds. Instead, the roadway improvements will provide enhanced connections to many community lifelines, which are largely concentrated along the coastline. Furthermore, this project supports other proposed projects for CDBG-MIT funding such as Project 6: Investing in paths and walking trails to improve options for safe walking and biking within the Territory. The project also supports the Phase II Savan Gut project by updating the aging downstream infrastructure that will be connected to the Savan Gut drainage improvements.

Environmental and Historic Impacts

The development of alternatives along Veterans Drive to address the needs of the project started in the mid-1980s resulting in various decisions as shown below in Table 59.

Table 59: Veterans Drive Alternatives Considered

Year	Decision
1984	Final Environmental Impact Statement (FEIS) from west of Kronprindsens Tvaer Gade to Long Bay Road (approved) Record of Decision (approved)
1986	Administrative Action/Environmental Assessment (AA/EA) from Tolbod Gade to Long Bay Road (completed)
1997	Reevaluation of 1984 FEIS from west of Kronprindsens Tvaer Gade to Tolbod Gade 1996 AA/EA (Approved)
1998	Revised Record of Decision (approved) Finding of No Significant Impact (approved)
2008	Final Environmental Studies (completed)
2010	Environmental Studies Document – Bridge Alternative in response to VISHPO's Request to Preserve Historical Shoreline (proposed)
2012	Re-Evaluation Alternative – Roadway on Fill (proposed)
2014	Re-Evaluation Alternative – Riprap (proposed)
2015	Re-Evaluation Alternative – Retaining Wall (proposed)
2017	Environmental Assessment – Retaining Wall (proposed)

This Project has been designed to minimize the impacts to the natural environment of the Island's unique ecosystem. Based on the 2017 Environmental Assessment approval, the proposed improvements require 8.57 acres of fill to be placed in the St. Thomas harbor. This is a reduction from the original 20 acres proposed under the 1984 Final Environmental Impact Statement and 9.75 acres of fill proposed under the 2012 approval. On average, the fill extends approximately 40 feet into the water and the average elevation depth of fill is between 6 feet and 9 feet.

The impacts of the Project have been reduced from the original design and mitigation has been proposed for unavoidable adverse impacts to benthic resources (benthic resources are known as the marine life on the bottom of a body water, such as corals, plants, and animals). The Project has however been redesigned to reduce the Project impacts on the benthic environment. The Project will now result in the filling of 8.57 acres of the harbor decreasing the seagrass impact to 1.15 acres and the coral colonized hard bottom impact to 2.97 acres.