

TRANSPORTATION



The US Virgin Islands is separated from the mainland United States by 1,200 miles, and its geographic location makes a robust and high-functioning transportation network essential. Sea and air transportation make possible the supply of nearly all of the Territory's materials and daily necessities; road transportation supports activity within each of the Territory's islands. Air and sea links also serve as crucial escape routes before major hurricanes for those residents of the USVI who want and are able to evacuate: here, unlike the continental US, driving out to another state is not an option.

Despite this crucial role, much of the transportation infrastructure is aging and fragile due to lack of funds, deferred maintenance, and challenging environmental conditions. On top of these issues, many roads, maritime facilities, and airport structures underpinning the transportation sector were not built to withstand Category 4 or 5 hurricanes.

Hurricanes Irma and Maria put the Territory's transportation system to a severe test. On land, their winds downed trees and utility poles, blew out houses, and deposited over 850,000 cubic yards (660,000 tons) of debris onto roads and other surfaces, making roadways temporarily impassable. 10-20 inches of combined rainfall created mud and mudslides, rockslides, potholes, sinkholes, and washouts that further damaged the Territory's roads. Runoff exceeded the stormwater system's capacity. Entire roads collapsed. The storms obliterated signage and blew streetlights and traffic lights away.

Along the coasts, silt, runoff, debris, and more than 400 sunken vessels blocked some seaports and channels around St. Thomas, St. John, and Water Island, leaving them unnavigable and unable to accommodate relief ships. Ferries and barges were damaged, preventing travel between the islands. On the shore, cargo equipment and facilities on St. Thomas were broken and destroyed, hindering the receipt of massive volumes of relief cargo. US Customs offices on all three islands were destroyed as well.

Air transportation was damaged, too: commercial traffic was halted for nearly a month. The airport tower on St. Croix was damaged and the tower on St. Thomas was destroyed. Terminals at both airports suffered severe damage.

During the response effort, government crews and residents alike cleared debris from roads. Federal responders set up temporary air traffic control infrastructure. Crews from the US Coast Guard checked

the safety of the ports, and dock masters worked to clear berths and ensure safe dockage for incoming relief ships. The US Army Corps of Engineers (USACE), under direction from FEMA and in cooperation with the US Coast Guard (USCG) and Virgin Islands Port Authority (VIPA), employed a private contractor to remove sunken vessels from channels and ports until February 2018.

The Territory now has the unique opportunity to improve its transportation future as it recovers from the storms of 2017 and faces more frequent possible disasters in the future. Building a more resilient transportation sector will include hardening and repairing the existing system (including bringing roads up to current federal standards), improving the Territory's capacity to rebuild (including increasing the availability of building materials and contractors), adopting more resilient road and street designs to lessen dependence on signaling and electricity (including using roundabouts instead of signalized intersections), encouraging modes of transportation other than private vehicles (including improved walkability and safe cycling routes), expanding and improving ports to accommodate greater cargo and passenger volumes (including expanding the container port on St. Thomas and creating a small cruise ship terminal on St. Croix), improving transportation system management processes (including speeding up customs processing), and better preparing for future storms (including preparing a debris management plan).



Damaged road on St. Thomas
Kelsey Nowakowski

HOW THE TRANSPORTATION SYSTEM WORKS

The USVI's transportation system includes a network of roads, extremely limited walking and cycling infrastructure, limited public transport, two major airports, and several ports. Road infrastructure provides transport within each island. Sea and air transportation are the only means for traveling between islands and for bringing goods and passengers into the Territory.

Roads

The USVI road network includes 1,230 miles of roads: 340 miles classified as federal routes, 410 local, and 480 private.

Most federal routes and local public roads are two-lane roadways paved with asphalt or concrete, mostly without shoulders. Signage provides traffic control along roads and at intersections, as well as location identification—although few street signs exist. “Guts”, culverts, inlets, and swales provide drainage. Retaining walls on steep slopes help prevent road collapse and landslides. Traffic signals regulate 57 public intersections. Many public roads suffer from deferred maintenance, which leads to cracks, potholes, deterioration of roadway striping, and disrepair of crosswalks.

Private, multi-household roads, and driveways are how most residents access their homes. Those roads are often completely unpaved or semi-paved and poorly built. They can also be poorly maintained, potentially making it difficult for emergency services or equipment to use them.

Federal routes are supported by federal grants, local public roads are funded through the budget of the Department of Public Works (DPW), and private roads are paid for and maintained by the residents who use them to access their homes. Public road maintenance for both federal and local roads is the responsibility of the local government. On those roads, deferred maintenance is primarily a result of inadequate planning, lack of resources, and a difficult procurement process.

Cycling and walking

As a result of steep, narrow roadways without shoulders, cycling is not common. There are also no designated

bike lanes, bike markings, or signage in the Territory. A 15-mile bike lane has been proposed and approved for St. Croix through a public-private partnership with nonprofit Crucian Bikeways Inc. DPW would provide oversight for the design process and fund the construction, while the nonprofit would pay for the design and ongoing maintenance of the lanes. Although some permitting and design work has been completed, the project has stalled because funding has not been fully secured.

Pedestrian access is also very limited or dangerous. In the historic Charlotte Amalie district on St. Thomas, pedestrians can use 47 historical “step streets” to quickly travel the steep hills between the streets on which the town sits—but, for the most part, pedestrians must walk along the edges of roads because so few roads have sidewalks.

Public transportation

Public transportation in the USVI includes a public bus system, shared-ride multi-passenger taxis, open-air safari taxis, and unique open-air safari “dollar rides,” as well as private taxis.



Safari bus

Bus service is provided on St. Thomas, St. John, and St. Croix by the Virgin Islands Transit System (VITRAN), a department of DPW, for a basic fare of \$1. St. Thomas is the system's busiest location: ridership there is about four times higher than on the other two islands.

“Dollar rides” aboard older open-air safaris generally run the same route as the public bus and pull in at or close to bus stops and can sometimes also be hailed on major roads. These are unique to the Territory and do not have a schedule. Frequency can depend on the time of day, whether they are servicing cruise ship passenger excursions, and how many drivers choose to run the route.

Private and shared-ride taxis (usually 8-12-person enclosed passenger vans traveling between major points) operate on St. Thomas, St. John, and St. Croix. These multi-destination shared vans are the only public transportation from the airport.

The USVI Taxicab Commission regulates taxis and fares, which are fixed based on the destination. Unfortunately, this oversight is little known to passengers and difficult to enforce. Taxis will refuse to pick up locals in favor of more lucrative cruise ship passengers and tourists, and it is common for taxi drivers to overcharge passengers or refuse to take them if their destination is too far or not far enough.

Seaports

On St. Thomas, the Edward Wilmoth Blyden IV Marine Terminal is the ferry dock on Charlotte Amalie's waterfront that supports passenger vessels traveling between St. Thomas, St. John, and Tortola. The St. Thomas/St. Croix ferry boards and disembarks passengers at this facility, and the facility also houses the US Customs clearance point on St. Thomas for vessels entering US waters. Separately, the St. Thomas waterfront in Charlotte Amalie offers berthing for public and private vessels. On the East End of St. Thomas, the Urman Victor Fredericks Marine Terminal in Red Hook supports passenger travel between St. Thomas and St. John, as well as to and from the British Virgin Islands.

Cruise ships arrive at one of two docks on St. Thomas: the VIPA-operated Austin "Babe" Monsanto Marine Facility or the West Indian Company Ltd. (WICO) dock across the harbor in Havensight. WICO is a public corporation owned by the VI Public Finance Authority (VIPFA); the WICO dock is the only public dock not operated by VIPA. This historic dock accommodates cruise ships and sees the greatest cruise ship traffic in

the Territory. Less frequently, it also accepts crane-equipped cargo vessels (WICO does not have a crane for offloading).

On St. Croix, Gallows Bay dock accommodates mini-cruise vessels, small inter-island sloops, ferries, private yachts, cargo vessels, and USCG vessels. Ann E. Abramson Marine Facility is the cruise ship dock in Frederiksted. St. Croix's hub for commercial and industrial marine traffic is the Wilfred "Bomba" Allick Port. The Gordon A. Finch Molasses Pier multi-purpose facility is used primarily to import molasses for the Virgin Islands Rum Industries Limited distillery. This pier is also used for importing all liquid asphalt, bulk cargo such as gravel, cement blocks, and other construction materials critical to St. Croix's construction industry.

On St. John, the Loredon L. Boynes Sr. Dock in Cruz Bay is the main passenger port of entry to the island. The Theovald Eric Moorehead Dock and Terminal at Enighed Pond is the main cargo and car barge facility serving the island. The Victor William Sewer Marine Facility is the Customs dock for St. John used for the berthing of commercial passenger ferries and privately owned vessels departing for the British Virgin Islands (BVI), as well as US-registered privately owned vessels clearing customs on their return to US waters.

Customs is a common and essential part of inter-island travel in the Caribbean. Travel within the USVI requires no passport, but traveling to the BVI does regardless of whether it's on a private boat/plane or public ferry. Private boats are required to clear Customs on arriving in the BVI and upon return to the USVI. A "Local Boater Option" (LBO) permits US citizens to register in advance with Customs, obtain a registered boater ID number, and call in or use an online Customs portal upon their return to US waters, instead of physically going to the Customs facility.



Passenger ferry from St. Thomas to St. John
vinow.com

Ferries and car barges

Private ferries and car barges offer passenger services between St. Thomas, St. Croix, St. John, and Water Island, as well as Puerto Rico and the BVI. Two private franchises, Varlack Ventures and Transportation Services of St. John, operate the most common passenger ferry route between Red Hook on St. Thomas and Cruz Bay on St. John with an operations and maintenance subsidy from the DPW. Car barges are operated privately by two franchises out of two VIPA car barge terminals on St. Thomas and St. John.

Cargo

Most incoming cargo arrives at the Crown Bay dock on St. Thomas, which includes facilities for US Customs to process goods imported into the Territory, or at the Wilfred “Bomba” Allick Port on St. Croix. Importing cargo into the Territory is a complex, paper-driven, costly, and time-consuming process that involves the Virgin Islands Bureau of Internal Revenue (BIR) and the US Customs Service. On St. Thomas, where most of the Territory’s incoming cargo lands, a cargo recipient must make four stops before receiving the cargo, none of which are within close walking distance of the others. On a typical day, this process can be completed in about three hours. There are no excise tax or customs fees for items barged between the islands of the Territory.

Air transportation

Two major airports, Cyril E. King (STT) on St. Thomas and Henry E. Rohlsen (STX) on St. Croix, connect the Territory to the rest of the US and the world. The

airports are owned by VIPA; air traffic control towers are owned and operated by the Federal Aviation Administration (FAA) on St. Thomas and owned by VIPA but operated by the FAA on St. Croix.

Seaplane service provides connections to nearby islands and within the Territory. The Territory has two terminals: the St. Thomas Seaplane Terminal on Charlotte Amalie’s waterfront next to the Edward Wilmoth Blyden IV Marine Terminal and the St. Croix Svend Aage Ovesen Seaplane Terminal in Christiansted.

Regulation and governance

Two territorial government agencies have primary oversight of transportation: the Department of Public Works (DPW) and the Virgin Islands Port Authority (VIPA or Port Authority). Several federal agencies provide additional oversight.

DPW administers land transportation, including all roads and public buses. Public roads, highways and storm drainage systems, public transportation systems, public parking facilities, public buildings, and public cemeteries are the responsibility of DPW. The department’s duties include planning, engineering, project management, construction, and maintenance of these public assets. While DPW interacts with all government agencies, laws enacted by the Virgin Islands Legislature regulate DPW’s scope. The Legislature also approves the department’s budget and provides appropriations for projects.

VIPA owns and operates all airport and maritime facilities in the Territory with the exception of one fuel port operated by Limetree Bay and one cruise



Workers clear debris from roadside drains during a rain storm to alleviate flooding on St. Thomas
K.C. Wilsey/FEMA

ship dock operated by the West Indian Company Ltd. (WICO). The authority also maintains the shipping channels into the Territory and dredges them when necessary to increase channel breadth or depth. A public corporation, VIPA is an autonomous government agency administered by a board of governors.

Federal agencies that oversee and regulate transportation include the Department of Transportation (DOT) and its subsidiary agencies, namely the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA). The Federal Aviation Agency (FAA) regulates airports and all aspects of civic aviation. Federal border security and law enforcement is carried out by the US Department of Homeland Security (DHS) and the US Customs and Border Protection (CBP); maritime law enforcement is carried out by the US Coast Guard (USCG), which has jurisdiction in both domestic and international waters. At the local level, the Department of Planning and Natural Resources (DPNR) regulates permitting, construction, and environmental standards, in addition to serving as the local arm of the Environmental Protection Agency (EPA). The Virgin Islands Bureau of Internal Revenue (BIR) collects cargo excise taxes; the Virgin Islands Police Department (VIPD) is responsible for local law enforcement and public safety.

Funding

DPW is funded primarily by the local and federal government. It receives annual funding approximating \$40 million (FY2018 projected) from the following sources:

- \$18.7 million: US Virgin Islands General Fund;
- \$16.8 million: Federal Highway Administration (FHWA) funding for support of Federal Routes, Moving Ahead for Progress in the 21st Century Act (MAP-21), and Territorial Highway Program Implementation and Stewardship Agreement;
- \$1.7 million: Federal Transit Administration (FTA);
- \$2 million: miscellaneous appropriated funds;
- \$800,000: revenue (public transportation, barge fees, parking, cemeteries).

VIPA operates on fees collected for the use of its facilities, including: rent, seaports, and airports. The authority receives no funding from the General Fund of the Government of the Virgin Islands (GVI).

IMPACT OF THE HURRICANES

The storms damaged road, marine, and air transportation to different extents. Roads received large amounts of debris, but debris removal made major roads passable within several days. Seaports received some damage but were also operational within a few days. Airports suffered the worst and were unable to support commercial traffic for nearly a month after the storms.

Roads

After the two hurricanes passed, over 850,000 cubic yards of vegetation, mud, rocks, boulders, downed utilities, construction materials, and other debris blocked the Territory's roadways. Erosion and clogged drainage contributed to public and private road surface damage. Some modern retaining walls failed due to heavy rains; many older walls, and those not built to current standards, failed as well. Wind damaged or destroyed traffic lights at all 57 intersections equipped with them; it also damaged signage and streetlights.

Driving after the storms was dangerous without traffic signals or streetlights. Occasionally, when debris blocked passage completely or when whole road sections were washed away, driving was impossible. People were stranded and often had no option but to hike. Military personnel and local police controlled traffic at key intersections and enforced the mandatory curfew (which was as restrictive as 6 p.m. to 12 p.m. the week of Hurricane Irma, but was gradually relaxed, reaching 11 p.m. to 5 a.m. the week of October 22 and lifted completely throughout the USVI on October 30). Limited hours between curfews concentrated traffic, generating "rush hour" on the limited but passable roads. Accomplishing errands was complicated and sometimes impossible.

Repairs to the road system started immediately after the storm. Government responders and residents worked with neighbors to clear private and community roads of debris. Where retaining walls failed, DPW either installed temporary barricades or—for extensive failures—closed lanes. The department also performed limited repairs to a few intersections immediately after the storm, but the commercial power outage limited the repair of traffic signals. Debris removal on St. Thomas and St. John was soon taken over by the USACE, which

awarded a contract to Ceres Environmental, a private response corporation, which then subcontracted work to local firms. On St. Croix, DPW awarded debris removal contracts to local firms, and on Water Island, one local contractor collected debris under a DPW award. DPW handed off debris and waste removal for the Territory to the Virgin Islands Waste Management Authority (VIWMA) in March 2018.

DPW, with FHWA and FEMA, continues to secure funding and to award contracts for permanent repairs. Repairs under these contracts commenced in spring 2018 and will be ongoing for several years. Costs to repair the hurricane-damaged roadway infrastructure exceed \$100 million. FHWA-funded roadway restoration and FEMA-funded repairs to local routes require more than \$50 million for road surface and retaining wall repair. Debris removal requires another \$30 million. FHWA will fund another \$20 million to repair traffic signals and signage.

Marine facilities

Marine facilities in the USVI experienced varying levels of damage. US Customs' seaport dockside facilities were destroyed on St. Thomas, St. John, and St. Croix. The most significant impact of this was the loss of the building at Crown Bay, where customs agents cleared the bulk of cargo into the Territory. The WICO dock also experienced damage, with silt and sand from storm surge and runoff rendering WICO's berths too shallow for most large vessels. Only the outer portion of the WICO pier, in the deepest water, could accommodate the first relief ships to arrive in the Territory. At the Austin "Babe" Monsanto Marine Facility, one of two berths was obstructed by a floating dock washed up by the storm. Shortly after the storm, a FEMA relief ship occupied the other berth. After the floating dock was removed, a second FEMA ship tied up to the dock. These ships remained for a number of weeks, bringing relief to the Territory, but making the dock unable to accommodate revenue ships. The St. Croix docks—like those on St. Thomas—stood up to the storms with little damage, and only the Ann E. Abramson pier sustained significant damage to its catwalk mooring extension. The buildings and facilities fared poorly: the storms destroyed VIPA's main St. Croix office, which housed administration and operational offices.

After Hurricane Irma, USCG, VIPA, and WICO assessed St. Thomas' harbor for underwater hazards before reopening the port there and on St. John on September 8 for ferry traffic only—which meant that

the already isolated St. John residents were effectively stranded for three days. For Hurricane Maria, USCG again closed ports September 19-26, with ferry service reopening on September 24, leaving St. John residents stranded for five days this time.

Even with the ports reopened, damage to marine transportation infrastructure caused delays in processing cargo when the Territory desperately needed supplies. At the cargo dock on St. Thomas, only two of three cranes were able to offload shipments for the first 30 days after the storms. The sheer volume of incoming relief and rebuilding cargo overwhelmed the importing process, while inadequate service facilities worsened port conditions.

At the WICO port, 1,100 cubic yards of silt were removed at the dock less than a month after Hurricane Maria. This cleanup allowed the first post-storm, revenue-producing cruise ship to dock on November 3, 2017.

Customs and imports

With the US Customs office at the cargo port destroyed, CBP relocated its cargo services to a temporary office at the Blyden Terminal. This location was inadequate for regular volumes of cargo, much less the high volume of relief cargo arriving after the hurricanes. Without adequate parking, or enough stations for Customs agents, this led to long lines and slowed processing. The facility had no Internet access in the first days after the storm, but then acquired a satellite receiver to supply Internet service. They also extended operating hours and remained open on weekends to clear the large volume of cargo. Trucks picking up containers of relief supplies or commercial cargo and individuals picking up palleted cargo caused daily congestion at port entrances. Vehicles accessing a temporary debris disposal site located on the same narrow road leading to the dock further encumbered traffic.

Well-intentioned private individuals and groups from the mainland sent relief supplies to the Territory without realizing the cargo would incur importation fees in the form of excise tax (there is no legislation permitting waiving or deferment of federal customs fees or territorial excise taxes in the USVI; only registered nonprofit organizations are exempt from these fees; however, they still have to go through a similar process). Many USVI recipients were also unfamiliar with this complicated process,

leading to confusion and increased stress after the hurricanes. The BIR Excise Tax office at Nisky Center on St. Thomas processed tax documents on paper by hand. Lacking Internet, this office was unable to charge credit cards for six weeks following the storms. Importers were forced to pay by check or make the hour-long drive over damaged roads to reach the BIR offices in Red Hook on the East End of St. Thomas to use credit cards, as the Nisky Center office does not accept cash. Despite efforts to quickly offload cargo, shipping warehouses became crowded with landed cargo and warehouses rapidly ran out of storage space for incoming shipments due to the backup of unreleased cargo. Tropical Shipping, a private company, lent their office space with backup power and Internet connectivity to the Excise Tax office in an attempt to aid the situation.

Airports

Both STT and STX closed to commercial air traffic on September 5 in advance of Hurricane Irma and did not reopen for nearly a month.

On St. Thomas, Hurricane Irma destroyed STT's air traffic control tower. Controllers operated from a tent on the airfield until the FAA could supply a mobile tower

HURRICANES AND TRAFFIC CRASHES

The Territory saw a seven fold increase in vehicular crashes reported at intersections on St. Thomas and St. Croix in the months immediately following the storms. For the post-storm period of September to December 2017, the Territory measured 425 vehicular crashes at intersections compared to 59 during the same period the previous year. Given that there was enforcement of no civilian nighttime vehicular traffic in September and October due to the curfew, this sharp increase is even more salient (see chart: [Intersection crashes in the USVI](#)).



On St. Thomas, downed trees, snapped utility poles, and debris were evidence of the powerful winds from Hurricane Irma
K.C. Wilsey/FEMA

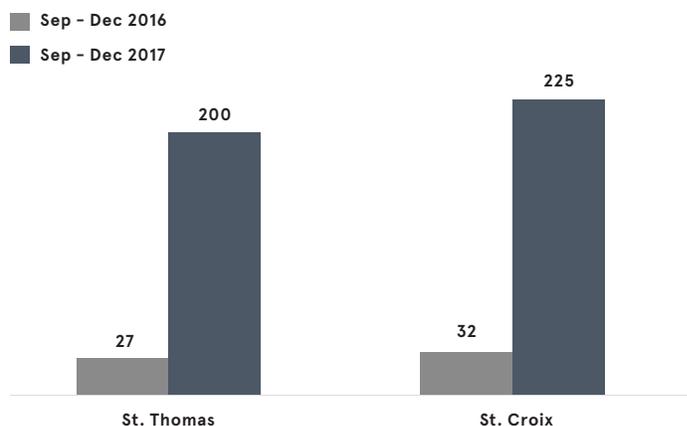
the following week. A C-130 cargo plane delivered the FAA's mobile tower on September 13, and, in less than three and a half hours, the temporary tower began assisting relief flights from the US government as well as private and small commercial aircraft. Following the tower's delivery, the airport reopened on September 15 with very limited service. The airport had effectively lost the second floor of its building; the first floor passenger lounges were closed off where damaged, and gates were reduced from 11 to three. The US Customs and Transportation Security Administration (TSA) screening facilities were flooded and terminal ceilings had collapsed. VIPA reopened the airport to limited commercial traffic on September 28, 2017, nine days after Hurricane Maria.

At Henry E. Rohlsen Airport on St. Croix, both storms caused damage to air traffic control systems and the terminal's roof. Challenges with the Henry E. Rohlsen air traffic control tower, which is owned by VIPA, but operated by FAA, kept the airport closed to commercial traffic until October 5, 2017.

Upon reopening, airline passengers at both airports endured exhaustingly long lines at security checkpoints, despite arriving hours in advance of their flights, as TSA agents screened luggage manually and used hand-wand screening for passengers. With limited to no telecommunications, passengers could not be alerted about delayed or cancelled flights before arriving at the airports, compounding airport congestion and passenger frustration. VIPA and airline officials worked to stagger departures, reducing the numbers of passengers in the facility at one time.

As of July 2018, remediation was still ongoing in departure lounges and at TSA and CBP checkpoints. VIPA anticipates STT's roof will be repaired by November 2018. Interior repairs will follow (see the initiatives discussion in this section for more details). Flight volumes returned to 57 percent of what they had been in June 2017 (see chart: [Major carrier flight seats by month](#)).

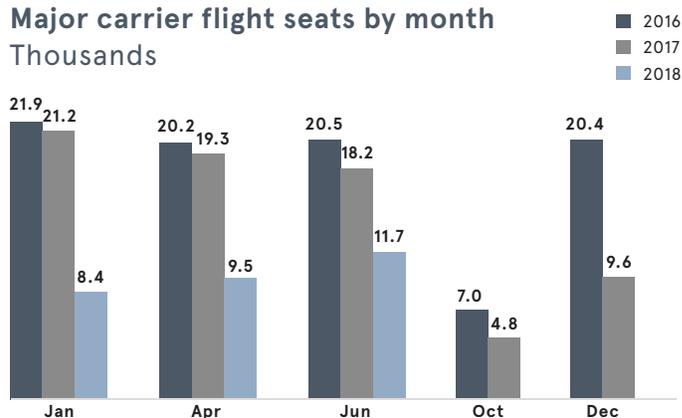
Intersection crashes in the USVI



DPW

Major carrier flight seats by month

Thousands



USVIBER

FUTURE CHALLENGES RESULTING FROM CLIMATE CHANGE

In the future, as the climate changes, more intense (though not necessarily more frequent) storms may result in damage similar to that caused by Hurricanes Irma and Maria, while sea level rise will contribute to flooding and erosion in coastal areas. Changes in precipitation may result in moderate impact on the storm water system depending on the intensity of

rainfall. The impact of temperature increase will be relatively minor as it can be mitigated by considering heat loads in choosing road materials while remodeling or building new facilities.

Hurricane winds, rainfall, and storm surge

In the future, hurricanes are likely to become more intense, though not necessarily more frequent. More intense hurricane winds will result in proportionally more debris, roadway deterioration, building facility damage at ports and airports, and traffic signal and signage damage. Stronger rainfall could overwhelm the existing drainage system, resulting in more surface flooding. Storm surge will result in moderate to high impact on seaports. Airport facilities at STT are moderately vulnerable: a major storm surge would have an impact (runway is approximately 10 feet above sea level at its lowest elevation). Impact at STX would be low because the facility is located at a higher elevation (runway is approximately 23 feet above sea level at its lowest elevation).

Rising sea levels

Flooding and erosion of low-lying coastal roads and storm water outfalls in coastal areas due to sea level rise are areas of particular concern, as the USVI could see up to 1.5-2 feet of sea level rise by 2050. This risk will lead to greater daily tidal flooding in low-lying areas and increased coastal erosion, and could impact low-lying coastal roads. Although most roads in the USVI are elevated enough not to be substantially affected by sea level rise, several roads—some critical to the transportation network—lie within areas at risk of flooding at high tide or erosion in the case of a two-foot sea level rise. Roads of particular concern are VI-37 at Hull Bay Beach on St. Thomas; North Shore Rd VI-20 and VI-107 in Coral Bay on St. John; and on St. Croix, VI-71 south of Frederiksted, VI-63 (Hams Bluff Rd), and North Shore Rd, VI-80. Since the most vulnerable roads are located in areas with low population and little or no commercial activity, this climate risk may have a larger impact on recreation, tourism, and environment than on the USVI population's ability to conduct daily business.

Risks are low to nonexistent for sea and airports, and sea level rise will have low to moderate impact on the transportation infrastructure overall. Critical airport infrastructure is sufficiently elevated at both STT and STX, and it would take very high levels of sea level rise before operations are impacted. However, in the case of a tsunami, STT would be affected.

Increases in temperature

Temperatures in the USVI will increase slightly, with the number of hot days—especially days with maximum temperatures above 90°F—and the number of warmer nights increasing slightly. This will have a negligible impact on physical transportation infrastructure, because higher temperatures are incorporated into system design. Roads are designed to withstand an increase in temperature, and the risks to seaports and airports are low. Lifestyle and human behavior may be impacted, however, producing demand for transportation requiring less physical activity or a reluctance to rely on multiple modes of transportation to reach one's destination.

Changes in precipitation

It is anticipated that the USVI will experience greater variability in rainfall from year to year and the Territory will become drier on average during both the wet and dry seasons. This greater variability in rainfall may have a moderate impact on storm water systems if greater-than-average or more intense rainfall is experienced, as increased rainfall intensity could overwhelm existing drainage systems and result in more surface flooding. Otherwise, change in precipitation and an overall drier climate will have low or no impact on transportation in the USVI.

INITIATIVES FOR INCREASING RESILIENCE IN TRANSPORTATION

Building a more resilient transportation sector will include hardening and repairing the existing system; improving the Territory's capacity to rebuild by increasing the availability of building materials and contractors; adopting more resilient road and street designs that depend less on signaling and electricity and that encourage modes of transportation other than private cars; expanding and improving ports to accommodate greater cargo and passenger volumes; improving transportation system management processes; and, better preparing for future storms.

HARDEN AND REPAIR THE EXISTING SYSTEM

These initiatives will strengthen roads to federal standards, rebuild ports and airports, and support several shovel-ready projects.

Initiative 1

Complete latent system repairs and improve road system to meet federal standards

Lagging repairs present a significant vulnerability in the Territory's transportation network that can be readily reduced by making repairs and hardening transportation system assets. DPW will work with FHWA, FTA, and the GVI to complete system repairs that are outstanding and bring the Territory's roads up to current FHWA standards in the next 3-5 years (including repairing all storm-damaged roads). Federal roads will be repaired using FHWA Emergency Relief funding and local roads using FEMA Public Assistance. All remaining roads that currently do not meet standards will be improved using FEMA Hazard Mitigation Grant Program, CDBG-DR, existing Grant Anticipation Revenue Vehicle (GARVEE) bond proceeds, US Department of the Interior (DOI) funds, and FHWA federal aid funds.

Initiative 2

Utilize concrete as the most suitable building material for roads

St. Thomas' steep topography and load requirements often mandate concrete instead of asphalt. Although concrete roads can be more expensive to build, they provide greater strength and longer lifespan and require less maintenance than asphalt. DPW will rebuild as many roads with concrete as funds permit, focusing especially on roads that have suffered repeated damage due to heavy loading and inadequate drainage.

Initiative 3

Repair storm damage at ports and airports

VIPA, working with airlines, TSA, FAA, and CBP where necessary, will conduct outstanding repairs of existing airports and seaports to bring them up to new building codes. At both ports and airports, this will include replacing or upgrading generators, upgrading and hardening security measures such as lighting and fencing to withstand higher wind loading, and hardening communication capabilities (e.g., satellite phones).

Initiative 4

Repair and harden Henry E. Rohlsen Airport (STX) and Cyril E. King Airport (STT)

Both airports sustained significant damage in the storms, which caused them to be out of service for several weeks. VIPA will carry out repairs to damaged terminals, replace runway lighting and signage, and conduct other storm-related repairs. Resilience will be a concern throughout the repair process: airport roofs at STT and STX are both being replaced to a higher standard, all sloped roofs are being replaced with structural metal panels, and flat roofs (formerly single ply) are being replaced with a two-ply TPO roofing system. Additionally, new standards call for increased wind loading (from 125 miles per hour to 165), stronger windows and walls, and roofs that can withstand higher winds.

*Initiative 5***Expand and modernize Cyril E. King Airport**

STT on St. Thomas is already one of eastern Caribbean’s busiest hubs—and passenger numbers have grown in recent years. To address future needs, VIPA will expand the airport’s capacity and modernize it in the process. The expansion and modernization will proceed in four phases:

- Phase 1: Build out second level, create 10 air bridges, increase retail space, improve passenger flow, involve community in design process;
- Phase 2: Build new transportation center, short- and long-term parking, rental cars area, and multi-level parking structure connected by bridge;
- Phase 3: Build new commuter wing to accommodate interisland flights;
- Phase 4: Tie marine passenger routes to the STT waterfront and STJ; connect airport terminal to water transportation.

The first phase is to be completed in approximately three years at an estimated cost of \$230 million.



Damage from Hurricane Irma at the Cyril E. King Airport on St. Thomas

K.C. Wilsey/FEMA

*Initiative 6***Improve VITRAN bus service Territory-wide**

To enhance transportation options available to the Territory’s residents, VITRAN will work to expand and modernize bus service on St. Croix and Territory-wide. As a first step, VITRAN will launch Routematch intelligent tracking system in late 2018. Routematch will allow users to track buses in real time and anticipate departure and arrival times via their mobile devices. In 2019, VITRAN is planning to expand services by procuring 10 additional buses and adding additional routes, bus stops, and bus shelters.

*Initiative 7***Facilitate completion of existing capital improvement projects and “shovel-ready” projects**

Planning for multiple capital projects has advanced to “shovel-ready” phase, but implementation has been delayed for lack of funds. These include improving public transportation stops for land and water networks, replacing the damaged crane at the St. Croix Container Port, reconstructing the St. Thomas waterfront in the largest single-road project in the USVI history, and several small-scale projects in various stages of design. DPW will deliver these projects subject to available funding (see table: [Selected DPW “shovel-ready” road projects in the USVI](#)).

IMPROVE CAPACITY TO REBUILD

The Territory’s recovery will require large amounts of materials and labor—and those may not always be available. These initiatives will improve the availability of both.

*Initiative 8***Study measures to expedite building materials import into the Territory**

To perform the amount of work required for recovery, the Territory will need considerably more construction materials than under non-recovery circumstances, but those materials can often be difficult to secure. With the

Selected DPW “shovel-ready” road projects in the USVI

Project	Description	Estimated cost in millions
St. Thomas		
Veterans Drive – Waterfront	Roadway widening & improvements. 1st Phase currently in construction. GARVEE-funded project.	\$120
Raphune Hill	Roadway widening & improvements. 1st Phase completed. Remaining two phases in final design.	\$40
Scott Free Road	Roadway widening & improvements. 1st Phase currently in construction.	\$10
St. Croix		
Melvin Evans	Roadway rehabilitation. 1st Phase currently in construction. GARVEE-funded project.	\$15
Clifton Hill Phase 2	Roadway improvements including roundabout at La Reine intersection.	\$10
Spring Gut Road	Roadway widening & improvements including 2-mile multiuse path. Currently in final design. GARVEE-funded project.	\$20
Mahogany Road	Roadway rehabilitation. Currently in design. GARVEE funded project.	\$8
Hams Bluff Road	Roadway rehabilitation. Currently in design. GARVEE-funded project.	\$7
Rattan Road	Roadway rehabilitation. Currently in design. GARVEE-funded project.	\$3
Frederiksted Roads (Routes: 702, 7029, 7027, 7025 & 7023)	Roadway rehabilitation. Currently in design. GARVEE-funded project.	\$3
Christiansted Roads (Routes 754, 75E & 75W)	Roadway rehabilitation. Currently in design. GARVEE-funded project.	\$3
St. Croix Bike Path	14-mile multiuse pathway along the South Shore. Funding for design and some maintenance commitments through nonprofit Crucian Bikeways Inc.	\$14

Note: Grant Anticipation Revenue Vehicle (GARVEE) is a commonly used debt-financing instrument used to finance transportation projects with future Federal-aid highway dollars. GARVEEs are authorized to receive Federal reimbursement of debt service and other bond-related financing costs under Section 122 of Title 23, United States Code.

exception of some quarried materials like stone, most materials are imported into the Territory, including ready-mixed concrete, construction aggregates, sand, soil cement, bagged cement, and masonry block. Other building materials such as lumber, steel, and hardware are also imported by ship. Post-hurricane, the volume of goods coming into the ports will include both new materials for reconstruction, as well as replacements of storm-damaged inventories—and those volumes will have to go through existing facilities and processes.

DPW will work with VIPA and CSB officials to determine what measures can be taken at ports and import facilities to expedite building materials, acquisition, starting by conducting a study to determine the impact on ports of importing a large volume of post-storm building materials. Some of the materials availability issues may also be addressed in the future by the expansion of the container port at the location of the destroyed Cancryn Middle School on St. Thomas (see Initiative 14).

Initiative 9

Study measures to expand local availability of materials

Expanding and/or speeding up the import of materials into the Territory does not have to be the only way of meeting the Territory’s materials shortage. Another way is to expand what is available locally, either by expanding government operations to aid the supply chain or working with existing supplies. For the former, the Governor’s Office, together with the DPW, will determine the possible options. For the latter, the Governor’s Office, together with the DPW, will work with both new and existing suppliers and vendors of asphalt, concrete, and aggregate to identify possible options, including by addressing possible land challenges with the use of government land (especially on St. Thomas) and by considering tax and other incentives.

Initiative 10

Grow contractor and workforce capacity

Post-hurricane recovery work will require large amounts of skilled and semi-skilled labor. This labor pool may now not be sufficient in the Territory. The Governor’s Office will coordinate with the Departments of Labor and Education and private contractors to offer workforce development and trade education, especially to create and train a disaster responder workforce specializing in

transportation-related hurricane damage restoration. To make sure that enough skilled labor can be attracted, the Governor's Office will ensure that wages are competitive and will work with the VI Department of Labor (VIDOL) to raise the prevailing wage of federal aid projects.

ALTER ROAD AND STREET DESIGN TO SUPPORT RESILIENCE

A resilient transportation system does not just mean a hardened one—it also means one in which users have more options for moving around and the system depends less on other systems like power, which these initiatives will help promote.

Initiative 11

Utilize roundabouts instead of street lights at intersections

Roundabouts (traffic circles) are simple and resilient traffic flow solutions currently underutilized in the Territory's roads infrastructure. Roundabouts increase the level of service and capacity, improve pedestrian mobility, and eliminate the need for electricity to power traffic signals—all of which also contribute to resilience. This type of measure is supported by the FHWA, and the Territory is looking to build several roundabouts, starting with the USVI's most dangerous intersections. On Clifton Hill, detailed engineering studies have shown roundabouts to offer better capacity and performance than conventional signalized intersections. Following the studies, one two-lane roundabout at the La Raine intersection is currently in design and will soon move into the construction phase. Beyond the Clifton Hill project, DPW will consider the use of roundabouts when making major intersection improvements anywhere in the Territory.

Initiative 12

Implement Safe Routes to Schools

Safe Routes to Schools is a planning approach that encourages active transportation to schools through measures such as crossing guards and monitors, reduced reliance on vehicles, and encouraging healthy activities for higher quality of life and safer, more cohesive communities. For example, on St. Thomas, school pickup and drop-off creates an inordinate amount of congestion in school zones and roadway traffic and pose both an

inconvenience and a safety risk. Safe Routes to Schools would help alleviate this, as well as encourage community building and more active transportation options for students and families. DPW will work with the Territory's nonprofit groups to implement the approach where feasible.

Initiative 13

Deploy walkability recommendations

Improving walkability enhances resilience by reducing dependence on cars where feasible, as well as decreasing roadway congestion and pollution. It also benefits all residents by providing more green space, shade, and a more enjoyable environment; reducing obesity, depression, hypertension, diabetes, and other health issues; and stimulating tourism, increasing land values, and contributing to overall economic activity.

Right now, the USVI ranks very low in walkability standards and high in chronic health issues indexes—but there is no reason why it should remain that way. The VI Department of Health (VIDOH) and the Centers for Disease Control (CDC) have created a program to encourage walking, biking, accessibility, and mass transit in the Territory, promoting a healthier society by using infrastructure to change behavior. The nonprofit USVI Walkability Institute also developed a "Complete Streets Policy" to improve walkability and accessibility in the Territory. The Governor's Office will work with VIDOH, DPW, and the Walkability Institute to implement walkability recommendations throughout the Territory.

DPW, for its part, will review all proposed roadway projects, including emergency repairs, widening, utility improvements, drainage, and paving to incorporate walkability enhancements where practical. WAPA and DPW will also review all undergrounding and infrastructure improvement projects located within the public right of way for opportunities to provide active transportation enhancements. DPW will coordinate with WAPA for the design and construction of these improvements. Potential funding is available through VITEMA / FEMA HMGP, HUD CDBG-DR, and DOT.

EXPAND AND IMPROVE PORTS AND CUSTOMS PROCESSING

These initiatives will expand the Territory's ability to receive cargo and passengers and will also speed up customs clearance.

*Initiative 14***Expand container port on St. Thomas**

Current container port capacity on St. Thomas—which serves as the hub for the rest of the Territory—is insufficient to accommodate the Territory’s needs in the hurricane recovery period. VIPA will work to expand port capacity, including possibly using the space where Cancryn Middle School—destroyed in the storms—was once located. Discussions between VIPA and the VI Department of Education (VIDOE) about a potential land trade are ongoing.

*Initiative 15***Conduct dredging and expansion in Gallows Bay Port**

The Gallows Bay Port facility on St. Croix can currently only accommodate smaller vessels, but not cruise ships of any size. VIPA is planning to conduct dredging and terminal expansion in the Gallows Bay Port to accommodate small cruise ships, which are typically luxury vessels with high passenger purchasing power. Plans for the terminal are complete; however, they are stalled due to both permitting and financing issues. VIPA is working with the US Army Corps of Engineers (USACE) to approve permits for dredging of Schooner Bay; such dredging, however, depends on securing funding. Separately, in order to create the environment for high-end cruise ships and luxury vessels, the port’s current cargo operation must be moved to the Gordon A. Finch Molasses Pier on St. Croix. This portion of the project is already under way; however, difficulties with contractors and skilled labor shortages have encumbered the timeline. VIPA will continue to work with USACE, as well as federal and private partners, to bring this project to fruition.

*Initiative 16***Modernize and expand customs clearance in Red Hook**

Plans to expand US Customs and Border Protection (CBP) clearance point in Red Hook (on the East End of St. Thomas) have been under way for years. Currently, there are temporary facilities in place to process paperwork, however, plans for a permanent CBP structure are currently under review by the USACE.

VIPA will work with CBP, USACE, and other federal partners to complete the project. Construction costs are estimated at \$6 million.

*Initiative 17***Deploy Automatic Customs Environment system to improve Customs processing**

The Territory depends on its ports for the import of nearly everything essential for its survival, however, because the USVI is outside the US customs zone, the imports take more time and effort than they would elsewhere in the US, slowing down the recovery after the storms. Automatic Customs Environment (ACE), a Customs and Border Protection proprietary system for automatically connecting importers to various responsible agencies and expediting approvals and tariff collection could facilitate a faster recovery by: 1) accelerating the import of critically needed recovery materials; 2) accelerating the transmittal of collected tariffs back to the Territory; 3) improving the long-term economic prospects and health of the Territory; and, 4) alleviating the reporting and storage burden on both the Virgin Islands Department of Licensing and Consumer Affairs (DLCA) and CBP.

FEMA has included the acquisition of ACE in its Hazard Mitigation Strategy for the Territory and has been in active discussions with Customs and Border Protection on how to best deploy the system. Doing so involves some work: due to the USVI’s unique status outside of the customs zone and associated tariffs, the software package would need considerable development before it can be ported to the USVI. The Governor’s Office and VIPA will continue to work with FEMA, CBP, Department of Homeland Security Infrastructure Protection, and the US Army Corps of Engineers to bring the system to the USVI. The total cost for the acquisition, development, and deployment of this technology system is still being evaluated, but is currently estimated to be above \$7 million.

IMPROVE ROAD SYSTEM PLANNING AND ASSET MANAGEMENT

These initiatives will improve the way the system is run and the way that planning for it is done through focusing on drainage and asset and resource management.

*Initiative 18***Conduct a comprehensive drainage study of the Territory's transportation network and apply results to improve the road drainage system**

Proper road drainage is critical in the event of a hurricane or flooding, as poor drainage makes roads more vulnerable to damage. The Territory, however, suffers from inadequate drainage both because of the way the drainage infrastructure is built and because of the way it is maintained (DPW only does drainage maintenance when there is a clog, because a map or database of drainage facilities does not currently exist). This could destabilize transportation infrastructure in the event of another natural disaster—and all the more so as precipitation patterns change in the future.

After the hurricanes, the Ridge to Reef Taskforce—a forum consisting of various government and private stakeholders—was formed to identify drainage and water resource issues in the Territory, which DPNR and DPW would then address. As part of this initiative, UVI, in coordination with DPW, DPNR, and the Ridge to Reef Taskforce, is working on a comprehensive Territory-wide hydrology study. The study's first step is to collect data on current drainage infrastructure and to map guts. This effort is currently under way and funded through a USGS grant. Once the study is completed, UVI will share the collected data with DPNR and DPW. The departments will then use the data to update their maps and GIS databases, which will help them manage the Territory's water resources and drainage infrastructure more efficiently and effectively. After the data is collected, UVI will perform the rest of the study, including modeling that will incorporate the latest in climate data and will identify current and future drainage issues for DPNR and DPW to address. Funding for the effort is available through VITEMA / FEMA HMGP.

*Initiative 19***Develop and implement asset and resource management system for all territorial roadways**

No centralized on-island inventory of all roadway assets and building/repair resources in the Territory currently exists. Creating one will help ensure that maintenance projects are scheduled on time and correctly prioritized

and that materials and labor are deployed more effectively and efficiently. DPW will create and maintain a GIS database for all roadways by developing an Asset and Resource Management System. This system will include the inventory of all roadway elements along with their condition, support the planning and performance of daily maintenance, and will also aid long-term resilience by helping with planning and management of infrastructure improvement projects. As the system's specific components, DPW will utilize VIRAMS (VI Road Asset Management System) to monitor the condition of the Territory's roadways and perform and prioritize maintenance. Additionally, DPW will implement a resource management system (VUEworks) to track resources (manpower and costs) associated with all facilities, including roadways.

IMPROVE PREPAREDNESS AND POST-STORM RESTORATION

Some of the challenges that future storms will bring are predictable. These initiatives will help ensure the Territory is better prepared for damage and that it can recover more quickly if and when damage does occur.

*Initiative 20***Update response plan for ports and airports to support restoration of critical baseline services after storms**

When ports and airports are damaged in a storm, they can only restore service gradually; it is important for the restoration process to prioritize restoring critical baseline services as quickly as possible. The Governor's Office will work with VITEMA and VIPA to update response plans to support such prioritization.

*Initiative 21***Institute a debris removal plan**

After the 2017 storms deposited more than 850,000 cubic yards of debris on the Territory's roads, complete clearance took many months. Contributing to the length of the process was not just the volume of work, but also the need to sign contracts and to find staging

locations for the debris that was collected. To expedite debris removal after future storms, DPW will work with the Department of Property and Procurement (DPP) to have debris removal contracts in place prior to the hurricane season. DPW, working with the Waste Management Authority (the agency responsible for disposing of debris by mulching it, burning it, or shipping it off-island), will also identify debris staging locations and have necessary equipment on standby (or equipment already identified and accessible on the mainland) so that future debris clearing operations can start and move as quickly as possible.

Initiative 22

Provide power backup source for signalized intersections

After the 2017 storms, traffic signals—even if they survived the storms intact or could be repaired quickly—were out of service for many weeks as power supply was being restored. DPW has considered the feasibility of using backup battery power for signalized intersections to increase system resilience. As such, DPW will standardize battery backup on all signalized intersections and install backups on all new intersections.

Initiative 23

Conduct temporary patching and emergency system repairs

After a major storm, certain types of road system repairs will likely need to be conducted. To accelerate such repairs, it helps to have a plan in place to perform temporary patching of infrastructure while more permanent solutions are being developed. DPW will work with the DPP to put emergency contracts in place prior to the hurricane season to ensure that emergency road repairs can be performed more quickly than they otherwise would be.

Initiative 24

Update VIPA emergency plans to stockpile repair materials

VIPA's emergency repair process was at times hindered by lack of available materials. Securely stockpiling materials for emergency repairs would help shorten lead times and prevent delays in making emergency repairs after another storm event. VIPA will update its emergency planning process to account for materials availability.



Hurricane damage to road in the USVI

Piotr Gajewski