VIRGIN ISLANDS DEPARTMENT OF HEALTH

FEDERAL CONSISTENCY DETERMINATION REQUEST

For

DEMOLITION AND RECONSTRUCTION OF THE JUAN FRANCISCO LUIS HOSPITAL AND MEDICAL CENTER

GRANTS MANAGER: #_ _ _ _ _

FEMA APPLICANT ID# _ _ _ _ _

June 21, 2023

PROJECT LOCATION

Figure 1 JFLHMC on St. Croix Location

The proposed Governor Juan Francisco Luis Hospital and Medical Center (JFLHMC) demolition and hospital replacement project is located near the midpoint of the island of St. Croix at 4007 Estate Diamond Ruby (See Fig 1 above & Fig 2 below). The existing site includes JFLHMC main building, JFL North temporary hospital, VI Cardiac Center and support systems. Primary access to the site is through a security station on the eastern lane of Highway 79 (Pepper Tree Road/Claude A. Benjamin Memorial Drive) that runs along the western perimeter of the site. The Pepper Tree Terrace Community sits across the street west of the facility. Located to the north at 302, and 25 feet away, respectively, are Acute Alternative Medical building and Queen Ridge Hospital housing. The Innovative Business Center is 308 feet away to the south. Sunny Isle Shopping Center and the Virgin Islands Bureau of Internal Revenue building are located 994 and 714 feet, respectively, to the southeast. JFLHMC occupies approximately 7.81 acres that are zoned Public. To accommodate the replacement hospital and provide additional space for temporary facilities and support structures, two (2) adjoining properties were acquired as part of the overall project site (See Figure 3 below on page 3). They include a 3.6-acre parcel at Plot No. 7E Estate Diamond to

the south and a 5-acre parcel at Remainder 2 Estate Sion Farm to the east zoned B-2 increasing the size of the entire site to 16.17 acres. Further information regarding the project location is provided below.

OWNERSHIP:	VI Government Hospitals & Health Facilities Corporation Territorial Board
PROJECT ADDRESS:	7-C, 7-D & 7-E Estate Diamond & Rem 2 Estate Sion Farm
GPS COORDINATES:	17°43'51.56"N, 64°44'52.43"W
PROPERTY ID:	204600043700

Figure 2 JFLHMC Project Site

PROJECT DESCRIPTION

As the only hospital on the island of St. Croix, the JFLHMC is a critical component of the Virgin Islands of the United States overall healthcare system. JFLHMC sustained severe damages from two category 5 hurricanes in September of 2017; Hurricane Irma on September 5th and Hurricane Maria on September 20th. The magnitude and extent of hurricane damages required immediate patient evacuation and relocation, and adversely affected the ability of JFLHMC to provide public health services to residents and visitors. Accordingly, FEMA assessed and approved the USVI replacement hospital as the most favorable alternative and eligible for funding under a Public Assistance Grant (Grants Manager #_ _ __).

The JFLHMC replacement hospital project involves demolishing the existing 3- story main hospital steel structure, foundations, stairs, roof and canopies, below-grade cisterns, biomedical waste building, Butler building, and the connector from VI Cardiac Center to JFL main building. Additionally, the project includes removing 3 medical trailers, concrete, asphalt, and other surfaces, underground utilities, and removal of selected trees. Subsequently, USVI will construct this much anticipated and needed impressive 8-story,

resilient, energy efficient, renewable energy conscious, contemporary JFL replacement hospital in the same location as the existing hospital. The JFLHMC replacement hospital project is coordinated and orchestrated by members of the talented Territorial Hospital Redevelopment Team and VI Government Hospitals & Health Facilities Corporation Territorial Board supplemented by specialized, knowledge-based contractors to create an environment that enhances the human potential of the Virgin Islands.

Figure 3 Additional Acquired Land Parcels

For the rebuild, a generic description of project activities include:

- Installation of a series of erosion and sediment control systems;
- Implementation of dust control measures;
- Demolition of existing 3 story main hospital steel structure, foundations, stairs, roof and canopies including (3) below grade cisterns, biomedical waste building, Butler building and the connector from VI Cardiac Center to JFL building;
- Removal of 3 medical trailers, concrete, asphalt and landscaped surfaces;
- Construction of 573 parking spaces in 2 phases;
- Construction of an 8-story contemporary-styled, energy efficient replacement hospital; and
- Removal of mechanical and utility infrastructure for the temporary hospital and return eastern 5.0-acre parcel to original state.

Centrally located, the JFLHMC replacement facility will be a resilient and efficient state-of-the-art hospital that will provide a full range of healthcare services to residents of St. Croix and beyond. The new hospital will promote healthy lifestyles and disease prevention, provide diagnosis and treatment, and rehabilitation by offering four broad types of services. Moreover, JFL replacement hospital will provide mental and dental care, laboratory and diagnostics, substance abuse treatment, preventative care, physical and occupational therapy, nutritional support and pharmaceutical services. Organizational and adjacency considerations, and energy-efficient building support systems are incorporated in the design. It features stacked patient care areas above, emergency, surgery and other treatment/support areas which provides a safer care model for patients. This approach minimizes patient movement and reduces distance and travel time. Through a solar analysis, the insulation requirements were tailored to produce an energy use intensity for JFLHMC of 203 kBtu/ft^2. For comparative purposes, many other hospitals are typically associated with EUIs that range between 400 to 500kBtu/ft^2. Consistent with the intent of the CZM program's preference for the use of renewable resources, optimization of sunlight and daylight and harvesting of rain allowed for a reduction in lighting requirements and potable water usage which will translate into a reduction in consumption of fossil fuels to produce electricity and water and, in turn, protects the environment. To further promote a reduction of fuel consumption and environmental pollution, the JFLHMC will include electric vehicle charging stations.

The new JFLHMC provides a therapeutic interior environment. Daylight and healing environs are part of the hospital design, where a 33% window-to-wall ratio will allow natural light to promote healing. Finally, outdoor spaces will include courtyards and rooftop terraces adorned and beautifully landscaped with native plants.

The VI Government Hospitals & Health Facilities Corporation Territorial Board (or Flad Architects on behalf of the VIGHHFC) will submit all applicable and relevant permit applications. Permit applications include, but are not limited to:

- Construction General Permit (with Notice of Intent Form) - DPNR
- Air Pollution Control Construction and Operation Permit- DPNR
- Earth Change - DPNR
- Hazardous Waste Generator and Transporter - DPNR
- Used Oil Management - DPNR
- TPDES Discharge Permit - DPNR
- Demolition Permit – DPNR
- Terminal Facility License Permit-DPNR
- Building Permit - DPNR
- Electrical Permit - DPNR
- Plumbing Permit - DPNR
- Mechanical Permit – DPNR
- Driveway Permit - DPW
- Waste Management Permits – WMA

ENVIRONMENTAL IMPACTS

A targeted environmental assessment was conducted to determine if any sensitive environments and/or organisms exist could be impacted and to inform best management practices throughout execution of demolition and construction activities. Areas considered and covered in the assessment were the potential for disruption of JFL North operations, impact on nearby residents, businesses, archaeological resources, wetlands, critical habitats, refuge lands and fish hatcheries, threatened and endangered species, and migratory birds. Uncontrolled demolition and construction activities may generate unacceptable levels of fugitive dust that become airborne, create unstable exposed soil surfaces that may produce undesirable environmental circumstances. These potential undesirable environmental impacts may pollute ambient air, deposit particle pollution on surfaces and generate sediment-laden stormwater. The intent is for the selected contractor to strategically use climate data and information, knowledge of weather patterns, periods of historically lower rainfall, and wind velocity to schedule demolition and soil disturbance activities. Further, soil disturbance activities will limit the extent and duration of exposed soil surfaces to minimize dispersion and lessen erosion of sediments to stormwater. Climate data/information is also vital to the development of an effective Stormwater Pollution Prevention Plan. Taking all of the above factors in consideration, as well as an evaluation of existing site conditions, the hydrology study, proposed demolition and construction activity, and the surrounding environs, the JFLHMC project will implement several best management erosion and sediment control practices to sufficiently minimize potential adverse project related environmental impacts.

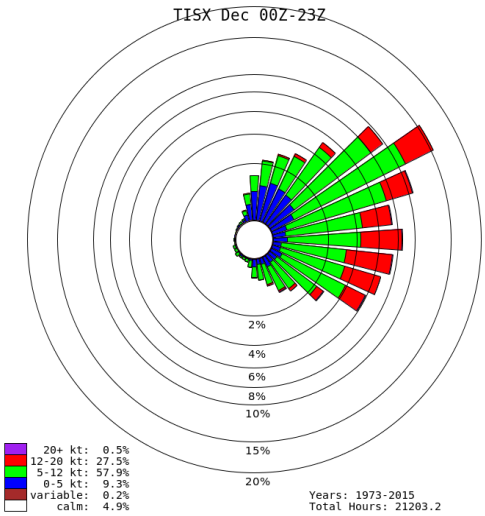
Climate / Weather [Prevailing Winds]

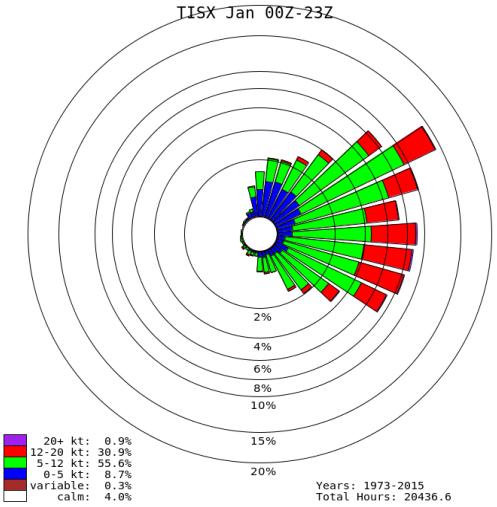
Based on the US Department of Agriculture Natural Resources Conservation Service Soil Survey, wind circulation throughout the Lesser Antilles region is dominated by easterly trade winds. Climate is maritime tropical and is characterized by generally fair weather, steady winds, and slight but regular annual, seasonal, and diurnal ranges in temperature. Rain-producing weather systems generally move into the Virgin Islands from the east in the summer and from the northwest in winter. From June through November, these weather systems are in the form of tropical waves that develop in the tropical trade wind belt. Some of these waves develop into tropical depressions, tropical storms, or hurricanes, especially during August and September. From December through May, the weather-producing systems are frontal systems and low-pressure troughs that move in from the northwest. These frontal systems transport cold Canadian air into the Caribbean region.

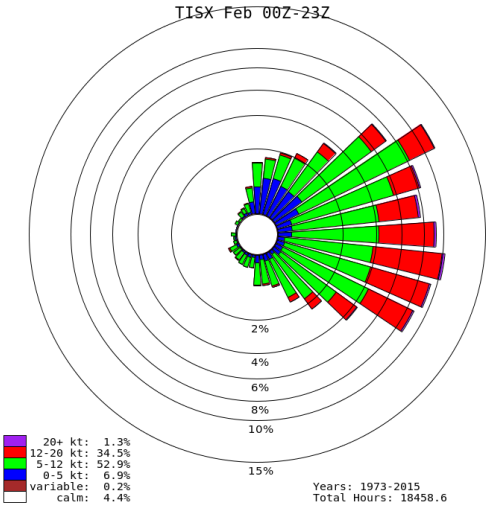
The Virgin Islands lie within the influence of the "Easterlies" or "Trade Winds" which traverse the southern part of the "Bermuda High" pressure area; thus, the predominant winds are from the east and east-northeast (IRF, 1977). These trade winds vary seasonally and are broadly divided into 4 seasonal modes: 1) December to February; 2) March to May; 3) June to August; and 4) September to November. Below are the characteristics of these modes as taken from Marine Environments of the Virgin Islands Technical Supplement No. 1 (IRF, 1977).

December - February

During the winter, trade winds reach a maximum and blow with great regularity from the east-northeast. Wind speeds range from eleven to twenty-one knots about sixty percent of the time in January. This is a period when the Bermuda High is intensified with only nominal compensation pressure changes in the Equatorial Trough. The trade winds during this period are interrupted by "Northerners" or "Christmas Winds" which blow more than twenty knots from a northerly direction in gusts from one to three days. Such outbreaks average about thirty each year and they are created by the strengthening of high pressure cells over the North American continent which, in turn, allows weak cold fronts to move southeastward over the entire Caribbean region. Intermittent rains, clouds, and low visibility for mariners accompany these storms.

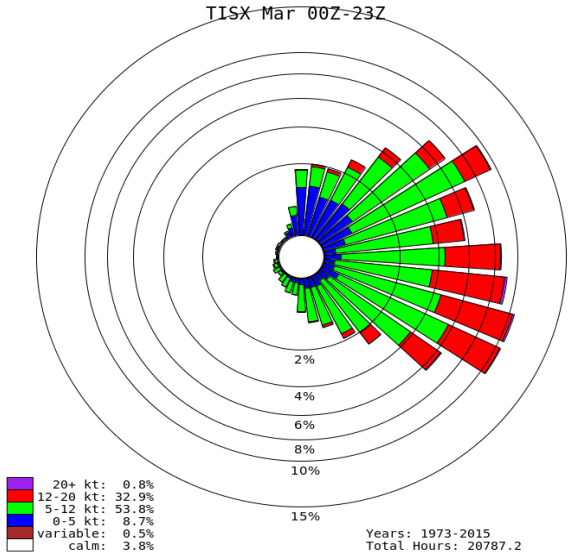


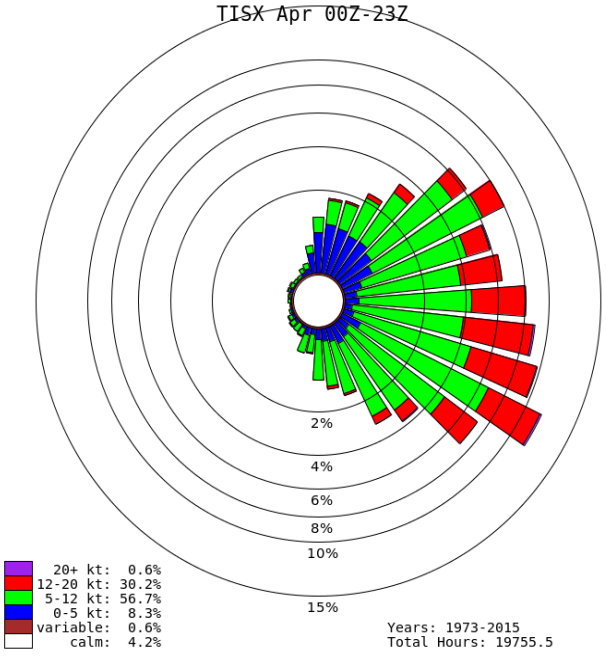


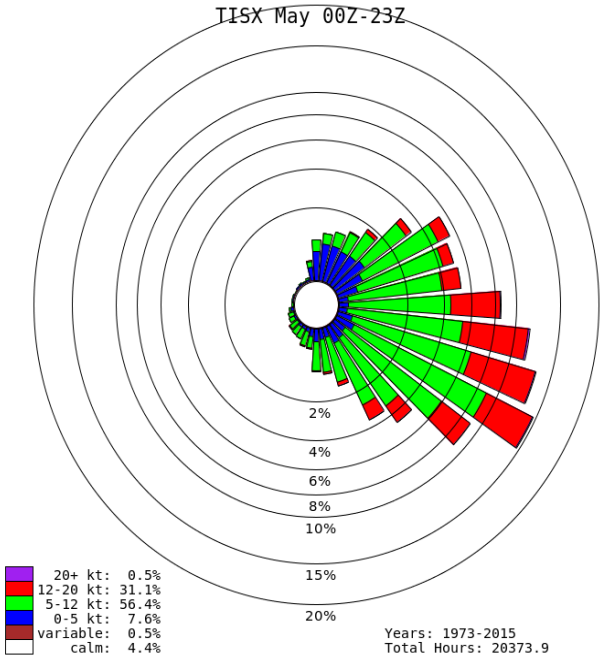


March – May

During the spring, the trade winds are reduced in speed and blow mainly from the east. Winds exceed twenty knots only thirteen percent of the time in April. The change in speed and direction is the result of a decrease in the Equatorial Trough.

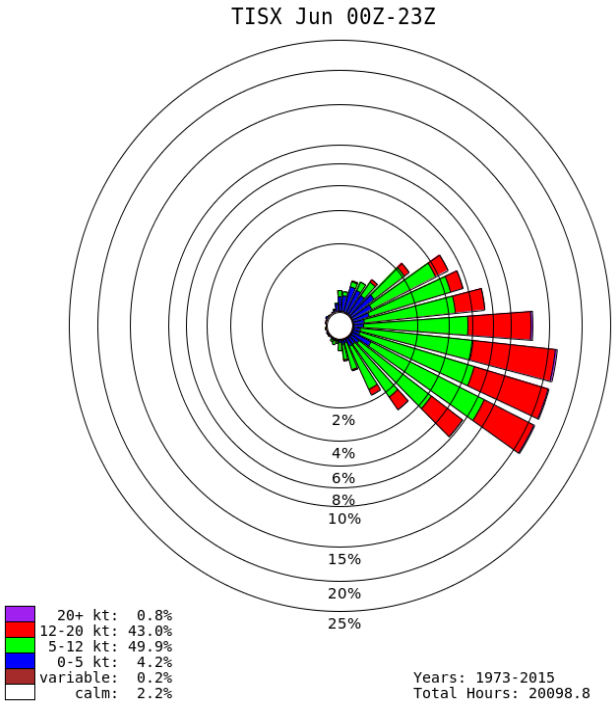


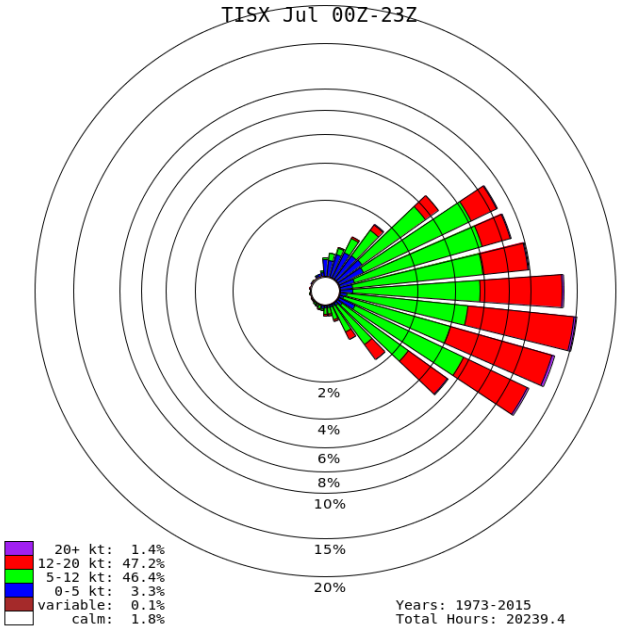


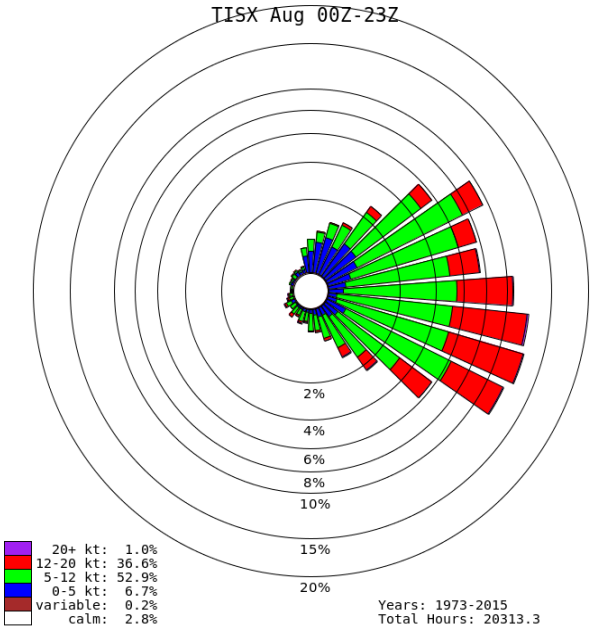


June - August

Trade winds reach a secondary maximum during this period and blow predominantly from the east to east-southeast; speeds exceed twenty knots twenty-three percent of the time during July. The trend for increasing winds results from the strengthening of the Bermuda High and a concurrent lowering of the pressure in the Equatorial Trough. Trade winds during this period are interrupted by occasional hurricane.



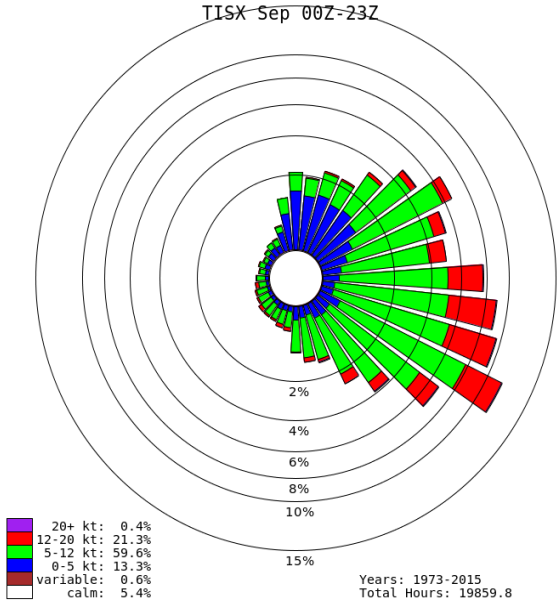


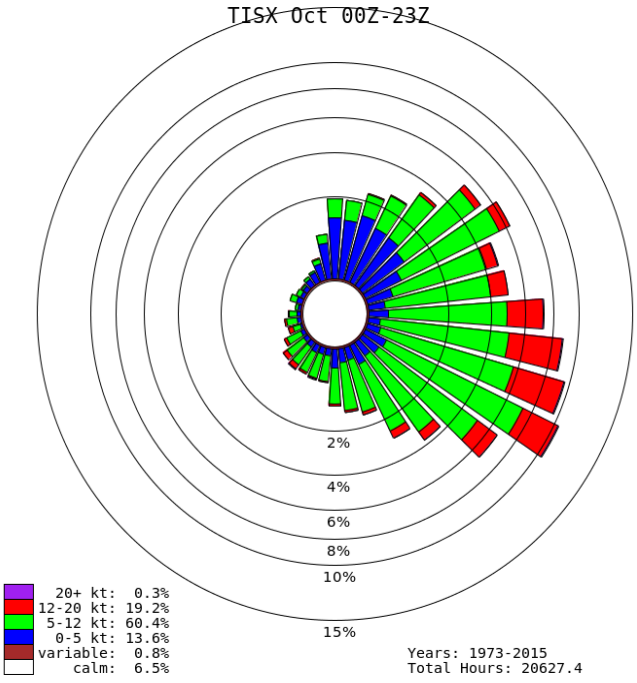


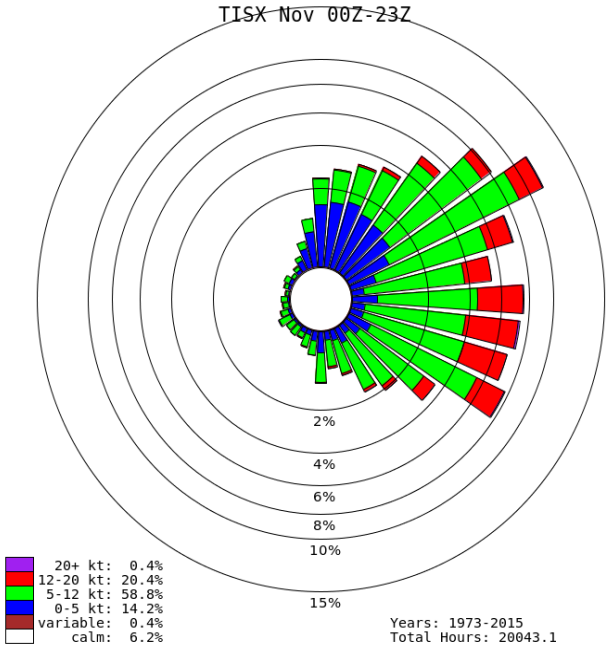
September - November

During the fall, winds blow mainly from the east or southeast and speeds reach an annual minimum; only 7 percent of the winds exceed 20 knots in October.

The low speeds result from a decrease in the Equatorial Trough. During this period, especially during late August through mid-October, easterly waves, tropical storms and hurricanes often break down the normal trade wind regime.







There are numerous disturbances during the year, especially squalls and thunderstorms. These occur most frequently during the summer, lasting only a few hours and causing no pronounced change in the trade winds. For example, a tropical thunderstorm develops sustained winds of 25 mph for 20 to 40 minutes with gusts to 40 mph. Line squalls (squall lines) occasionally develop winds of 60 mph for periods of 30 minutes to an hour with gusts to 90 mph. Funnel clouds (tornadoes, water spouts) occasionally develop over the coast or

offshore, and may cause winds well in excess of those described above. The average occurrence interval of severe winds in a funnel cloud at an offshore location is greater than once in a hundred years (Howard Needles, Tommen & Bergen doff, 1975).

A tropical cyclone whose winds exceed 74 mph is termed a hurricane in the Northern Hemisphere, and significantly affects the area. These are low-pressure areas around which the wind circulates in a counterclockwise, inward spiral. These hurricanes occur most frequently between August and mid-October with their peak activity occurring in September. Since 1989, the Virgin Islands have been impacted by various hurricanes. Hurricane Hugo impacted the island in 1989, Hurricanes Luis and Marilyn in 1995. Hurricanes Bertha and Hortense in 1996. No hurricanes passed in the immediate vicinity of the Virgin Islands in 1997. Hurricane Georges struck the Virgin Islands on September 21, 1998 and Hurricane Lenny, a category 4 hurricane on November 17, 1999. Hurricane Lenny developed very late in the season and approached the island from the southwest. Hurricane Omar struck the Virgin Islands in 2008.

Hurricanes Irma and Maria hit the Virgin Islands in 2017. Within a 14-day period, those two category 5 hurricanes wreaked havoc throughout the territory. Hurricane Maria ravaged St. Croix, the largest of the U.S. Virgin Islands. Although there were no reports of casualties, the storm unleashed powerful winds and heavy rainfall, tearing off roofs, downing trees and decimating the communication networks and the power grid across the island.

Climate

According to the USDA NRCS Soil Survey, major rainfall events are associated with weather systems that enhance the uplift of moist air in the region. Orographic lifting of moist air over hilly terrain is the most common cause of rainfall on the islands. The amount of rainfall increases with increasing elevation. The total annual rainfall differs substantially at various locations throughout the islands. St. Croix has a variable amount of annual rainfall. The total annual rainfall is more than 50 inches in the northwestern part of the island, about 25 to 35 inches on the southwestern coast, about 40 to 50 inches on the south-central coast in the vicinity of the JFLHMC project, and about 20 to 30 inches in the eastern part of the island. Leeward aspects receive greater amounts of rain because clouds develop over the slopes on a daily basis. In general, days have a higher incidence of rainfall than nights. The Virgin Islands do not have a sharply defined wet season or dry season. The wettest period generally is from September to November, and the driest period is from January to June. Occasionally, intense rainfall occurs during the drier period.

Stormwater runoff in the Virgin Islands is a result of rainfall which then flows over land. Below find the most recent data from 2000 to May of 2023 for Henry E. Olsen Airport monitoring location, acquired on June 10, 2023 from the closer to the project site of the two meteorological stations on St. Croix. In 2022, May, September, October and November are months when mean rainfall levels are the highest. The annual precipitation on St. Croix at the HERA in 2022 was 37.88 inches.
Typically, the difference between the monthly mean temperatures of the coolest and warmest months ranges between (5 to 7) °F. The highest monthly mean temperatures are in July and August, and the lowest are in January or February. During the warmest months, the highest monthly mean daytime temperature is about 85.2° F. Warm spells can occur for short periods, and during this time the temperature can reach into the low 90's for several days in succession. On August 17th & 18th of 2020 and September 1, 2022 temperatures reached 95°F at the HERA.

Monthly Total Precipitation for HENRY E. ROHLSEN AIRPORT, VI

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2000	2.50	1.60	M	0.91	3.46	1.24	2.81	2.07	3.29	7.37	3.42	1.40	M
2001	0.91	1.49	0.48	0.86	11.38	0.10	1.90	2.97	1.64	5.85	6.56	7.86	42.00
2002	1.33	1.65	2.38	2.13	0.39	0.79	1.09	2.41	3.12	1.10	3.05	2.17	21.61
2003	2.75	2.37	0.29	8.53	0.37	0.49	4.77	4.15	3.48	7.08	18.03	3.82	56.13
2004	1.59	1.11	1.81	0.31	8.09	0.78	2.34	1.82	8.67	4.59	6.08	1.68	38.87
2005	5.26	0.11	0.39	M	M	1.88	6.03	1.35	6.29	M	2.83	2.85	M
2006	2.87	0.64	0.76	0.85	2.24	1.19	4.76	3.43	M	10.12	3.74	1.52	M
2007	0.81	0.98	0.97	3.64	0.89	3.04	3.10	2.40	3.68	M	2.10	1.90	M
2008	1.89	1.45	1.36	2.12	0.59	0.99	2.25	5.76	7.42	9.09	1.92	0.75	35.59
2009	0.60	0.82	1.02	1.59	M	1.61	0.95	1.51	3.05	2.57	4.72	2.18	M
2010	1.77	0.32	1.36	1.43	5.97	7.03	4.72	3.39	3.75	9.06	10.71	0.37	49.88
2011	0.49	0.72	1.80	2.34	8.05	7.31	6.57	6.81	2.08	3.06	5.43	3.06	47.72
2012	3.03	1.59	3.81	1.69	3.69	0.26	1.90	2.27	3.74	2.64	2.79	2.18	29.59
2013	1.05	0.61	2.49	1.00	5.34	4.90	1.70	4.63	5.43	4.72	5.76	6.64	44.27
2014	1.13	1.03	1.77	3.71	5.52	0.47	0.90	6.08	2.71	2.30	8.65	5.56	39.83
2015	1.22	1.74	0.76	0.59	1.05	0.56	0.77	3.00	1.27	2.90	6.30	2.38	22.54
2016	0.50	1.47	2.39	3.22	3.21	0.86	3.54	2.87	4.18	1.39	7.30	4.29	35.22
2017	0.93	0.81	6.40	7.69	2.05	2.51	1.08	5.10	M	M	M	4.46	M
2018	M	1.98	1.04	0.62	1.45	2.35	1.26	2.21	4.03	1.95	5.45	1.99	M
2019	M	0.39	0.02	0.49	6.28	0.49	4.67	3.73	2.72	1.12	2.63	1.78	M
2020	2.91	0.92	3.76	0.61	0.56	2.16	2.65	3.96	4.24	M	3.34	2.06	M
2021	1.86	0.88	0.55	1.35	1.47	1.73	2.21	3.27	1.53	4.43	1.00	1.18	21.46
2022	2.22	4.86	1.18	0.57	0.35	0.73	4.15	2.15	11.80	2.80	6.47	0.60	37.88
2023	1.85	0.82	0.29	1.82	0.34	M	M	M	M	M	M	M	M
Mean	1.79	1.26	1.61	2.09	3.31	1.89	2.87	3.36	4.20	4.43	5.38	2.73	37.33
Max	5.26 2005	4.86 2022	6.40 2017	8.53 2003	11.38 2001	7.31 2011	6.57 2011	6.81 2011	11.80 2022	10.12 2006	18.03 2003	7.86 2001	56.13 2003
Min	0.49 2011	0.11 2005	0.02 2019	0.31 2004	0.34 2023	0.10 2001	0.77 2015	1.35 2005	1.27 2015	1.10 2002	1.00 2021	0.37 2010	21.46 2021

Monthly Mean Avg Temperature for HENRY E. ROHLSEN AIRPORT, VI

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2000	77.2	M	M	81.3	80.6	81.9	83.1	82.9	82.4	81.3	80.0	79.2	81.0
2001	77.3	77.6	78.5	79.2	80.6	82.7	83.5	83.6	83.3	82.8	79.1	79.6	80.6
2002	78.8	77.4	78.8	78.8	81.8	83.3	83.2	83.5	83.4	82.7	81.4	80.0	81.1
2003	78.5	79.0	79.8	80.0	81.1	82.4	83.2	83.1	83.2	81.7	80.1	78.6	80.9
2004	76.4	77.9	78.3	79.5	80.5	82.7	82.8	84.0	82.3	81.7	80.0	79.0	80.4
2005	77.0	77.6	78.3	81.2	80.7	82.7	82.6	83.1	83.3	M	80.3	77.2	80.4
2006	76.9	77.4	77.7	80.0	81.8	83.8	83.1	81.9	M	82.5	80.3	80.1	80.5
2007	77.9	78.5	79.3	79.5	M	81.4	83.7	83.8	83.2	81.3	79.7	78.9	80.7
2008	77.2	78.0	77.0	78.6	80.9	83.1	82.5	83.2	81.1	80.6	79.6	77.3	79.9
2009	78.3	77.6	76.8	79.2	80.6	82.6	84.8	84.4	83.0	82.7	81.2	79.9	80.9
2010	78.1	78.5	80.6	80.9	82.2	M	84.0	83.5	81.9	80.0	78.3	75.9	80.4
2011	77.4	78.6	76.8	78.7	79.7	82.1	81.6	82.2	82.4	82.0	78.9	77.0	79.8
2012	73.4	74.8	77.5	79.2	80.1	82.5	83.0	83.4	82.0	82.7	81.2	78.9	79.9
2013	77.5	77.4	77.2	79.3	80.3	M	83.3	84.1	83.1	83.5	80.9	79.9	80.6
2014	79.0	79.4	78.7	80.4	81.0	83.9	85.0	83.5	82.9	82.6	81.1	78.4	81.3
2015	78.2	79.0	78.4	80.8	82.2	84.0	84.2	84.3	83.2	83.7	81.3	80.3	81.6
2016	78.8	79.2	80.0	80.6	82.1	84.0	84.3	84.6	82.5	81.2	81.0	79.8	81.5
2017	77.7	77.8	78.8	79.3	81.6	82.5	84.6	84.4	M	M	M	79.8	80.7
2018	77.1	77.3	78.0	80.5	81.7	83.5	83.9	84.3	83.6	83.1	81.4	80.1	81.2
2019	78.5	80.0	79.1	80.5	80.7	82.8	83.4	83.0	83.1	83.1	81.5	81.2	81.4
2020	78.8	79.2	78.5	80.7	84.0	85.6	85.2	85.9	84.2	83.7	81.6	78.2	82.1
2021	78.4	79.8	79.0	80.1	82.0	83.1	84.0	83.2	83.9	82.5	81.6	81.0	81.6
2022	78.6	78.1	78.9	80.2	82.5	83.9	83.8	85.2	84.3	83.4	81.7	79.0	81.6
2023	78.6	78.0	78.1	79.1	82.6	M	M	M	M	M	M	M	79.3
Mean	77.7	78.2	78.4	79.9	81.4	83.1	83.6	83.7	83.0	82.3	80.6	79.1	80.8
Max	79.0 2014	80.0 2019	80.6 2010	81.3 2000	84.0 2020	85.6 2020	85.2 2020	85.9 2020	84.3 2022	83.7 2015	81.7 2022	81.2 2019	82.1
Min	73.4 2012	74.8 2012	76.8 2009	78.6 2008	79.7 2011	81.4 2007	81.6 2011	81.9 2006	81.1 2008	80.0 2010	78.3 2010	75.9 2010	79.3

Landform, Geology, Soils and Historic Land Use

St. Croix was formed from volcanic sediments deposited deep on the ocean floor in the late Cretaceous period (approximately 80 million years ago). The rocks which underlie the mountain ranges are sedimentary, formed by debris from eroding volcanic rocks (Whetten, 1974). Two predominant mountain ranges exist (the Northside Range and East End Range) that are separated by a central sediment-filled valley where the project site is located. At one time, the two ranges were distinct islands, separated by a submerged lagoonal environment, which during a later period of uplifting formed the present sediment-filled valley and island of St. Croix. The landform position associated with soils is on the toe of slopes of hills and mountains underlain by limestone.

According to the Soil Survey of the United States Virgin Islands report (Fig. 4), the primary soils associated with this site are an estimated >95% ArC, Arawak gravelly loam with (5-12)% slopes, very stony. These soils are composed of 85% Arawak and 15% contrasting inclusions of Glynn, Hesselberg and Sion. They present a severe hazard of erosion and depth to bedrock ranges from 14 to 60 inches. This map unit is poorly suited for urban uses. The depth to bedrock and the slope has management concerns for dwellings and small commercial buildings. All structures should be designed so that they conform to the natural slope of the land. Ripping the bedrock or building above it and landscaping with fill material help to overcome the depth to bedrock. The depth to bedrock, the slow percolation rate, the slope, and large stones are severe limitations for septic tank absorption fields.

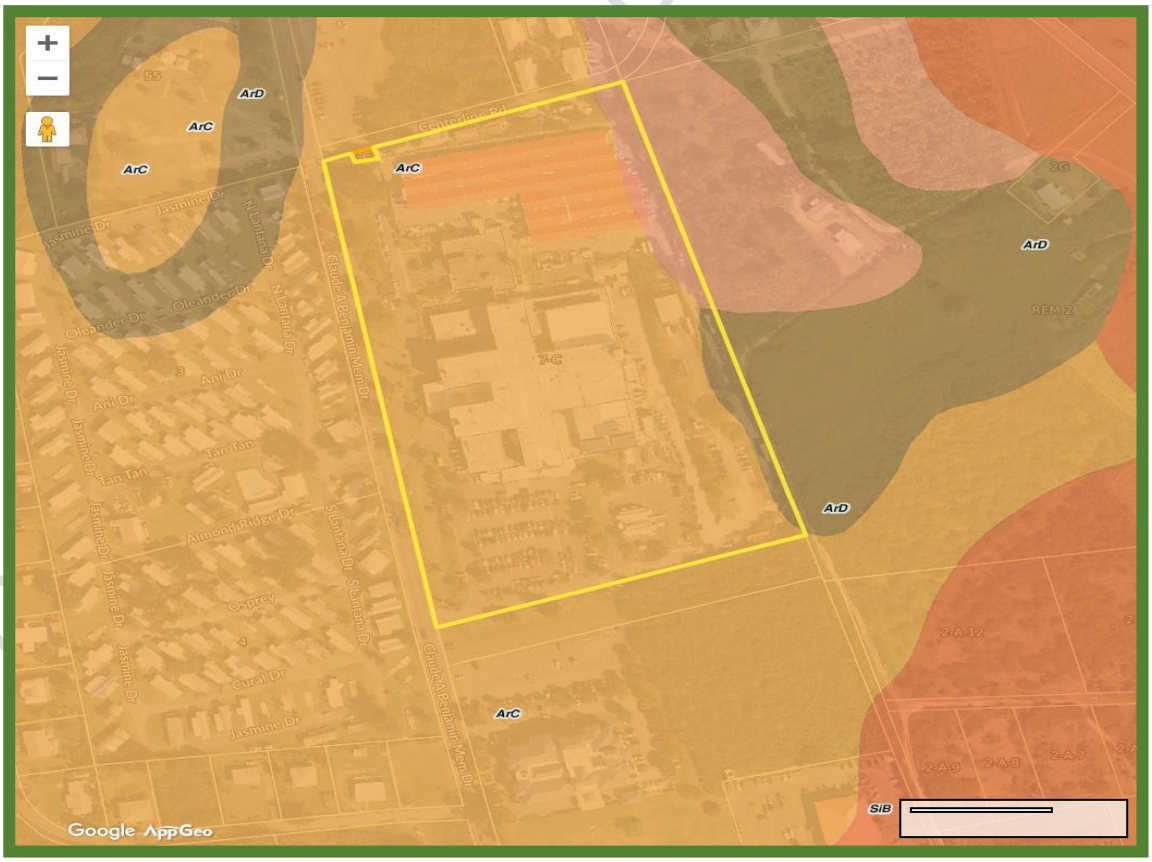


Figure 4 JFLHMC Soils Map

Estate Diamond was actually part of Estate Diamond Ruby and also part of the sugar cane economy of the Caribbean. Estate Diamond Ruby is considered an early and a representative sugar estate in the rich center lands of St. Croix. The estate was under cultivation by the 1740s and remained a productive sugar, and sometimes cotton, estate for nearly 200 years.

Draining, Flooding, Erosion Control and Drainage Patterns

Existing topography and conduits convey stormwater from the north to the southwestern and southeastern sections of the property primarily through overland flow and existing inlets, drains, swales and culverts. There are five (5) drainage basins associated with the site and they are divided into three (3) offsite and two (2) onsite basins. The offsite basins are located on the northern, western and eastern perimeters of the site. Along with the two (2) onsite basins, only the northern basin contributes to stormwater flow on the site. (See JFL Replacement Hospital Hydrology Report in Attachment A for more detail). The 16.71- acre site slopes from approximately 217 feet in the northeast section to 150 feet in the southeast corner of the property. After crossing the southwestern end of the property by the entrance gate through large culverts, stormwater discharges into a swale just outside the southern perimeter of the site in front of the Innovative Business Center (IBC) building. It flows east before reaching another swale along the eastern perimeter then makes a 90° turn south. It is important to note that stormwater discharge from the site under existing conditions occurs without attenuation.

Beyond the southern perimeter of JFLHMC, stormwater travels approximately 2.3 miles to the southern coast shoreline of St. Croix. After exiting the JFLHMC property boundary, stormwater flows toward an approximately 141,000ft^2 grassland south of IBC building and west of the Virgin Island Bureau of Internal Revenue (VIBIR) and traverses another approximately 29,000ft^2 of grassland south of the VIBIR where velocity decreases and infiltration occurs due to a gentler slope and vegetative growth. It continues to flow due south across the Sunny Ilse Shopping center and the Melvin Evans Highway and Highway 79. Stormwater flow continues through a culvert under Hope Road and in drainage inlets just east of the former Limetree Bay Refinery, now Port Hamilton Refining and Transportation, in a deep gut/swale toward the sea and empties into Canegarden Bay.

Erosion and sediment control system design includes silt fences around the entire site and berms to control stormwater run-on and run-off. Soil tracking prevention devices will be constructed at points of egress from unstabilized site areas to capture sediment-laden stormwater and manage offsite tracking. Components of the STPD include hay bales, aggregate, filter fabric, berms, and a swale ditch draining the STPD with a 0.2% minimum and 1.0% maximum grade along the STPD to the sediment pit. The sediment pit is designed with a 3600ft^3/acre retention volume. Inlet protection devices with geotextile fabric will be placed over drains and inlets. Further, the stormwater management system uses storm drains and pipes to transport stormwater to two (2) stormwater management ponds. (See Overall Drainage Plan Sheet C-200). The western pond includes an onsite discharge into a drainage ditch leading to the final pond. The final stormwater pond consists of a skimming device that separates and prevents discharge of oily water.

Located in Flood Zone X as shown in the FEMA Flood Map below (Fig. 5), this site is outside FEMA flood zone in an area where the annual flood risk is between 1 and 0.2 percent

.

Figure 5 FEMA Flood Zone Map

Fresh Water Resources

Supplemented by rain via roof catchment and stored in 3 below grade cisterns, the primary water source for the existing JFLHMC is purchased piped potable water produced by the VI Water and Power Authority. There are 3 groundwater wells on the property that were discontinued since 2011-2012. According to a former JFLHMC Facilities Manager, he restarted the wells as a feasibility pilot project. Each well reportedly produced 30,000 gallons per day of clear low turbidity water during field evaluation testing.

The replacement JFLHMC facility design incorporates 3 one million-gallon cisterns whose primary source will be piped water from WAPA supplemented with rain via roof catchment. Historically, between 2000 and 2023 St. Croix receives a higher monthly maximum rainfall in May and from August through November. However, annual monthly rainfall levels fell from 35.22 inches in 2016 to 21.46 inches in 2021 but rose again to 37.88 inches in 2022. From January through May of 2023, total rainfall levels are 4.06 inches less than in 2022. This means rain as a resource is even more valuable, Accordingly, JFLHMC will optimize this valuable renewable resource by harvesting rain which reduces overall facility operating costs.

Oceanography

This project occurs outside of Tier 1 and will not impact the marine environment or coastal areas.

Marine Resources

This project occurs outside of Tier 1 and will impact on the marine resources or coastal areas.

Terrestrial Resources

Pursuant to sections 7(a)(1) and 7(a)(2) of the Endangered Species Act and its implementing regulations at 40 C.F.R. 402 et seq., federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and determine whether projects may affect those species and or their designated critical habitat. Accordingly, a request was made to the Secretary of Interior on June 2, 2022 for information on whether any listed or proposed species may be present in the area of the proposed JFLHMC Francisco Luis Hospital demolition and replacement hospital project. In response to the request, the Caribbean Ecological Services Field Office of the US Department of Interior, US Fish and Wildlife provided the following information addressing endangered species, critical habitats national wildlife refuge lands and fish hatcheries, migratory birds, and wetlands relative to the JFLHMC project.

Endangered Species Act Species

Any species on the list should be considered in an effects analysis for the project and could include species that exist in another geographic area.

- There is a total of 0 threatened, endangered, or candidate species on this species list.

Critical Habitats

National Oceanic and Atmospheric Administration Fisheries, also known as the National Marine Fisheries Service is an office within the Department of Commerce.

- There are no critical habitats within your project area under this office's jurisdiction.

USFWS National Wildlife Refuge Lands and Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system undergoes a "Compatibility Determination" conducted by the Refuge.

- There are no refuge lands or fish hatcheries within your project area.

Migratory Birds

Any person or organization planning activities that may impact migratory birds, eagles and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures.

- There are no FWS migratory birds of concern within the vicinity of your project area.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

- There are no wetlands within your project area.

The United States Virgin Islands Department of Planning and Natural Resources, Division of Fish and Wildlife (DFW) is mandated to "protect, conserve, and manage indigenous fish, wildlife and plants, and endangered or threatened species for the ultimate benefit of all Virgin Islanders, now and in the future" by Virgin Islands Code Title 12, Chapter 2, Subsection 101. This act ensures protection for all fish and wildlife indigenous to the Virgin Islands and within its geopolitical boundaries.

ADD EXISTING JFL SITE BIOLOGICAL SURVEY.

Air Quality

The United States Virgin Islands is in a Class II air quality region and must comply with the National Air Ambient Quality Standards. The Department of Planning and Natural Resources (DPNR) is the state regulatory agency enforcing the Clean Air Act and VI Air Pollution Control Act through the administration of the Air Pollution Control Program.

According to DPNR's Division of Environmental Protection 2020 U.S Virgin Islands Monitoring Network Plan, 40 CFR Part 58 does not CO, O_3, NO_2, PM10 and PM2.5 monitoring, based on population. From an air pollution source perspective, 40 CFR Part 58 does not require for monitoring for SO^2 and Pb. Still, the Division of Environmental Protection (DEP) currently operates two (2) monitoring stations for particulate matter: one (1) station is on St. Croix in Bethlehem Village, and the other on St. Thomas in Vendor's Plaza. Therefore, particulate matter monitor is several miles away from the project site.
According to the World Health Organization's guidelines, the air quality in the U.S. Virgin Islands is considered safe. The most recent data indicates the country's annual mean concentration of PM2.5 is 10 µg/m3 which aligns with the recommended maximum of 10 µg/m3.

- IQAir[1] analyzed PM2.5 air pollution, fine particles in the air measuring 2.5 microns or smaller in diameter, at air monitoring stations in 6,475 cities in 117 countries, regions and territories.
- According to their testing, not a single country in the world has an air quality that meets the standards set by the World Health Organization
- The U.S. Virgin Islands and two other locations met the WHO's air quality standards.

The JFL North facility is currently in operation on the northern part of the project site. Just north of the project boundary is the Queen Ridge Hospital housing community and Peppertree Terrace community is just across the street. Therefore, wet suppression methods to minimize excessive generation of dust from demolition and construction operations will be used including misting during demolition and frequent light water with a sprinkler to manage dust resuspension from vehicle transport. In addition, a fence scrim will be erected around the property to help manage and capture dust and debris.

Implementation of the following specifications below are required by the Contractor.

- Execute work by methods to minimize raising dust from demolition and construction operations.
- Provide positive means to prevent airborne dust from dispersing into atmosphere and over adjacent properties.
- Provide dust-proof enclosures to prevent entry of dust generated outdoors.
- Provide dust-proof barriers between demolition and construction areas.

During demolition and reconstruction heavy equipment will emit low levels of combustion byproducts such as carbon monoxide, nitrogen oxides, volatile organic carbon and particulate matter. DPNR will be encouraged to monitor visible emissions associated with project activities periodically. None of these emissions are expected to exceed air quality, visible or fuel-burning emission standards or pose a nuisance or threat to human health or

[1] IQAir, a Swiss company that makes air purifiers and clean air monitors.

environment. DPNR will be notified if emergency generators are expected to be in operation onsite for greater than 6 months and require an Authority to Construct and Operate air pollution control permit.

The JFLHMC demolition and reconstruction project is not expected to adversely affect air quality.

IMPACTS ON MAN'S ENVIRONMENT

Land and Water Use Plans

According to The Virgin Islands Comprehensive Land and Water Use Plan document, significant plans have been prepared for various USVI agencies since 1917, with one of the first plans, the Barano Plan, being prepared and completed in 1954 in the post-military occupation era. Several other efforts produced a document called The Virgin Islands Comprehensive Land and Water Use Plan that was never passed and approved by the Legislature of the Virgin Islands. Those early planning efforts were valuable and provided the basis for our current zoning laws and natural resource and environmental protection guidelines. However, while the local Coastal Zone Management Program addressed some of the Territory's environmental concerns and provided a growth management mechanism for the Territory, the reality still is the Virgin Islands of the United States does not have a Comprehensive Land and Water Use Plan. The CZM program's intent is to treat coastlines as unique places where special types of development should be prioritized and balance the need for coastal access with resource protection and retention of natural areas. Recently, the Department of Planning and Natural Resources began an effort in February of 2023 to develop a comprehensive land and water use plan and the planning process is currently underway.

The original approximately 7.81-acre JFLHMC site is zoned public. A portion of the additional acquired property south of the site and east of the Innovative Business Center building (i.e., 7-E Estate Diamond) is zoned B-2. The Acute Alternative building runs along approximately 75% of the northern perimeter of the site, (i.e., 184-C Estate Ruby) is also zoned B-2 and the remaining approximately 25% of the property above the northern perimeter is zoned R-3. The Peppertree Terrace Community, zoned R-2, is across the roadway west of the project site. Given that the original JFLHMC site is shaped similar to a quadrilateral, 55 Estate Ruby located at the northeast vertex is zoned R-3. Finally, the properties east of the project site Rem 2 and 2G are zoned R-2.

In concert with the VI Coastal Zone Management Act, the Coastal Barrier Resources Act encourages the conservation of storm-prone and dynamic coastal barriers through the coastal barrier resources system. Through the Coastal Barriers Resources Act, the U.S. Fish and Wildlife Service primary responsibility is the conservation and management of fish, wildlife, plants, and their habitats. The coastal barriers resources system map areas as CBRS units. There are eleven areas designated as mapped units on St. Croix and consist of:

- Rust Up Twist Unit VI-01;
- Salt River Bay Unit VI-02;
- Altona Lagoon Unit VI-03;

- Southgate Pond Unit VI-04_VI-04P;
- Coakley Bay Unit VI-05;
- Robin Bay Unit VI-06;
- Great Pond Unit VI-07;
- Canegarden Bay Unit VI-08;
- Ruth C VI-09;
- Long Point Unit VI-10; and
- West End Salt Pond; Unit VI-11

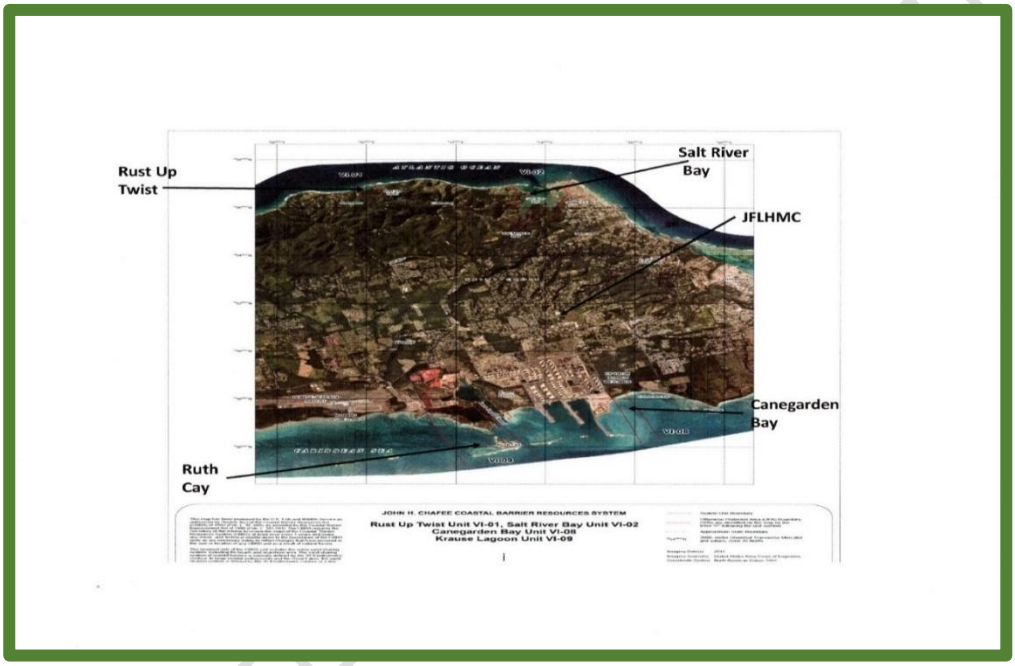


Figure 6 Coastal Barrier Resources

Depicted in Figure 6 above, the closest mapped CBRS units and their approximate distances away from the project site are the Rust up Twist (4.17 miles) and Salt River Bay (2.37 miles) to the north and Ruth Cay (3.47 miles) and Canegarden Bay (2.37 miles) to the south. Figure 6 shows these four CBRS units' distances from the project. Consequently, the JFLHMC demolition and replacement hospital project is consistent with the previous land use designation for the property since it is being reconstructed in the same location the project activities will not impact either of the four CBRS units or any coastal area.

Visual Impacts

The significant buildings on the existing facility include 3-story and 2-story masonry structures built in the early 1980s. The architectural design of the proposed new facility is contemporary and is a captivating layout that will enhance the appeal of the entire area. The new JFLHMC project will have an aesthetically pleasing positive visual impact.

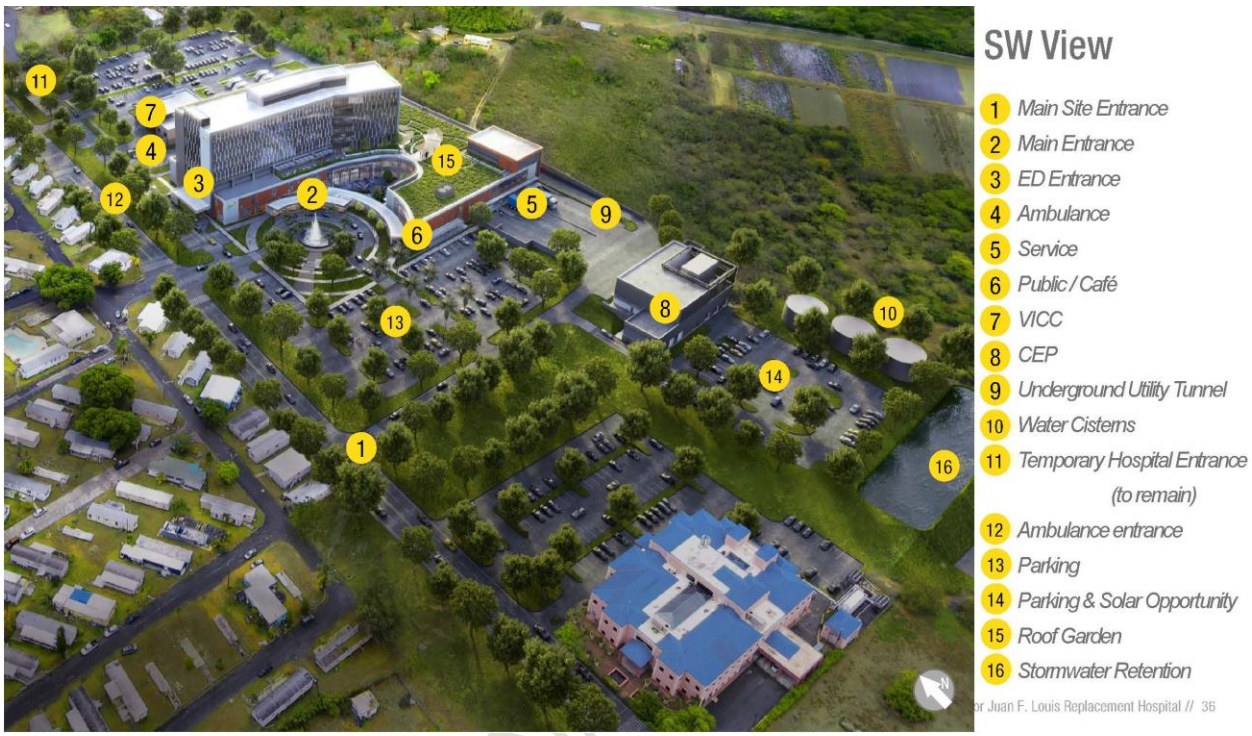


Figure 7 New JFLHMC Facility

Figure 8 Another View of New JFLHMC

The southern shoreline when seen from estates Ruby, Mary's Fancy, and Rattan and Belvedere all north of the JFLHMC, offers a panoramic view of the south shore coastline that stretches for miles. Although the JFLHMC replacement hospital is 147 feet tall, the aesthetic view of the beautiful and enticing transparent blue, green and, aqua colors of the sea and horizon beyond will remain available for the community and visitors.

Social Impacts and Economic Impacts

In 2017, two category 5 hurricanes, Irma and Maria, wreaked havoc on St. Croix, with the latter producing much greater destruction. The JFLHMC suffered significant damages that adversely affected and disrupted the provision of health and medical care services to the St. Croix community. The hospital's roof, emergency room, medical-surgical units, progressive care, and intensive care units were severely damaged and all inpatients and hemodialysis patients were evacuated. The JFLHMC hospital replacement project restores hope in residents and healthcare workers and will result in significant and positive social impacts on St. Croix and Virgin Islands medical and healthcare industry, as a whole.

Participants identified a replacement hospital as a top priority during planning and development meetings for the original VI Land and Water Use planning document and in more recent civic and political forums. Over the last several years, St. Croix residents and other Virgin Islanders feel compelled to travel off-island to seek medical and healthcare services. Therefore, it is more common than unusual for VI residents to encounter each other at medical facilities abroad. Traveling off-island to seek healthcare services places an additional financial and emotional burden on residents since now they incur the costs of airfare, land transportation, lodging and food.

On the mainland over the last three decades, American families have experienced a rise in the costs of many necessities that have made it difficult for them to attain economic security. Researchers estimate, for example, that 80 percent of families saw the share of budgets dedicated to spending on needs such as housing and health care increase by more than 7 percentage points between 1984 and 2014, potentially crowding out spending on other categories like leisure, longer-term investments in education, and saving for retirement. Further, a 2019 Pew survey found that 35 percent of middle-income families frequently worry about paying their bills; similarly, 37 percent worry about the cost of health care for themselves and their families. The point is Virgin Islanders and St. Croix residents, in particular, experience similar economic hardships.

According to the USVI Bureau of Economic Research 2021 Inflation Review report, inflation reached its highest since 2010. "U.S. Virgin Islands' consumer prices surged over the past 12 months, with inflation—measured as the year-on-year change in the consumer price index—reaching 8.6 percent in 2021 from 5.7 percent in 2020. Price inflation was unrelenting in 2021, with most months above 6 percent. Demand for goods and services following the COVID-19 pandemic, global supply disruptions, and rising food and energy prices have increased inflation".

For many residents and neighbors, the JFLHMC project will relieve them of the unsustainable compounded costs associated with off-island travel for healthcare services.

Once completed, this community will receive it as responsive and deeply socially and economically satisfying. The right to health care was first recognized in the 1946 World Health Organization (WHO) constitution, which states that "the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition." The right to health was also affirmed in the Universal Declaration of Human Rights in 1948 and in the International Covenant on Economic, Social and Cultural Rights (ICESCR).

The JFLHMC replacement hospital project makes the attainment of the fundamental right to healthcare a reality.

Typically, when one component of society thrives other parts will also flourish. The JFLHMC demolition and hospital replacement project will generate short-term and long-term employment opportunities. Design architectural, engineering, and environmental management and numerous other types of jobs will be created during the planning and implementation phases of the project. It will require between 400-600 workers onsite during peak construction. Knowledge of the new facility will boost the island's tourism product which will, in turn, fuel the hotel and restaurant industries in Christiansted and throughout the island as a whole. The infusion of jobs and increase in our tourism product will produce an economic ripple effect for business establishments, in general, and particularly those in the medical supply industry, including local fishermen who supply the hotels and restaurants with an assortment of fresh seafood.

Historical and Archaeological Resources

Pursuant to the National Historic Preservation Act of 1966 and the Antiquities and Cultural Properties Act of 1998 (Title 29, Chapter 17, §950 of the V.I. Code), in addition to other relevant legislation, a request was made for a determination by the Virgin Islands State Historic Preservation Office on whether a Phase I Archaeological Survey is required for the Governor Juan Francisco Luis Hospital & Medical Center demolition and replacement hospital project described below. In response to the request the Director and Deputy State Historic Preservation Officer has provided the following recommendation. "The VISHPO's review of the project site and the adjoining vacant lots immediately south and east of the existing Governor Juan Luis Hospital and Medical Center contains no known historical resources or sites. Further, the nearest known historic site is the Estate Diamond Plantation site, is several hundred yards southwest of the Hospital beyond the Pepper Tree Road (See Figure 9 below). What is not known about the vacant land south and east of the Hospital building site is whether there are below ground archaeological resources associated with Native American habitation and settlement. Therefore, the VISHPO has No Objection to the proposed demolition and reconstruction of the Governor Juan Francisco Luis Hospital and Medical Center located at Estate Diamond, Parcels 7-C and 7-D, St. Croix, Virgin Islands, however, future development of the vacant parcels immediately to the south and east of the existing Hospital buildings may require an Archaeological Phase I survey". Note that, if needed, the responsibility for conducting an archaeological Phase I survey rests the JFL North project.

Figure 9 Estate Diamond Greathouse & Sugar Mill

Waste Disposal and Accidental Spills

According to the GBB 2009 Waste Stream characterization study, St. Croix Anguilla Landfill received an estimated 104,402 tons of solid waste. Additionally, a 2019 USVI Residential Waste Characterization Study by the Caribbean Green Technology Center of the University of the Virgin Islands and Resource Recycling Systems concluded that "The Territory's disposal facilities are nearing capacity and bin sites are overused which contributes to litter and marine debris. Since the Territory is prone to extreme weather events, as seen by hurricanes Irma and Maria in 2017, spikes in waste generation are, and will likely remain, frequent. Moreover, the average per-person commercial solid waste generation rate in the Virgin Islands is 9lbs per day, approximately 40% higher than that of the US mainland, which, as of 2018, was at 4.9 pounds of municipal, commercial solid waste per day.

Although there are many dedicated groups and organizations aimed at tackling this waste management crisis, there are currently no territory-wide recycling or composting programs. Accordingly, in concert with environmentally conscious concepts to reduce, reuse and recycle, every effort will be made to minimize the impact of this project on the island's solid waste management facilities, especially since an estimated 42% of the waste stream is recyclable and approximately 14% is compostable. To the extent practicable and in consultation with the VIWMA, recyclable construction demolition wastes that can be reused or recycled as road surface materials could be diverted for other similar purposes. However, it is the intent that the selected contractor will transport off-island all none recyclable and/or unused products of demolition including debris, mixed waste, concrete and garbage with VIWMA's oversight. Installing drinking water fountains with bottle fillers throughout the facility providing clean

water will encourage staff to use refillable containers thereby further reducing landfill waste generation.

Intermingling of wastes will be avoided and all substances that exhibit hazardous waste characteristics will be managed to prevent a release to the environment. All applicable, relevant and appropriate federal and local requirements for treatment, storage and disposal as per 40 CFR Part 260 Hazardous Waste Management: General through 40 CFR Part 282 Approved Underground Storage Tank Program, will be followed. Approval will be acquired from DPNR for managing items such as lamps described as universal wastes in 40 C.F.R. Part 273 under the universal waste rule.

The following waste removal procedures are required and included in procurement and contract requirements specifications.

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
B. Provide containers with lids. Remove trash from site periodically.
C. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by DPNR or the VIWMA.
D. Salvageable shall be dismantled to such a size that it can be readily handled, and delivered to a designated storage area.
E. Any rejected materials must be removed from the site.
F. Concrete, concrete block, asphalt, unsalvageable bricks and piping shall be transported to a waste disposal site approved by regulatory agencies.
F. All other materials shall be hauled by the Contractor to a waste disposal site that has been approved by regulatory authorities.
G. Any contaminated materials identified on site are to be properly removed or disposed of according to DPNR and USEPA's requirements.

Contractors will adhere to the following BMPs, upon final approval of regulatory agencies, Spill kits will be positioned throughout the site so that incidental and accidental spills or releases can be stopped, contained and cleaned up, in particular, according to 40 CFR Part 269 Standards for Used Oil Management as it pertains to used oils. Cleanup materials will be accumulated in polyethylene bags or other appropriate containers for temporary storage prior to disposal. Any spill where there is a release will be contained, cleaned up and placed in an appropriate chemically compatible container.

In addition to the above, these specifications typically apply and are included in contractual requirements.

1. Clean project site and work areas daily, including common areas.
2. Comply with NFPA 241 for removal of combustible waste materials and debris.
3. Do not hold waste materials more than seven days during normal weather or three days if temperatures are elevated.
4. Containerize hazardous and unsanitary waste materials separately from other waste, mark containers appropriately and dispose of following DPNR's and/USEPA's requirements.
5. Use DOT approved containers intended for holding waste materials.
6. Coordinate cleaning for joint-use areas.
7. Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

COASTAL CONSISTENCY

The Juan Francisco Luis Hospital and Medical Center demolition and hospital replacement project will be undertaken in a manner consistent with the enforceable policies of the U.S. Virgin Islands' Coastal Zone Management (CZM) program. This federal consistency determination request demonstrates the project's compliance with the U.S. Virgin Islands' CZM program. JFLHMC is centrally located and far removed from the CZM coastal boundaries. Figure10 below depicts the relationship of JFLHMC's location to the southern (closest) and northern (furthest) perimeters of the CZM Tier 1 boundaries which are approximately 5,750 and 9,700 feet away, respectively. Consequently, since most of the 11 basic USVI CZM program goals speak directly to protecting, preserving and maintaining the coastal environment, the JFLHMC replacement hospital project activities are only sometimes applicable or relevant but never at variance with the CZM program's intent.

The following policies are set forth in the U.S. Virgin Islands Code Title 12, Conservation Chapter 21, Virgin Islands Coastal Zone Management [V.I. Code tit. 12, § 903(b)]. This project meets each of the basic USVI coastal zone goals. Additional details are as follows:

Goal: 903(b)(1)… protect, maintain, preserve and, where feasible, enhance and restore, the overall quality of the environment in the coastal zone, the natural and man-made resources therein, and the scenic and historic resources of the coastal zone for the benefit of residents and visitors of the United States Virgin Islands;

JFLHMC project occurs far enough inland, as delineated in Figure 8 below, that it will not affect the overall quality of the coastal zone environment. VISHPO's review of the project site and the adjoining vacant lots immediately south and east of the existing indicated that the site contains no known historical resources or sites and the closest historical site, Estate Diamond Plantation, is approximately 1200 feet away to the southwest. The Caribbean Field Office of the U.S. DOI did not identify and sensitive environments or habitats anywhere near the site. However, a biological survey of a nearby newly acquired plot identified many heritage trees. It is the intent that the selected contractor will consult with the VI Department of Agriculture to assess whether permits are required for tree removal. It should be noted that throughout all phases of this project, from pre-demolition to post construction, implementation of erosion and sediment control, stormwater management including dust suppression systems will result in effective control of stormwater run-on and run-off, and fugitive dust dispersion. The selected contractor will implement these pollution prevention methods though, the nearest shoreline to the site, Canegarden Bay, is 2.4 miles away.

Goal: 903(b)(2)… promote economic development and growth in the coastal zone and consider the need for development of greater than territorial concern by managing: (1) the impacts of human activity and (2) the use and development of renewable and nonrenewable resources so as to maintain and enhance the long-term productivity of the coastal environment;

The JFLHMC demolition and hospital replacement project will generate both short-term and long-term employment opportunities. Design architectural, engineering and environmental management and numerous other types of jobs will be created during the planning and implementation phases of the project. As indicated before, it will require between 400-600 workers onsite during peak construction. Knowledge of the new facility will boost the island's

tourism product which will, in turn, fuel the hotel and restaurant industries in Christiansted and throughout the island as a whole. This will produce an economic ripple effect for business establishments, in general, and particularly those in medical supply industry, including local fishermen who supply the hotels and restaurants with an assortment of fresh seafood. Also, St. Croix is home to many people from other Caribbean countries, consequently, news of the new JFLHMC will attract family members from those islands to St. Croix to seek healthcare services benefitting the economy of St. Croix.

Concerning the use of renewable energy, JFLHMC will realize an overall reduction of energy consumption and operating costs by specifying energy-efficient building systems and exceeding ASHRAE's 40% energy reduction standard while decreasing the environmental footprint.

A solar analysis allowed an understanding of optimal window glazing criteria to increase thermal performance for the heat load on the exterior walls and roof, which helped to define proper insulation requirements for the building.

The use of solar energy allows optimization of sunlight and daylight, resulting in lighting requirements tailored to the JFLHMC environment and in meaningful cost savings since residential electricity costs in the VI are 40.03 cents for the first 250kWh and 42.65 cents after that. The commercial rate is 46.54 cents/kWh, almost three times higher than the U.S. average power price of 15 cents per kWh.

JFLHMC will harvest rainwater for irrigation to reduce potable water consumption while still providing water for the indigenous plants accustomed to the Virgin Islands climate. Additionally, this helps reduce the runoff from the site as that water is captured and reused.

JFLHMC will install drinking fountains with bottle fillers to promote hydration and provide clean, filtered water for clients and staff to fill reusable containers and reduce landfill waste reducing leachate that adversely affects coastal water quality since the landfill is unlined.

Human activities that could potentially produce negative impacts associated with the project include demolition and construction activities. However, since coastal, historic, and known cultural resources are far removed from the site, JFLHMC demolition and construction activities will not impact these invaluable assets. If any unknown below-ground archaeological resources are encountered, activity will cease and the VISHPO's office will be notified immediately, and appropriate actions will be undertaken to preserve artifacts. Demolition and construction generate dust and noise; however, an efficient mist system will be used to control dust and other wet suppression techniques such as frequent but light watering with a sprinkler system to minimize dust resuspension from vehicular onsite traffic. Therefore, reduction of the potential impact of particulate matter on the residents of surrounding communities (i.e., Queen Ridge Hospital Housing, Peppertree Terrace, Joseph E. James Terrace) and customers of nearby facilities and businesses (i.e., JFL North, Acute Alternative, Innovative Business Center and Sunny Isle Shopping Center) has been identified as a priority in project planning. The following best management practices are incorporated in contractual requirements.

- Execute work by methods to minimize generation of dust from demolition and

construction operations.

- Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent properties.
- Provide dust-proof enclosures to prevent entry of dust generated outdoors.
- Provide dust-proof barriers between demolition and construction areas.

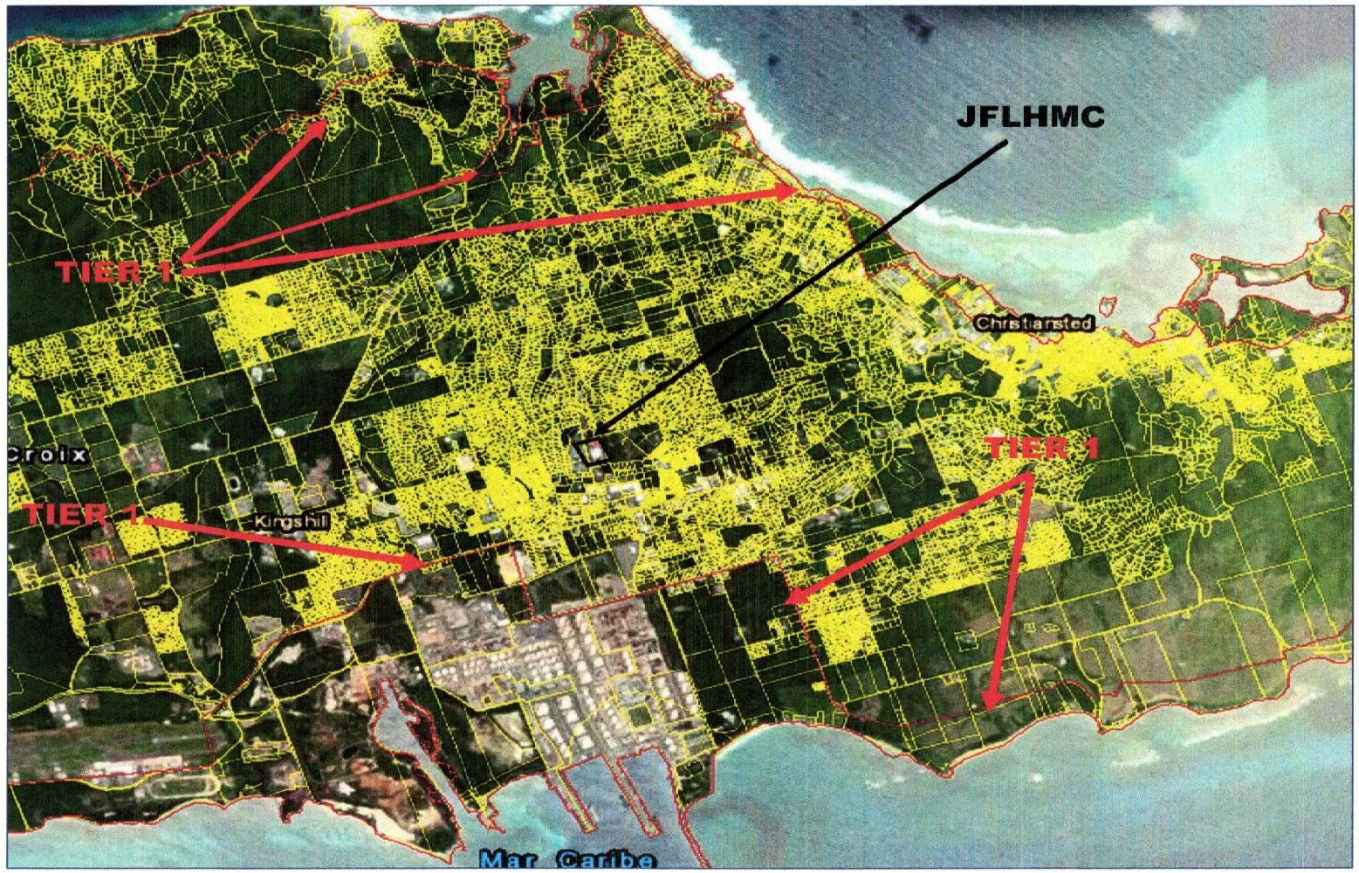


Figure 10 Relative Distance of JFLHMC from CZM Tier 1 Boundaries

Goal: 903(b)(3)… assure priority for coastal-dependent development over other development in the coastal zone by reserving areas suitable for commercial uses including hotels and related facilities, industrial uses including port and marine facilities, and recreation uses;

By its location, the JFLHMC intrinsically prioritizes coastal-dependent projects such as marine parks and sanctuaries for the enjoyment of nature enthusiasts and the general public.

Goal: 903(b)(4)… assure the orderly, balanced utilization and conservation of the resources of the coastal zone, taking into account the social and economic needs of the residents of the United States Virgin Islands;

JFLHMC demolition and replacement hospital project addresses the socioeconomic needs of USVI residents. Participants in the initial Land and Water Use Plan development planning process identified better medical and healthcare facilities as one of four significant priorities. The consequential damages experienced by the JFLHMC deepened the need and desire for quality medical and healthcare services. Therefore, the increased stability in medical and healthcare services resulting from this project will resonate throughout the territory as an island-wide socially satisfying accomplishment. Accordingly, many residents, can reallocate the savings from addressing their healthcare needs on island to lessen the weight of the financial burden of current inflationary forces adversely affecting many Virgin Islanders.

According to the USVI Bureau of Economic Research 2021 Inflation Review report, inflation reached the highest since 2010. "U.S. Virgin Islands' consumer prices surged over the past 12 months, with inflation—measured as the year-on-year change in the consumer price index—reaching 8.6 percent in 2021 from 5.7 percent in 2020. Price inflation was unrelenting in 2021, with most months above 6 percent. Demand for goods and services following the COVID-19 pandemic, global supply disruptions, and rising food and energy prices have pushed inflation to high levels".

As far as promoting economic development, the JFLHMC project will generate new jobs in the near-term during project planning, design, demolition and reconstruction phases. New job opportunities will also be created in the long-term from the expanded operations at the new facility. Citizens of St. Croix, St. Thomas, St. John, ex-patriots living abroad who travel home frequently, and visitors from neighboring islands and the mainland will benefit tremendously from the establishment of the new state-of-the-art health care facility. Medical equipment and supply vendors will see increased market opportunities as the demand for the acquisition of healthcare service-related products on island will rise. Knowledge of the new facility will boost our tourism product which will, in turn, fuel the hotel industry and give a boost to restaurants throughout the island.

Goal: 903(b)(5)… preserve, protect and maintain the trust lands and other submerged and filled lands of the United States Virgin Islands so as to promote the general welfare of the people of the United States Virgin Islands;

There are several trust lands and submerged lands on/or associated with the island of St. Croix that serve as safe spaces for Virgin Islanders and the exotic wildlife that inhabit these areas. Along with numerous ephemeral guts, some of these environments include:

- Approximately 30 acres of the Buck Island Reef National Monument situated off the northeast coast of the island that constitute part of a significant ecological community;
- Christiansted National Historic Site covering over seven acres in
- Salt River Bay National Historical Park and Ecological Preserve uniquely documents the human and natural Caribbean world from the earliest indigenous settlements in the central Caribbean to their clash with seven different colonial European powers;
- Fifteen acres of a trust property in Estate Marienhoj surrounded by forest on all sides, offering a quiet refuge for birds and wildlife;
- Forty-two acres in Estate Lowry Hill protecting a natural resource of open undeveloped green space and wildlife habitat; and
- As part of the largest area of contiguous forest on St. Croix these ten acres in the northwest region Estate Spring Garden protect the headwaters of the Caledonia Valley and serve as catalyst for efforts to preserve lands in the Maroon Ridge/Annaly Bay area and has high ecological and historical value.

JFLHMC project promotes the general welfare of the people since it does not impact or interfere with trust and other submerged/filled lands on St. Croix.

Goal: 903(b)(6)… preserve what has been a tradition and protect what has become a right of the public by insuring that the public, individually and collectively, has and shall continue to have the right to use and enjoy the shorelines and to maximize public access to and along the shorelines consistent with constitutionally-protected rights of private property owners;

The JFLHMC project does not infringe on the right of Virgin Islanders, individually and collectively, to enjoy and maximize public access to shorelines consistent with the constitutionally protected rights of private property owners. As delineated in Figure 8 above, the project is centrally located and occurs far away from coastal resources.

Goal: 903(b)(7)… promote and provide affordable and diverse public recreational opportunities in the coastal zone for all residents of the United States Virgin Islands through acquisition, development and restoration of areas consistent with sound resource conservation principles;

The JFLHMC will not impact public recreational activities in the coastal environment or any other areas on island.

Goal: 903(b)(8)… conserve ecologically significant resource areas for their contribution to marine productivity and value as wildlife habitats, and preserve the function and integrity of reefs, marine meadows, salt ponds, mangroves and other significant natural areas;

Canegarden Bay, the closest shoreline and waterbody, is approximately 12,300 feet away and project activities will not impact water quality. The JFLHMC replacement hospital project occurs on only previously disturbed and developed land and will be built in the same location of the existing facility. Under Project Code: 2022-0049333, the US Department of Interior Fish and Wildlife Service provided an analysis of any threatened and endangered species, including proposed species that may occur in the JFLHMC project location or may be affected by this project (See Attachment A). Through USDOI's Caribbean Ecological Services Field Office, the report indicated that:

- There is a total of 0 threatened, endangered, or candidate species on this species list.
- There are no critical habitats within your project area under this office's jurisdiction.
- There are no refuge lands or fish hatcheries within your project area.
- There are no FWS migratory birds of concern within the vicinity of your project area.
- There are no wetlands within your project area.

Further, Caritech Group, LLC conducted biological surveys as part of the JFL North project on the two properties adjacent to the JFLHMC main project site. They include a 3.6-acre parcel at Plot No. 7E Estate Diamond to the south and a 5-acre parcel at Remainder 2 Estate Sion Farm to the east. The 3.6-acre survey's findings indicated that "…there are no Federal endangered plant or animal species found on the 3.6-acres site. Also, there are no "VI heritage trees" located on the site," A summary conclusion of the 5.0-acre survey's findings indicated "…there are no Federal endangered plant or animal species found on the 5-acres site. However, there are numerous "VI heritage trees" located on the site and that "the VI Department of Agriculture must be consulted to determine if permits will be required for the removal/pruning of said heritage trees".

Goal: 903(b)(9)… maintain or increase coastal water quality through control of erosion, sedimentation, runoff, siltation and sewage discharge;

Soil tracking prevention devices will be constructed at points of egress from unstabilized site areas to capture sediment laden-stormwater and manage offsite tracking. Components of the STPD include hay bales, aggregate, filter fabric, berms and a swale ditch draining the STPD with a 0.2% minimum and 1.0% maximum grade along the STPD and to the sediment pit. The sediment pit is designed with a 3600ft^3/acre retention volume. Inlet protection devices with geotextile fabric will be placed over drains and inlets. Further, the stormwater management system also contains storm drains and pipes to transport stormwater to two (2) stormwater management ponds. Again, the JFLHMC project occurs over 12, 300 feet away from the nearest coastline, Canegarden Bay, and, therefore, will not adversely impact water quality.

Prior to the initiation of this project, the JFLHMC facility was connected to the VI Wastewater Management Sewerage System. During demolition and construction, temporary sanitary devices, such as portable toilets situated throughout the site, will be used to collect sewage generated on site. Vacuum trucks will periodically collect and transport the contents of portable toilets directly to the Harold G. Thompson Wastewater Treatment Plant for disposal and treatment to meet secondary effluent standards. Secondary effluent standards are typically 85% removal of biological oxygen demand (BOD) and total suspended solids (TSS), as well as a standard for coliform bacteria appropriate to meet the designated uses of the water, temperature, phosphorus and oil and grease. The wastewater collection and

disposal permit for the portable toilets is issued pursuant to Title 12, Chapter 7, Virgin Islands Code and provisions of Sections 184, 185 and 186 and pursuant to 40 CFR Part 100 Subpart D and is authorized by the Virgin Islands Waste Management Authority. Post construction, JFLHMC will be reconnected to the sewerage system. Consequently, as far as sewage is concerned, the system is designed so that sewage generated during and after completion of the project will be treated to meet secondary effluent standards and not adversely affect coastal water quality.

Goal: 903(b)(10)… consolidate the existing regulatory controls applicable to uses of land and water in the coastal zone into a single unified process consistent with the provisions of this chapter, and coordinate therewith the various regulatory requirements of the United States Government;

Since US Environmental Protection Agency authorizes the Government of the Virgin Islands to administer several environmental programs, existing regulatory controls applicable to land and water use issues and coordination of various Federal regulatory requirements are unified and extremely prominent throughout the VICZM permitting process for the JFLHMC project. Through the federal Clean Water Act (CWA), DPNR administers the Virgin Islands Water Pollution Control (VIWPC) Program, pursuant to Title 12 Chapter 7 of the Virgin Islands Code which regulates the discharge of pollutants into waters of the Virgin Islands and allows management of hazardous substances that are directly regulated under the Federal Resource Conservation and Recovery Act. The VIWPC program also covers the ambient water quality monitoring (Section 106 of the CWA and nonpoint source pollution (Section 319 of the CWA) which are critical components of controlling pollution from major development projects, such and the JFLHMC. Toward compliance with the provisions of the Clean Water Act, 33 USC § 1251 et. Seq., as amended by the Water Quality Act of 1987, P.L. 100-4, and the VI Water Pollution Control Act, operators of stormwater discharges associated with industrial activity must apply for authorization to discharge. A Construction General Permit (VIGSA0000) will be required for stormwater runoff with construction activities on properties in excess of one acre. The following will be required under the Construction General permit:

- A Notice of Intent (NOI) per the DPNR
- A Stormwater Pollution Prevention Plan (SWPPP)
- A Fee Form for the General Permit
- A Hydrology Report. This will include the design of the stormwater collection, conveyance and discharge system utilizing the TR-55 Method per the VI Environmental Protection Handbook by the USDA. The NRCS VI Soils Survey will be utilized for determining the soil properties for the stormwater runoff rates.
- A Notice of Termination (NOT) will be submitted upon completion of construction activities.

The stormwater design will include studying onsite and offsite drainage basins based on topographic surveys provided for the site and using the USVI Geospatial Information System Division hosted by VIMapGeo to estimate the drainage basins contributing stormwater runoff. The onsite grading and drainage plan will incorporate trench drains, parking lot inlets and landscape area drains. The pre-development system was evaluated to determine peak discharge rates. The final design will not exceed pre-development peak storm water discharge rates.

Under the Clean Air Act, air pollution is addressed by the local environmental regulatory agency through the Virgin Islands Air Pollution Control Act under the Title V operating permit and other programs. Devices, such as generators, that emit conventional and other hazardous air pollutants, are regulated to ensure protection of air quality. In the event that the existing 3 groundwater wells at the JFLHMC are reestablished they will be regulated under the federal Safe Drinking Water Act source protection requirements and Primary and Secondary Drinking Water Standards as per the Virgin Islands Safe Drinking Water Act.

Goal: 903(b)(11)… promote public participation in decisions affecting coastal planning conservation and development.

The Federal Consistency review procedure is conducted through the VICZM permitting process that includes oversight by the CZM committee. It typically involves a pre-application meeting, a completeness determination, an internal review, and a 30-day comment period. Subsequently, CZM committee holds a public hearing where any resident or other interested persons can testify and have their concerns documented in the official record and offer suggestions for minimizing their view of potential unwanted impacts. On the hand, it can be approved with special conditions or even with recommendations that the project as proposed be rejected by the CZM Committee. Consequently, the proposed JFLHMC demolition and reconstruction project satisfies the public participation requirements set forth in the Virgin Islands Coastal Zone Management Program and will be conducted in a manner consistent with such program.

ATTACHMENT A

HARRIS
Harris Civil Engineers, LLC

JFL Replacement Hospital

United States Virgin Islands
Department of Planning and Natural Resources
Division of Environmental Protection
Hydrology Report

Prepared For:

Flad Architects
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Prepared By:

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HCE # 7287000

06/03/22

TABLE OF CONTENTS

Hydrology Report

1.1 INTRODUCTION

The purpose of this report is to provide drainage design documentation with sufficient detail to receive approval from the Department of Planning and Natural Resources (DPNR), Division of Environmental Protection for an Earth Change Permit Application Form III-Major Development.

The JFL Replacement Hospital project includes the demolition of the existing hospital to be replaced by a new hospital. The project is located at 4007 Estate Diamond Ruby, Christiansted, St Croix, USVI, 00821. See the Exhibit 5 Location Map for reference.

A. Existing Conditions

The existing site consists of the existing hospital, temporary hospital and supporting amenities. The topography ranges from elevations 217-ft at the northeast corner of the site down to elevation 150-ft at the southeast corner of the site. Storm water runoff is captured by a combination of inlets, trench drains, culverts and swales throughout the site. A study utilizing the survey provided onsite by Antillean Engineers, Inc and supplementing with the USVI GIS system of the offsite basins was conducted to evaluate the total runoff contributed by the site.

Offsite basins are separated into 3 basins while the onsite basins are separated into two basins. See Exhibit 1 for reference to how onsite and offsite basins were delineated.

Table 1: Basin Areas

Sub-Basin	Location	Area (Ac)	Contributes Onsite?
ON 1	Onsite	15.78	YES
ON 2	Offsite	2.77	YES
OFF 1	Offsite	5.07	YES
OFF 2	Offsite	4.23	NO
OFF 3	Offsite	7.67	NO

OFF 1

OFF 1 consists of a 5.07 acre basin north of the property. The roadway between basins OFF 1 and ON 1 does not provide curbing to properly convey the runoff from OFF1. As a result, OFF 1 runoff is conveyed onto the JFL property and into ON 1 basin. See Photo 1 below for reference.

Picture 1: Roadway Between OFF 1 AND ON 1

OFF 2

OFF 2 consists of a 4.23 acre basin and unpaved road east of the property. Runoff within this basin is conveyed towards the eastern JFL property line. An offsite roadway and swale capture runoff from OFF 2 and convey it south between the onsite basins and OFF 2. The JFL site is elevated approximately 6 ft to 10 ft above the adjacent swale. OFF 2 does not discharge onto the JFL property. See Photos 2 and 3 below for reference.

Picture 2: Offsite Swale Between Property and OFF 2 Basin

Picture 3: Offsite Unpaved Road Between Property and OFF 2 Basin

OFF 3

OFF 3 consists of a 7.67 acre basin west of the property. Runoff within OFF 3 is conveyed into a concrete valley gutter along the west side of Pepper Tree Road flowing south. Pepper Tree is crowned in the middle to properly capture runoff from OFF 3. This basin does not discharge onto the JFL property. See Photo 4 below for reference.

Picture 4: Facing South Down Pepper Tree. Valley Gutter Along West Lane

ON 1

ON 1 consists of a 15.78 acre basin consisting of the existing hospital site within the JFL property. Runoff is captured via inlets, trench drains and swales throughout the site. The stormwater is conveyed via pipes, culverts and sheet flow to two locations; the swale along the western property line and the existing offsite swale to the south. The swale along the western property line discharges to the offsite swale to the south and finally discharged to the vacant lot south of the property. See Photos 5, 6 and 7 for reference.

Picture 5: Swale Along Western Property Line

Picture 6: Offsite Swale and Three 36" Culverts from Property to Offsite Swale Along Southern Property Line

Picture 7: Discharge to Offsite Vacant Lot

ON 2
ON 2 consists of a 2.77 acre basin within the JFL property. Runoff is conveyed via overland flow. The runoff is discharged into the swale in between OFF 2 and ON 2 where it is conveyed to the south off site. The ON 2 basin is elevated from the swale approximately 6 ft to 10 ft above the adjacent swale. See Photos 2 and 3 above for reference.

1.2 HYDROLOGIC AND HYDRAULIC MODELING

A. Design Criteria

The applicable regulations of TR-55 Methodology as provided in the Virgin Islands Environmental Protection Handbook for estimating peak discharge runoff rates. The rainfall distributions below were obtained from the Virgin Islands Environmental Protection Handbook (2002).

Table 2: Rainfall Distributions

Frequency (yr)	Duration (hr)	Rainfall (in)
2	24	3.5
25	24	6.0
100	24	9.5

B. Method

Runoff rates from each drainage basin were estimated using the Soil Conservation Service (SCS) Unit Hydrograph Method. Input data required for this method includes: basin-area (acres), curve number (CN), time of concentration (minutes), total rainfall (inches), and synthetic rainfall distribution. Basin areas, curve numbers, and times of concentration have been determined for each individual drainage basin contributing to the onsite runoff. The SCSII-24 rainfall distribution was utilized in generating all runoff hydrographs.

Pre-development peak discharge rates were calculated utilizing "Advanced Interconnected Channel and Pond Routing", Version 3.02 (AdICPR), developed by Streamline Technologies, Inc. AdICPR computes rainfall excess using the SCS curve number and infiltration formulae. It is then applied to a unit hydrograph based on basin characteristics and shape factor to obtain runoff throughout the entire storm duration. Hydrographs are then routed through storage nodes connected by weirs, pipes, channels, drop structures, etc., to determine flood elevations and peak discharge rates throughout the area being modeled. The selection of this program was made because of its ability to determine the impact of tailwater on outflow and stage for various control structures.

C. Curve Numbers

Table 3: CN Values

Sub-Basin	CN
Onsite	87
Offsite	81

Curve numbers are utilized to account for the variation of runoff characteristic for differing soil types and ground cover. The soil types within the basins were generally classified as B/D. The limits of the existing soils were obtained from the Soil Conservation Service (SCS) Soil Survey of USVI. See the soils exhibit. Curve numbers used for the analyses contained in this report were taken from the SCS TR-55 manual (Second Edition, June 1986). By superimposing drainage basins with soil and land use delineation's, weighted runoff curve numbers were calculated for each drainage basin. The Curve Number tabulations are included in this report.

Table 4: Soils Type

Sub-Basin	Area (Ac)	Soil Type
Onsite	18.55	ArC
Offsite	5.07	ArC

D. Time of Concentration

In addition to basin drainage area and curve number, the time of concentration is utilized to determine runoff rates. The time of concentration is the time it takes runoff to travel from the hydraulically most distant part of a watershed to a point of interest within the watershed. Times of concentration are computed by determining the path of longest travel time within each of the delineated basins. Flow velocities and travel times are estimated from land slopes and land cover conditions. Times of concentration for this project were estimated using the methods outlined in the SCS TR-55 manual (Second Edition, June 1986) and per the USVI Environmental Protection Handbook, 2002 Edition. The Time of Concentration tabulations are included in this report.

E. Water Quantity

The existing site does not have attenuation measure in place. The existing site conditions were utilized in developing the AdICPR model to determine peak discharge rates from the site. See the results in the table below for the pre development peak discharge.

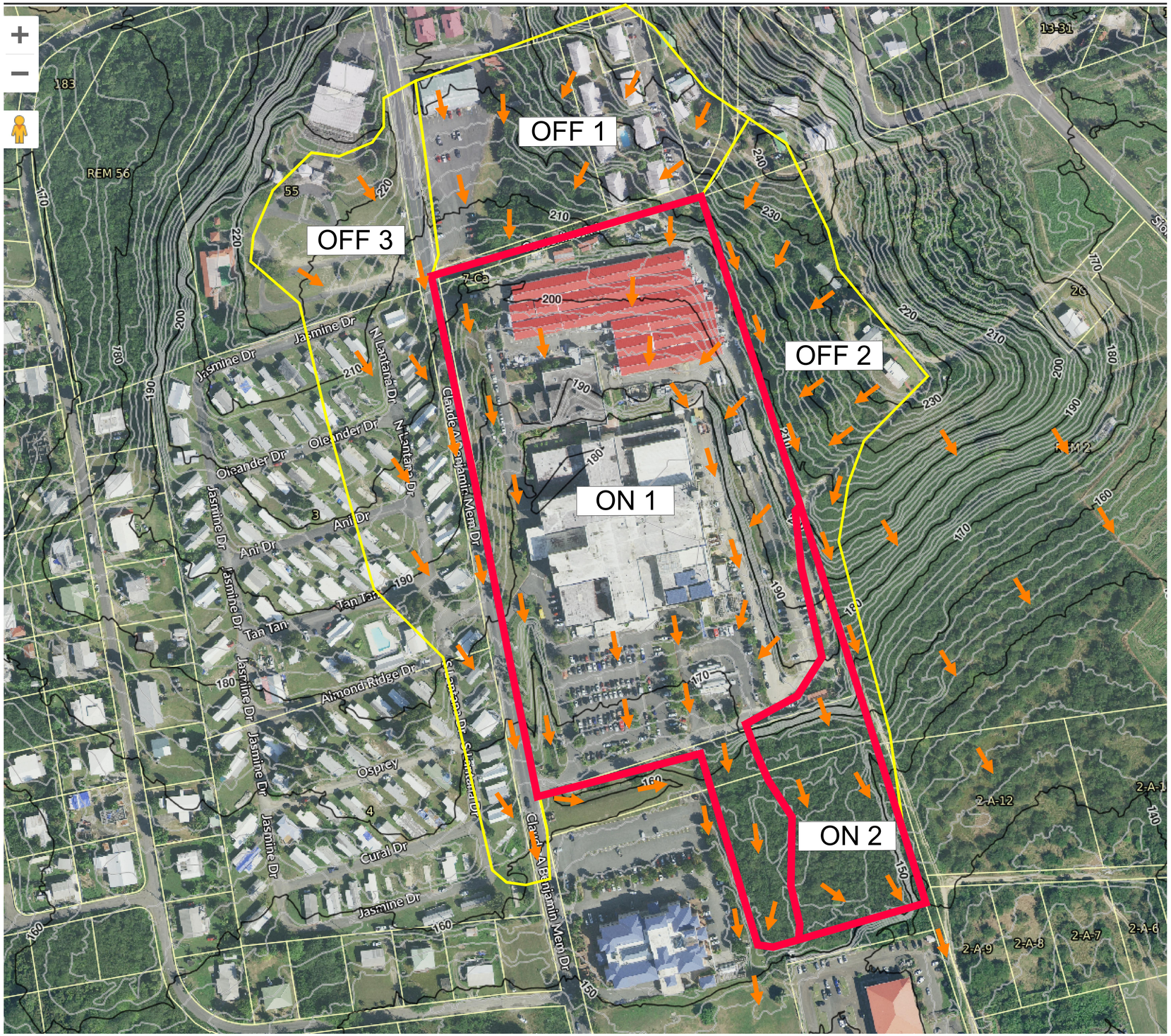
Table 5: Peak Discharge

Frequency (yr)	Q_{peak} (cfs)
2	16.23
25	35.32
100	62.52

F. Conclusions

The proposed replacement hospital will be required to meet peak discharge requirements per the Virgin Islands Environmental Protection Handbook (2002). Attenuation measures will be installed to discharge at or equal to the above peak discharges.

EXHIBITS



NORTH

100 0 50 100 200

1 Inch = 100 Ft

This plan may have been reduced in size. Verify before scaling dimensions

LEGEND

ONSITE BASIN LINE

OFFSITE BASIN LINE

Sub-Basin	Location	Area (Ac)	Contributes Onsite?
ON 1	Onsite	15.78	YES
ON 2	Offsite	2.77	YES
OFF 1	Offsite	5.07	YES
OFF 2	Offsite	4.23	NO
OFF 3	Offsite	7.67	NO

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EB 9814

Juan F. Luis Hospital
Rehabilitation Project

4007 Est. Diamond Ruby
Christiansted, St. Croix, USVI

Revisions:

No.	Date	Description
9.		
8.		
7.		
6.		
5.		
4.		
3.		
2.		
1.		

ONSITE & OFFSITE BASIN MAP

Scale:
Date:
Project No.: 07287000
Design:
Drawn:
Checked:

Release:

EX 1

This plan may have been reduced in size. Verify before scaling dimensions

NORTH

100 0 50 100 200

1 Inch = 100 Ft

This plan may have been reduced in size. Verify before scaling dimensions

LEGEND

- PROPERTY LINE
- OFF PROPERTY CONTRIBUTING BASIN
- IMPERVIOUS SURFACE
- PERVIOUS SURFACE

Basin	Pervious Area (Ac)	Impervious Area (Ac)	Total Area (Ac)
Onsite	6.84	11.71	18.55
Offsite	3.04	2.03	5.07

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Revisions:

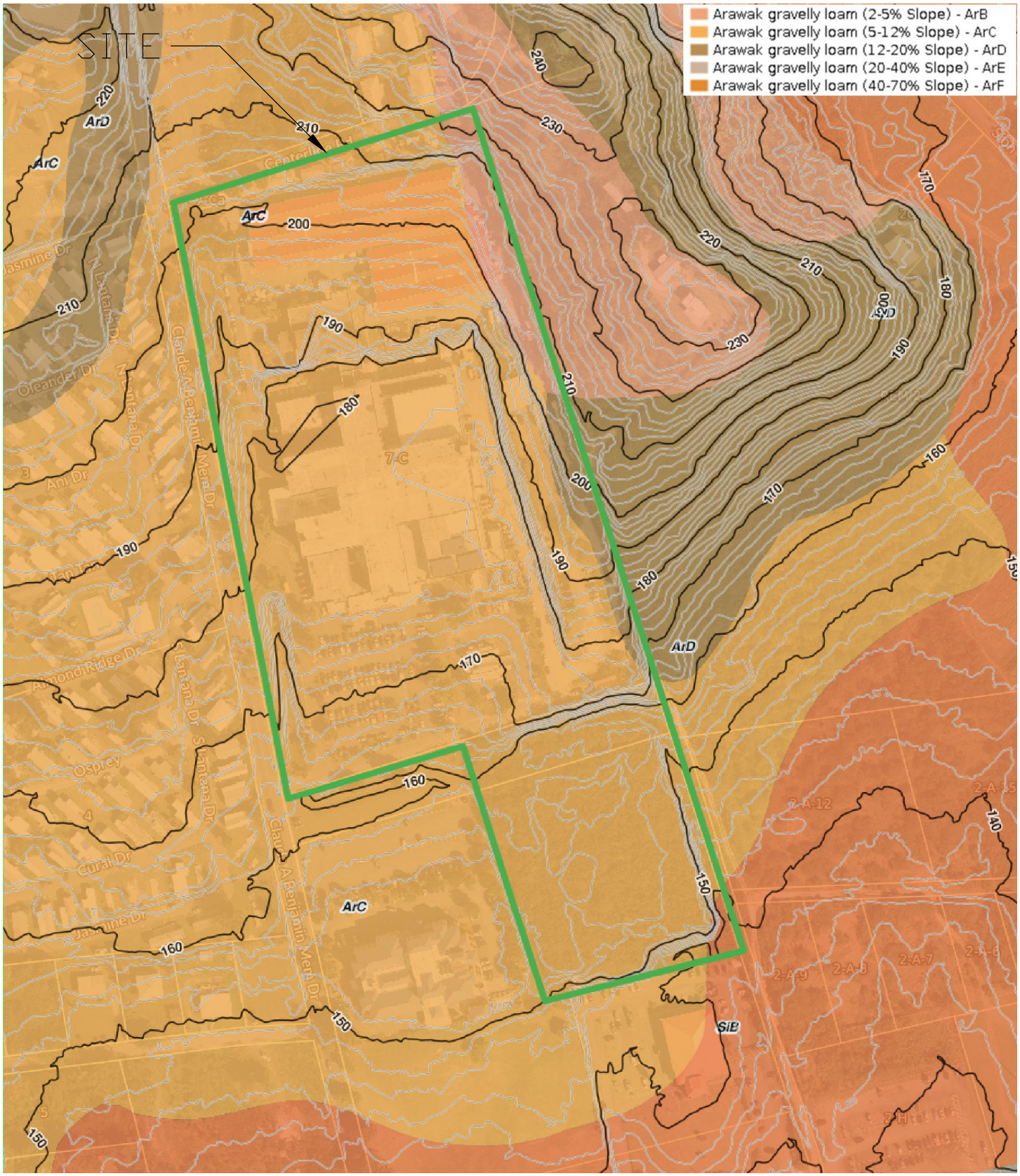
No.	Date	Description
9.		
8.		
7.		
6.		
5.		
4.		
3.		
2.		
1.		

PERVIOUS-IMPERVIOUS BASIN MAP

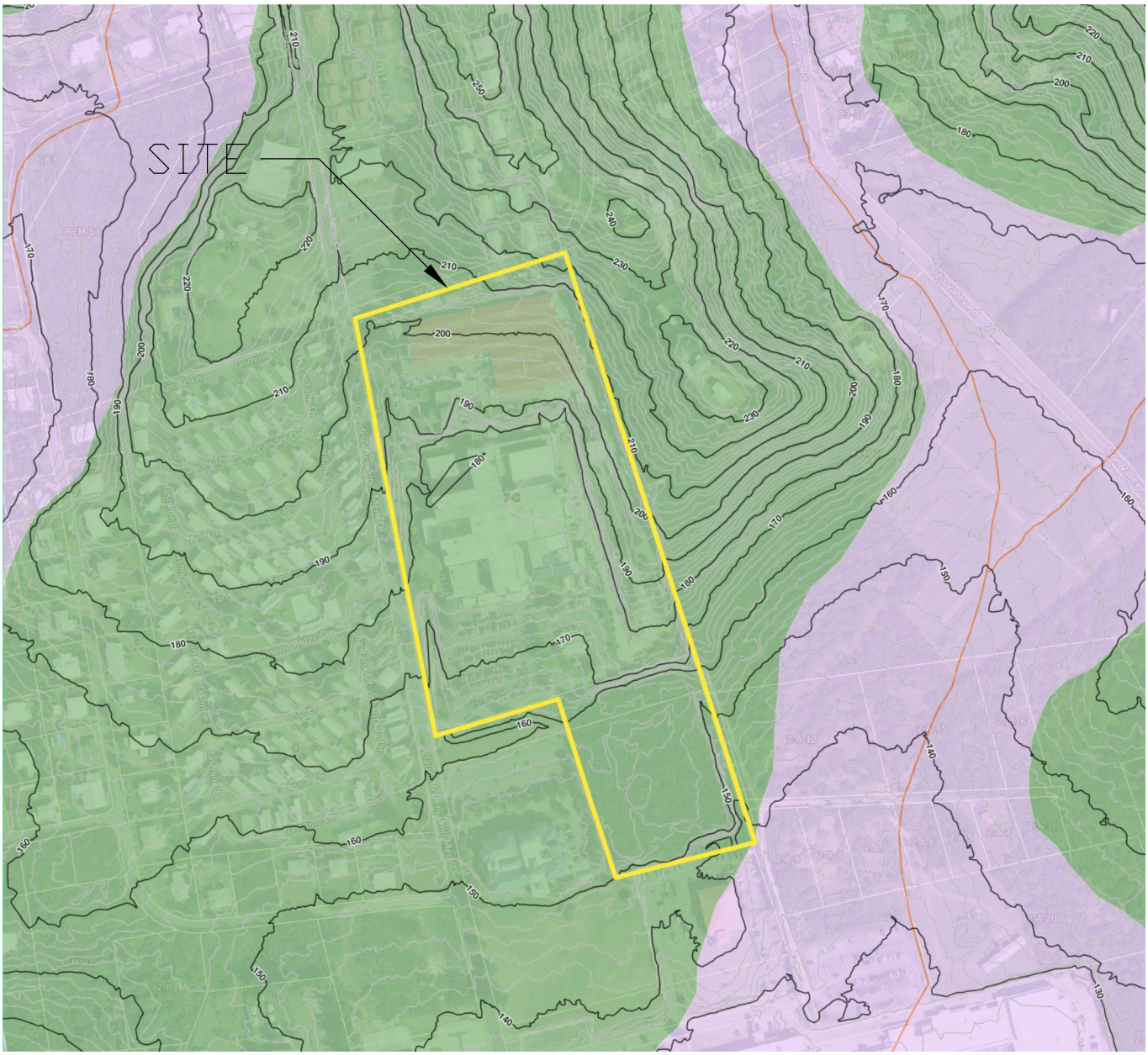
Design:
Drawn:
Checked:
Scale:
Date:
Project No.: 07287000

Release:

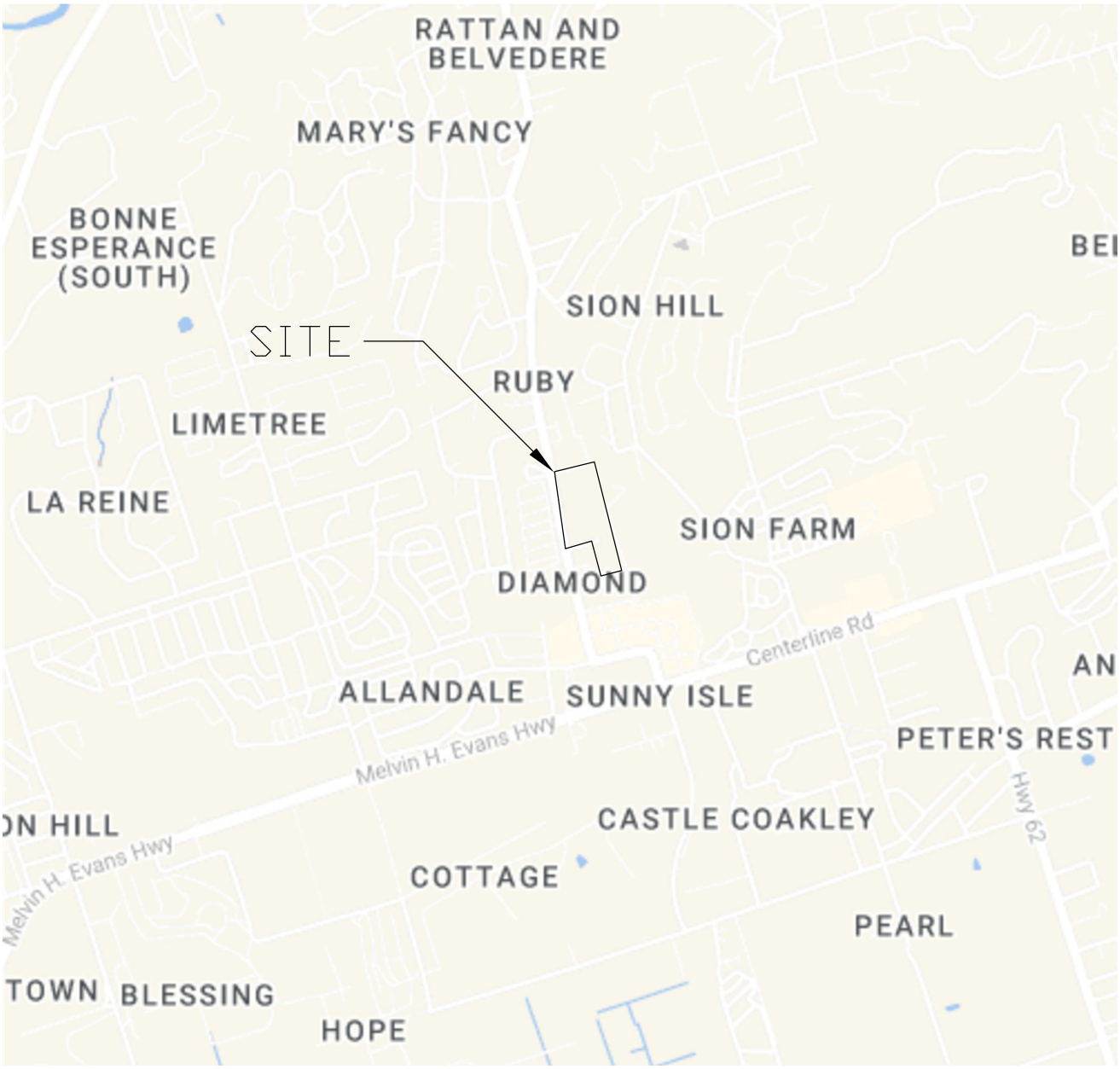
EX 2



EX 3	JFL REPLACEMENT HOSPITAL SOILS MAP	HARRIS Harris Civil Engineers, LLC



EX 4	JFL REPLACEMENT HOSPITAL FEMA MAP	HARRIS Harris Civil Engineers, LLC



Source: Google Maps

EX 5	JFL REPLACEMENT HOSPITAL LOCATION MAP	HARRIS Harris Civil Engineers, LLC

CALCULATIONS

Pre-Development Runoff Curve Number

Basin: **Onsite Basin**
Circle one: **Pre-Development** Post-Development

Runoff Curve Number (CN)

Soil Name and Hydrologic group	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN Tab. 2-2	CN Fig. 2-3	CN Fig. 2-4	Area acres mi %	Product of CN x area
B	PERVIOUS SURFACE - Onsite Fair Condition	69			6.84	472
	IMPERVIOUS SURFACE- Onsite Buildings and Hardscape	98			11.71	1148
						0
						0

CN (weighted) = total product/total area

Totals = 18.55 1620

Technical Release 55, Soil Conservation Service, June 1986

Use CN = **87**

Pre-Development Runoff Curve Number

Basin: **Offsite Basin**
Circle one: **Pre-Development** Post-Development

Runoff Curve Number (CN)

Soil Name and Hydrologic group	Cover Description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN			Area acres mi %	Product of CN x area
		Tab. 2-2	Fig. 2-3	Fig. 2-4		
B	PERVIOUS SURFACE - Onsite Fair Condition	69			3.04	210
	IMPERVIOUS SURFACE- Onsite Buildings and Hardscape	98			2.03	199

CN (weighted) = total product/total area

Totals = 5.07 409

Technical Release 55, Soil Conservation Service, June 1986

Use CN = **81**

Worksheet 3: Time of Concentration (Tc) or travel time (Tt)

Project	JFL Replacement Hospital	By	LJM	Date	6/1/2022
Location	Christensted, St. Croix, USVI	Checked	JMR	Date	

Check one: ☑ Presen ☐ Developed

Check one: ☑ Tc ☐ Tt through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet.
Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to Tc only)

Segment ID	1				
1. Surface description (table 3-1) ……	Short grass				
2. Manning's roughness coefficient, n (table 3-1) .	0.15				
3. Flow length, L (total L † 300 ft) ……..…....ft	300				
4. Two-year 24-hour rainfall, P_2 ……..……in	3.5				
5. Land slope, s ……..ft/ft	0.06				
6. $T_t=0.007(nL)^{0.8}/(P_2^{0.5}s^{0.4})$ Compute T_t …..hr	0.242311	+		=	0.242311

Shallow concentrated flow

Segment ID	2				
7. Surface description (paved or unpaved) ……..	paved				
8. Flow length, L ……..……..……..ft	1500				
9. Watercourse slope, s ……..……..ft/ft	0.051				
10. Average velocity, V (figure 3-1) ……..……ft/s	4.590754				
11. $T_t=L / (3600 V)$ Compute T_t……..……hr	0.090762	+		=	0.090762

Channel flow

Segment ID					
12. Cross sectional flow area, a ……..……ft^2					
13. Wetted perimeter, p_w ……..ft					
14. Hydraulic radius, $r=a/p_w$ Compute r ……..ft					
15. Channel slope, s ……..……..ft/ft					
16. Manning's roughness coefficient, n ……..……..					
17. $V=1.49r^{2/3}s^{1/2}/n$ Compute V ……..……..ft/s					
18. Flow length, L ……..……..……ft					
19. $T_t=L / (3600 V)$ Compute T_t……..……hr		+		=	
20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) ……..……..……Hr					0.333073
				Min	20

(210-VI-TR-55, Second Ed., June 1986)

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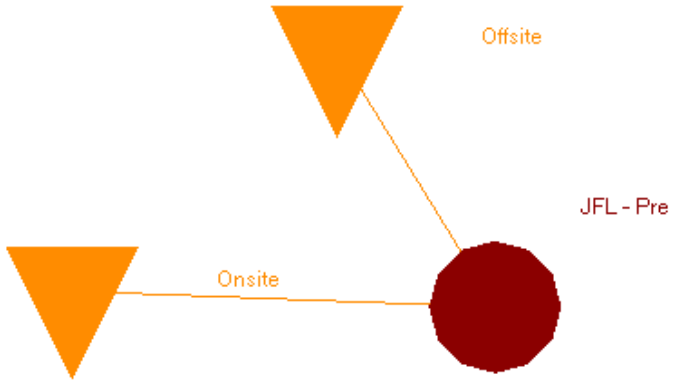
Node Reach Diagram



Simple Basin: Offsite

Scenario:	Scenario1
Node:	JFL - Pre
Hydrograph Method:	NRCS Unit Hydrograph
Infiltration Method:	Curve Number
Time of Concentration:	10.0000 min
Max Allowable Q:	0.00 cfs
Time Shift:	0.0000 hr
Unit Hydrograph:	UH256
Peaking Factor:	256.0
Area:	5.0700 ac
Curve Number:	81.0
% Impervious:	0.00
% DCIA:	0.00
% Direct:	0.00
Rainfall Name:	

Comment:

Simple Basin: Onsite

Scenario:	Scenario1
Node:	JFL - Pre
Hydrograph Method:	NRCS Unit Hydrograph
Infiltration Method:	Curve Number
Time of Concentration:	20.0000 min
Max Allowable Q:	0.00 cfs
Time Shift:	0.0000 hr
Unit Hydrograph:	UH256
Peaking Factor:	256.0
Area:	18.5500 ac
Curve Number:	87.0
% Impervious:	0.00
% DCIA:	0.00
% Direct:	0.00
Rainfall Name:	

Comment:

Node: JFL - Pre

Scenario:	Scenario1
Type:	Time/Stage

Base Flow: 0.00 cfs
Initial Stage: 0.00 ft
Warning Stage: 0.00 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	140.00
0	0	0	99.0000	140.00

Comment:

Simulation: 100 yr -24 hr

Scenario: Scenario1
Run Date/Time: 6/1/2022 5:48:04 PM
Program Version: ICPR4 4.07.08

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	35.0000

	Hydrology [sec]	Surface Hydraulics [sec]	Groundwater [sec]
Min Calculation Time:	60.0000	0.1000	900.0000
Max Calculation Time:		60.0000	

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Groundwater

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	60.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder: Icpr3
Reference ET Folder:
Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set:
Green-Ampt Set:
Vertical Layers Set:
Impervious Set:
Roughness Set:
Crop Coef Set:
Fillable Porosity Set:
Conductivity Set:
Leakage Set:

Tolerances & Options

Time Marching:	SAOR	IA Recovery Time:	24.0000 hr
Max Iterations:	6	ET for Manual Basins:	False
Over-Relax Weight Fact:	0.5 dec		
dZ Tolerance:	0.0010 ft	Smp/Man Basin Rain Opt:	Global
Max dZ:	1.0000 ft	OF Region Rain Opt:	Global
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	Scsi-24
		Rainfall Amount:	9.50 in
Edge Length Option:	Automatic	Storm Duration:	24.0000 hr
Dflt Damping (2D):	0.0050 ft	Dflt Damping (1D):	0.0050 ft
Min Node Srf Area (2D):	1 ft2	Min Node Srf Area (1D):	113 ft2
Energy Switch (2D):	Energy	Energy Switch (1D):	Energy

Comment:

Simulation: 2 yr - 24 hr

Scenario: Scenario1
Run Date/Time: 6/1/2022 5:48:41 PM
Program Version: ICPR4 4.07.08

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	35.0000

	Hydrology [sec]	Surface Hydraulics [sec]	Groundwater [sec]
Min Calculation Time:	60.0000	0.1000	900.0000
Max Calculation Time:		60.0000	

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Groundwater

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	60.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder: Icpr3
Reference ET Folder:
Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set:
Green-Ampt Set:
Vertical Layers Set:
Impervious Set:

Roughness Set:	
Crop Coef Set:	
Fillable Porosity Set:	
Conductivity Set:	
Leakage Set:	

Tolerances & Options

Time Marching:	SAOR	IA Recovery Time:	24.0000 hr
Max Iterations:	6	ET for Manual Basins:	False
Over-Relax Weight Fact:	0.5 dec		
dZ Tolerance:	0.0010 ft	Smp/Man Basin Rain Opt:	Global
Max dZ:	1.0000 ft	OF Region Rain Opt:	Global
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	Scsi-24
		Rainfall Amount:	3.50 in
Edge Length Option:	Automatic	Storm Duration:	24.0000 hr
Dflt Damping (2D):	0.0050 ft	Dflt Damping (1D):	0.0050 ft
Min Node Srf Area (2D):	1 ft2	Min Node Srf Area (1D):	113 ft2
Energy Switch (2D):	Energy	Energy Switch (1D):	Energy

Comment:

Simulation: 25 yr - 24 hr

Scenario:	Scenario1
Run Date/Time:	6/1/2022 5:49:21 PM
Program Version:	ICPR4 4.07.08

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	35.0000

Hydrology [sec]	Surface Hydraulics [sec]	Groundwater [sec]

Min Calculation Time:	60.0000	0.1000	900.0000
Max Calculation Time:		60.0000	

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Groundwater

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	60.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder: Icpr3
Reference ET Folder:
Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set:
Green-Ampt Set:
Vertical Layers Set:
Impervious Set:
Roughness Set:
Crop Coef Set:
Fillable Porosity Set:
Conductivity Set:
Leakage Set:

Tolerances & Options

Time Marching: SAOR
Max Iterations: 6
Over-Relax Weight Fact: 0.5 dec
dZ Tolerance: 0.0010 ft

IA Recovery Time: 24.0000 hr
ET for Manual Basins: False
Smp/Man Basin Rain Opt: Global

Max dZ:	1.0000 ft	OF Region Rain Opt:	Global
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	Scsi-24
		Rainfall Amount:	6.00 in
Edge Length Option:	Automatic	Storm Duration:	24.0000 hr
Dflt Damping (2D):	0.0050 ft	Dflt Damping (1D):	0.0050 ft
Min Node Srf Area (2D):	1 ft2	Min Node Srf Area (1D):	113 ft2
Energy Switch (2D):	Energy	Energy Switch (1D):	Energy

Comment:

Simple Basin Runoff Summary [Scenario1]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
Offsite	100 yr -24 hr	15.35	10.0333	9.50	7.16	5.0700	81.0	0.00	0.00
Onsite	100 yr -24 hr	48.19	10.1167	9.50	7.91	18.5500	87.0	0.00	0.00
Offsite	2 yr - 24 hr	3.46	10.0500	3.50	1.71	5.0700	81.0	0.00	0.00
Onsite	2 yr - 24 hr	13.06	10.1333	3.50	2.18	18.5500	87.0	0.00	0.00
Offsite	25 yr - 24 hr	8.28	10.0333	6.00	3.88	5.0700	81.0	0.00	0.00
Onsite	25 yr - 24 hr	27.64	10.1167	6.00	4.51	18.5500	87.0	0.00	0.00

Node Max Conditions [Scenario1]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
JFL - Pre	100 yr -24 hr	0.00	140.00	0.0000	62.52	0.00	0
JFL - Pre	2 yr - 24 hr	0.00	140.00	0.0000	16.23	0.00	0
JFL - Pre	25 yr - 24 hr	0.00	140.00	0.0000	35.32	0.00	0

REFERENCES

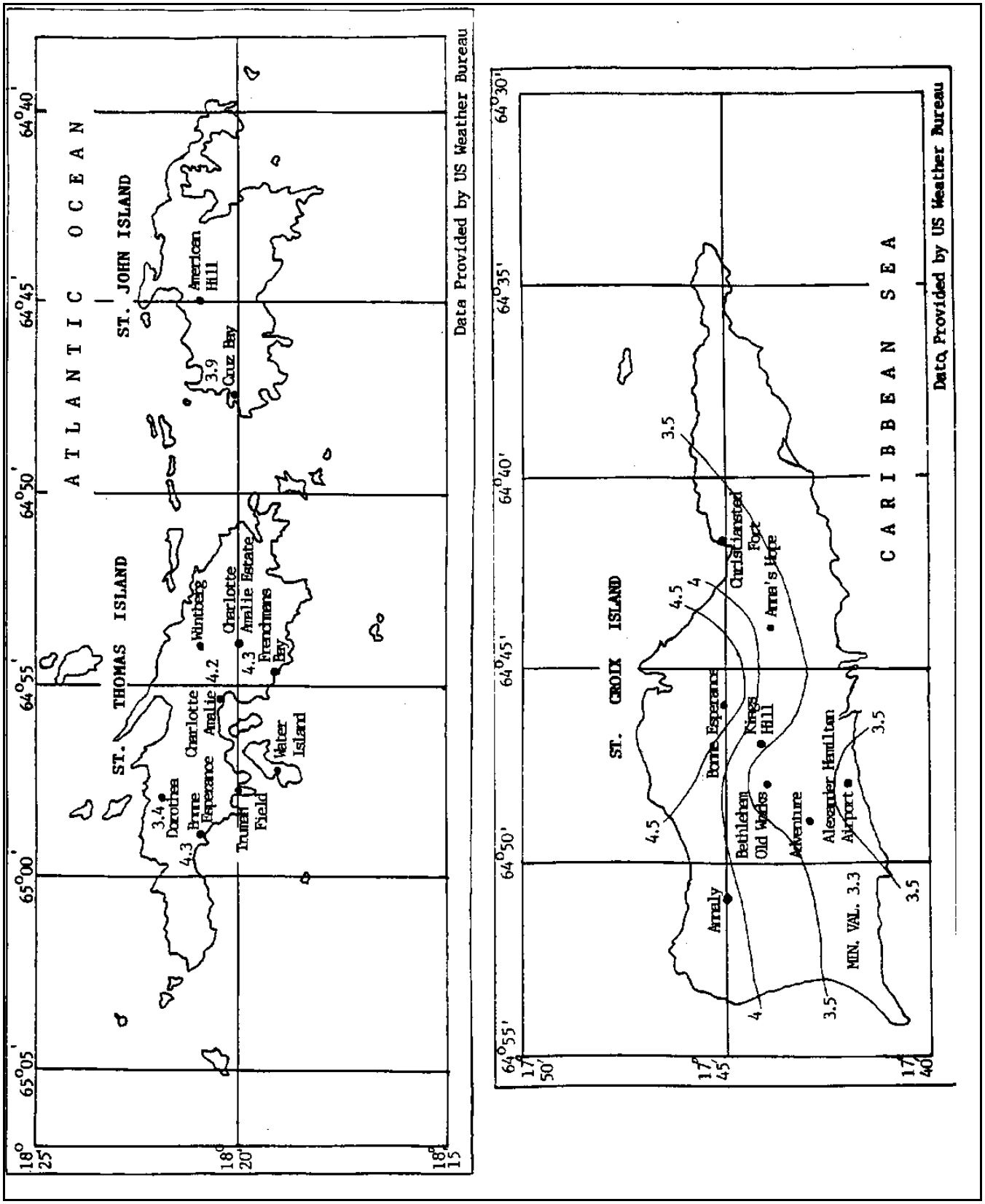


Figure 6.6. 2-year, 24-hour rainfall for the U.S. Virgin Islands (in.) (USDA-SCS, 1986).

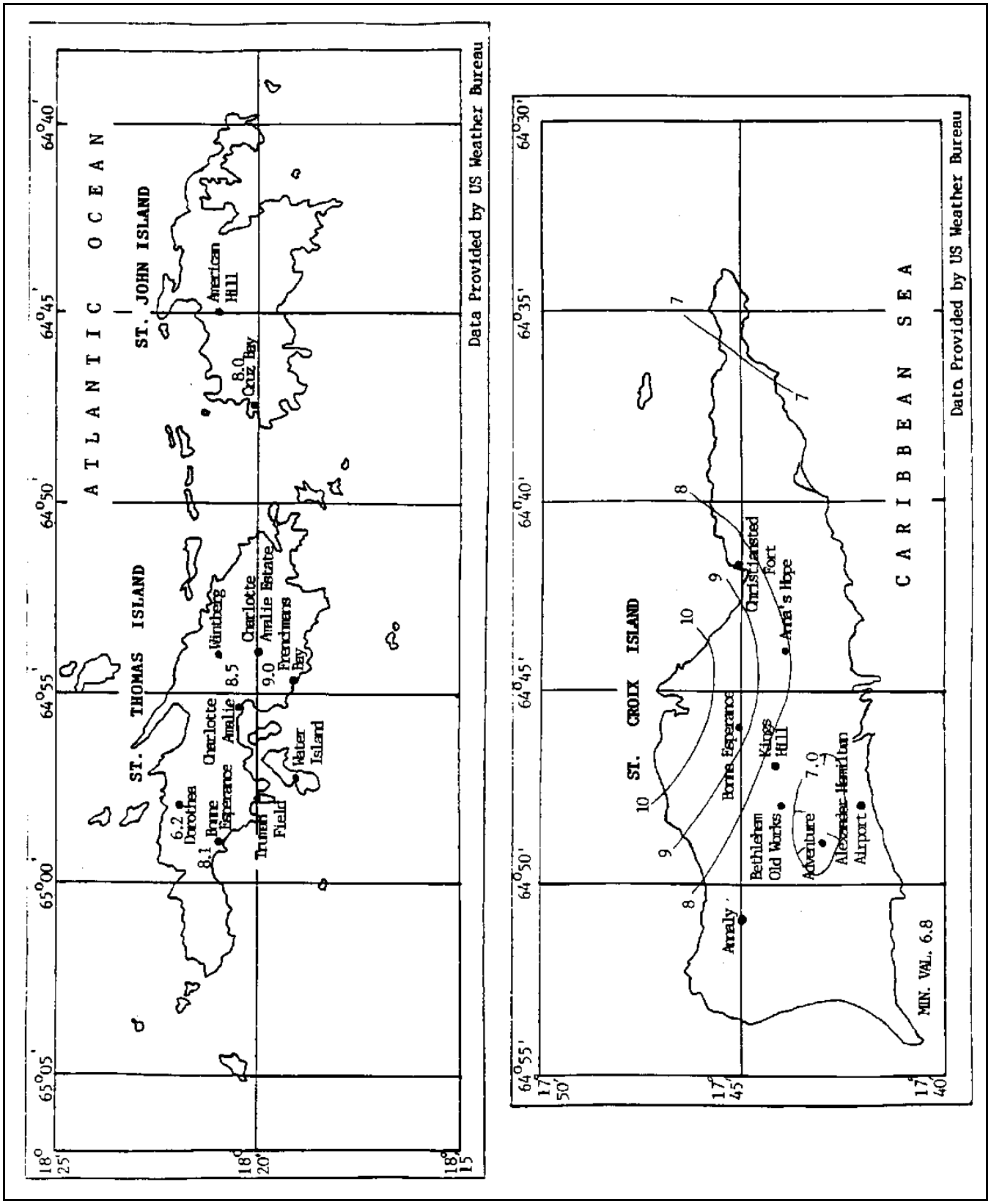


Figure 6.9. 25-year, 24-hour rainfall for the U.S. Virgin Islands (in.) (USDA-SCS, 1986).

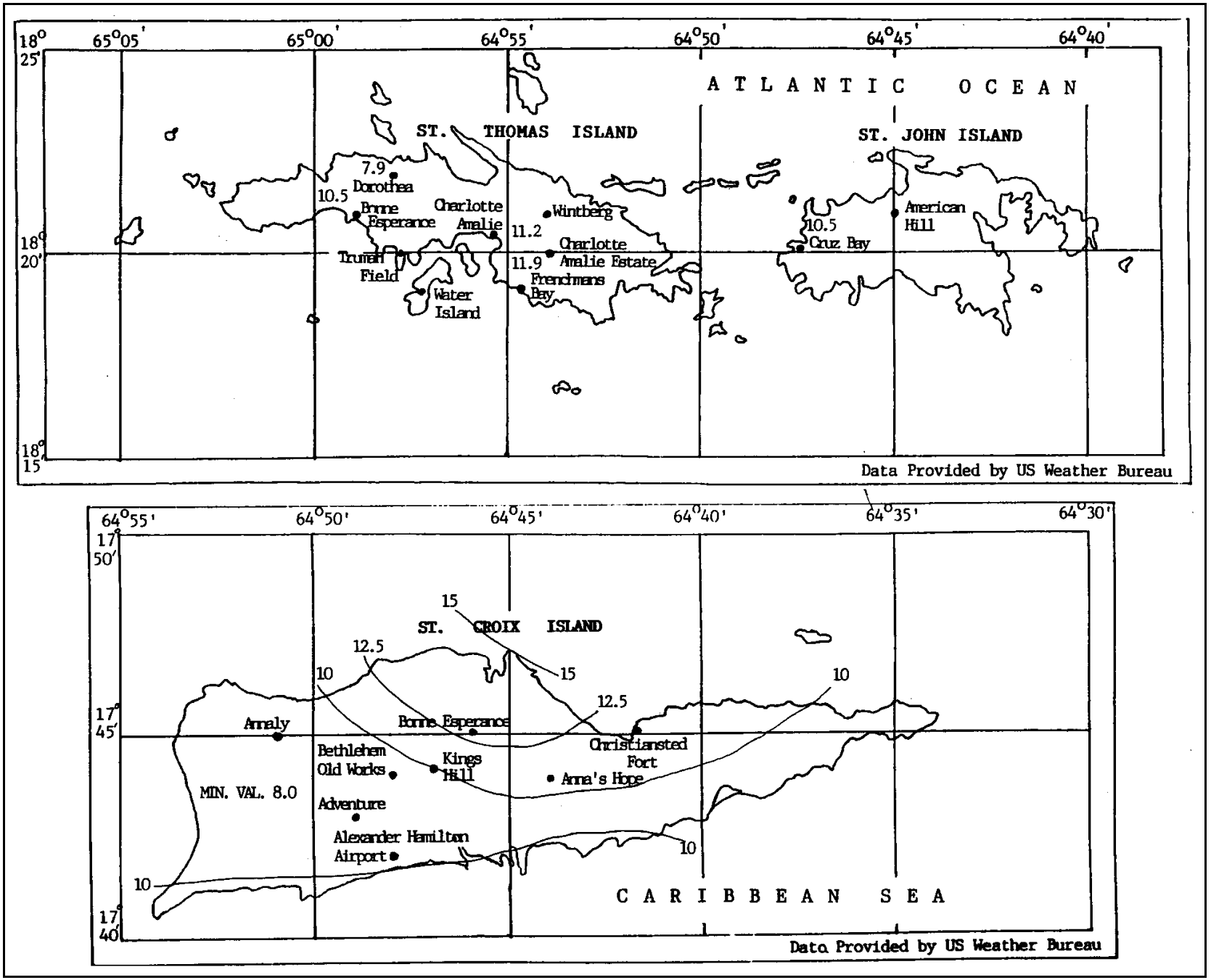


Figure 6.11. 100-year, 24-hour rainfall for the U.S. Virgin Islands (in.) (USDA-SCS, 1986).

Table 15.--Soil and Water Features

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Cemented pan		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Depth	Hardness	Uncoated steel	Concrete
					Ft			In		In			
AcD*, AcE*, AcF*, AcG*:													
Annaberg	D	None	---	---	>6.0	---	---	10-20	Hard	---	---	Moderate	Moderate.
Cramer	C	None	---	---	>6.0	---	---	10-20	Soft	---	---	Moderate	Moderate.
AmD*, AmE*, AmF*, AmG*:													
Annaberg	D	None	---	---	>6.0	---	---	10-20	Hard	---	---	Moderate	Moderate.
Maho Bay	D	None	---	---	>6.0	---	---	10-20	Soft	---	---	Moderate	Moderate.
AqA. Aquents	D	Frequent	Very long	Jan-Dec	+1.-1.0	Apparent	Jan-Dec	>60	---	---	---	---	---
ArB, ArC, ArD, ArE, ArF. Arawak	B	None	---	---	>6.0	---	---	10-20	Soft	---	---	Moderate	Low.
BrB*. Beaches	D	Frequent	Very brief to long.	Jan-Dec	>6.0	---	---	0	Hard	---	---	---	---
BsB*. Beaches	D	Frequent	Very brief to long.	Jan-Dec	0-6.0	Apparent	Jan-Dec	>60	---	---	---	High	High.
BtB*. Beaches	D	Frequent	Very brief to long.	Jan-Dec	0-6.0	Apparent	Jan-Dec	>60	---	---	---	---	---
CaA. Carib	D	Frequent	Brief	Apr-Dec	1.5-3.0	Apparent	Apr-Dec	>60	---	---	---	High	Low.
CbB, CgC. Cinnamon Bay	B	Occasional	Very brief	Apr-Dec	>6.0	---	---	>60	---	---	---	Moderate	Low.
CvC*, CvD*, CvE*, CvF*:													
Cramer	C	None	---	---	>6.0	---	---	10-20	Soft	---	---	Moderate	Moderate.
Victory	B	None	---	---	>6.0	---	---	20-40	Soft	---	---	Low	Low.

See footnote at end of table.