

November 25, 2025

Department of Planning and Natural Resources  
Charles W. Turnbull Regional Library - 4607 Tutu Park Mall  
St. Thomas, VI 00802

**Re: Stormwater Management Calculations Cover Letter  
US VIDE St. Thomas Yvonne E. Miliner Bowsky  
Elementary School  
9432+WCR, Mandal, St. Thomas 00802, U.S. Virgin Islands**

## SITE DESCRIPTION

The proposed development for the US Virgin Islands Department of Education (VIDE) St. Thomas Bowsky Elementary School is located along Mandal Road in St. Thomas, US Virgin Islands. The existing project site is composed of eight buildings clustered around a central playground area, 8 modular buildings, and a paved parking lot. The project site is bounded on the north by Mandal Road, on the east by a residential property, on the south by a hill that rises about 210-feet above the school site and to the west by residential properties. The proposed development area is 4.94 acres. See image below for the project Location Figure.

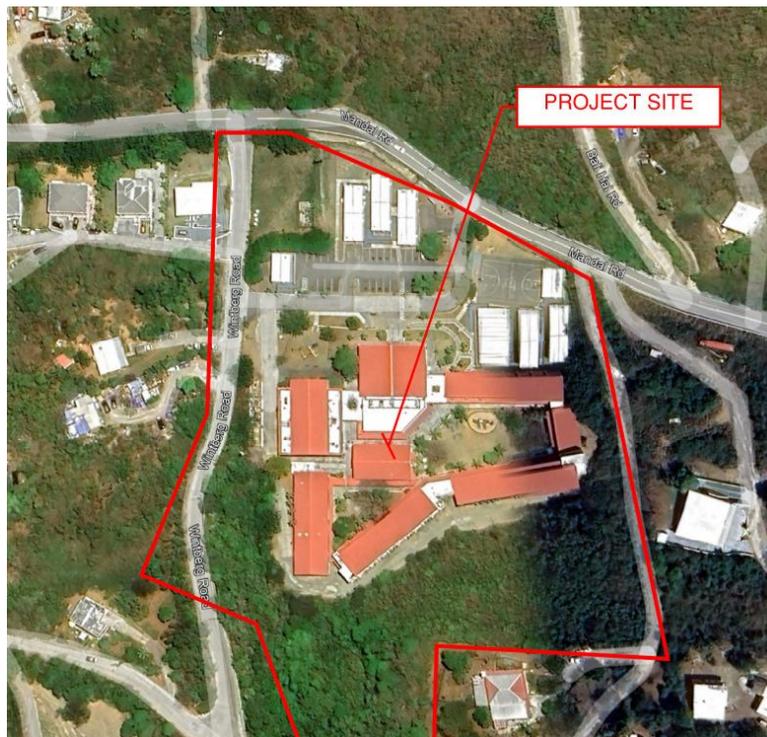


Figure 1 – Site Location Figure

## EXISTING SITE CONDITIONS

The topography of the proposed development area varies approximately between elevations 193.0-ft to 220.00-ft, with the higher areas of the site being along the south boundary of the property and dropping towards the northwest area of the site. The elevations referenced are based on Army Corp Aerial Topography, per the topographic survey prepared by Marvin Berning & Associates (refer to **Attachment A**). Stormwater runoff currently drains towards an existing ghut along the western perimeter of the site. The ghut then discharges to an existing box culvert that connects to an existing paved swale that runs parallel to the northern perimeter of the site, along Mandal Road. The site also has an existing ghut that runs parallel to the eastern boundary of the project site. Tabulated below is a breakdown of the existing land use of the site.

Surface Type	Area (acres)
Existing Buildings	1.47
Pervious	2.00
Impervious	1.47
<b>Total</b>	<b>4.94</b>

## PROJECT DESCRIPTION

The proposed project will consist of renovating the existing eight buildings that are clustered together, a new gymnasium building, a proposed wastewater treatment plant and a new parking lot and two private driveways.



Figure 2 – Existing Buildings to be Removed

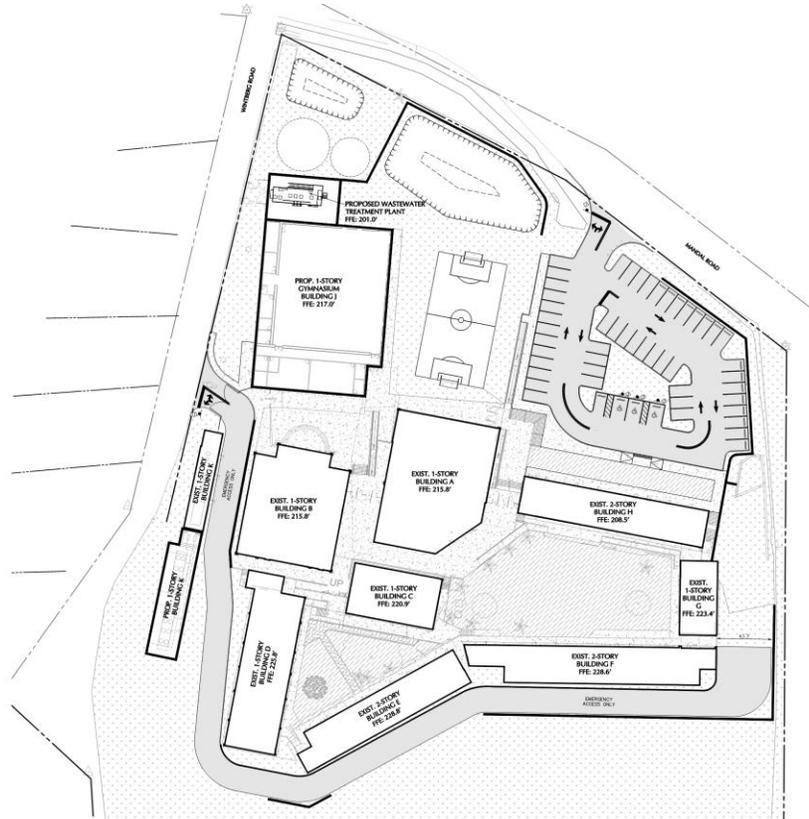


Figure 3 – Proposed Site Plan

Below is the breakdown for the post-development land use condition:

Surface Type	Area (acres)
Proposed Buildings	0.42
Existing Building	0.94
Pervious	1.53
Impervious	2.05
<b>Total</b>	<b>4.94</b>

### PROPOSED ON-SITE STORMWATER MANAGEMENT IMPROVEMENTS

The proposed stormwater management system includes two separate systems. One of these includes catch basins and drainage pipes along the proposed southern driveway which discharge

into the existing ghut on the west side of the property. This ghut discharges to the box culvert that is being relocated to avoid conflicts with the proposed gym building. This system collects and discharges the upland runoff that comes from the hill to the south of the site. The box culvert has been sized to convey the runoff from a 100-yr 24-hr storm event. The second system consists of interconnected catch basins, drainage pipes, and dry detention areas. The runoff collected from the site discharges into the dry detention areas and the runoff from the building roofs are conveyed to the proposed cistern under the new gym building to be treated and reused. The cistern has an overflow into the proposed dry detention areas. The dry detention areas overflow into the existing concrete swale along Mandal Road. A control structure will be installed to ensure that discharge occurs once the required stormwater quantity and quality requirements have been met.

We have conducted a pre-development to post-development analysis for the 10-year and 100-year 24-hour storm events (type II distribution) per the VI Department of Planning and Natural Resources (DPNR), section 2.2 – Post-Construction Standards for Permanent Stormwater Control.

The post-development and pre-development total runoff volumes will be calculated using the following design parameters and criteria:

1. Groundwater Table Elevation for the site ranges between elevations 172-ft to 185-ft per the Geotechnical Engineering Study prepared by Langan. The bottom elevation of the proposed dry detention areas will be designed to be at least 1 foot above the groundwater table elevation.
2. Using Table 3-6 Typical Curve Number Values for Urban Areas (SCS 1986) a weighted curve number value was calculated for the pre-development conditions and a uniform curve number was used for the post-development conditions based on land use type. The values used are tabulated below:

	<b>CN (pervious)</b>	<b>CN (impervious)</b>	<b>CN (weighted)</b>
<b>Pre-Development</b>	80	95	89
<b>Post-Development</b>	-	95	95

3. Precipitation (P) data will be obtained from NOAA (National Oceanic and Atmospheric Administration) Atlas 14. Refer to **Attachment B**. The rainfall amount used for the calculations is equivalent to 90% of the highest rainfall amount within the range provided in Atlas 14 for each of the 10-year 24-hour and 100-year 25-hour storm events, as per the requirements of the DPNR Environmental Protection Handbook.

The pre-development and post-development will be calculated using the NRCS (Natural Resources Conservation Service) method. See below for formulas.

$$S = \frac{1000}{CN} - 10$$

$$Q = \frac{(P - 0.2S)^2}{(P + 0.8S)} (A)$$

Q = total runoff volume (ac-ft)

P = precipitation data (ft)

A = area (acres)

The table below summarizes the results of the pre-development and post-development runoff volume calculations.

Storm Events	Pre-Development Q (ac-ft)	Post-Development Q (ac-ft)
10-year, 24-hour	2.91	3.21
100-year, 24-hour	5.94	6.27

As shown in the table below, the post-development condition generates more runoff volume than the pre-development conditions. To address this condition, we are proposing dry retention areas that will be providing additional storage volume on site of approximately 0.57 ac-ft. This volume is larger than the additional runoff volume generated in the post-development condition for the 10-year 24-hour event and the 100-year 24-hour event. Therefore, the post-development condition will discharge less total runoff volume offsite, compared to the pre-development condition for the 10-year 24-hour and 100-year 24-hour storm events.

## WATER QUALITY

Based on the available information for the existing site, it does not appear that there are currently any water quality treatment practices in place. The proposed stormwater management system will provide the required water quality volume within the proposed dry detention areas. The required water quality treatment volume is being calculated using the following formula per the DPNR Environmental Protection Handbook, section 2.2 – Post-Construction Standards for Permanent Stormwater Control.

$$WQ = \frac{(1")(I)}{12}$$

WQ = required water quality volume (ac-ft)

I = Impervious area for proposed development (acres)

$$WQ = \frac{(1")(2.05 \text{ acres})}{12}$$

$$WQ = 0.12ac - ft$$

<b>W</b>	<b>WQ (ac-ft)</b>
Required	0.17
*Provided	0.57

\* The total water quality volume provided includes the total volume in the proposed dry retention areas.

### **SWPPP (STORMWATER POLLUTION PREVENTION PLAN)**

The following Best Management Practices (BMPs) are being implemented as part of the stormwater pollution prevention plan:

- Silt fences and berms around the perimeter of the site
- Stabilized construction entrances,
- Inlet protection for existing and proposed drainage inlets
- Sedimentation basins. The sedimentation basins are sized to hold the volume equivalent to 1" of runoff from the contributing area (on-site area disturbed during construction), as per the DPNR Environmental Protection Handbook, section 2.1 – Standards for Temporary Erosion and Sediment Control.

### **FINISHED FLOOR ELEVATION**

Per FEMA panel 7800000013G the project site is located within FEMA flood zone X which means the project is not located in a flood zone area. Refer to **Attachment C**. The proposed finished floor elevation for the proposed building is 217-ft.

If you have any questions, please do not hesitate to contact us at 786-264-7200.

Sincerely,

**Langan Engineering and Environmental Services, LLC**

Eric Blaine Shwarz, PE  
Senior Principal  
USVI PE License No. 0-50150-3B  
Registration No. 1644-e

Cc: Leonardo Rodriguez, PE, Kelvin Martinez, PE

Enclosure(s): Attachment A – Topographic survey prepared by Marvin Berning & Associates

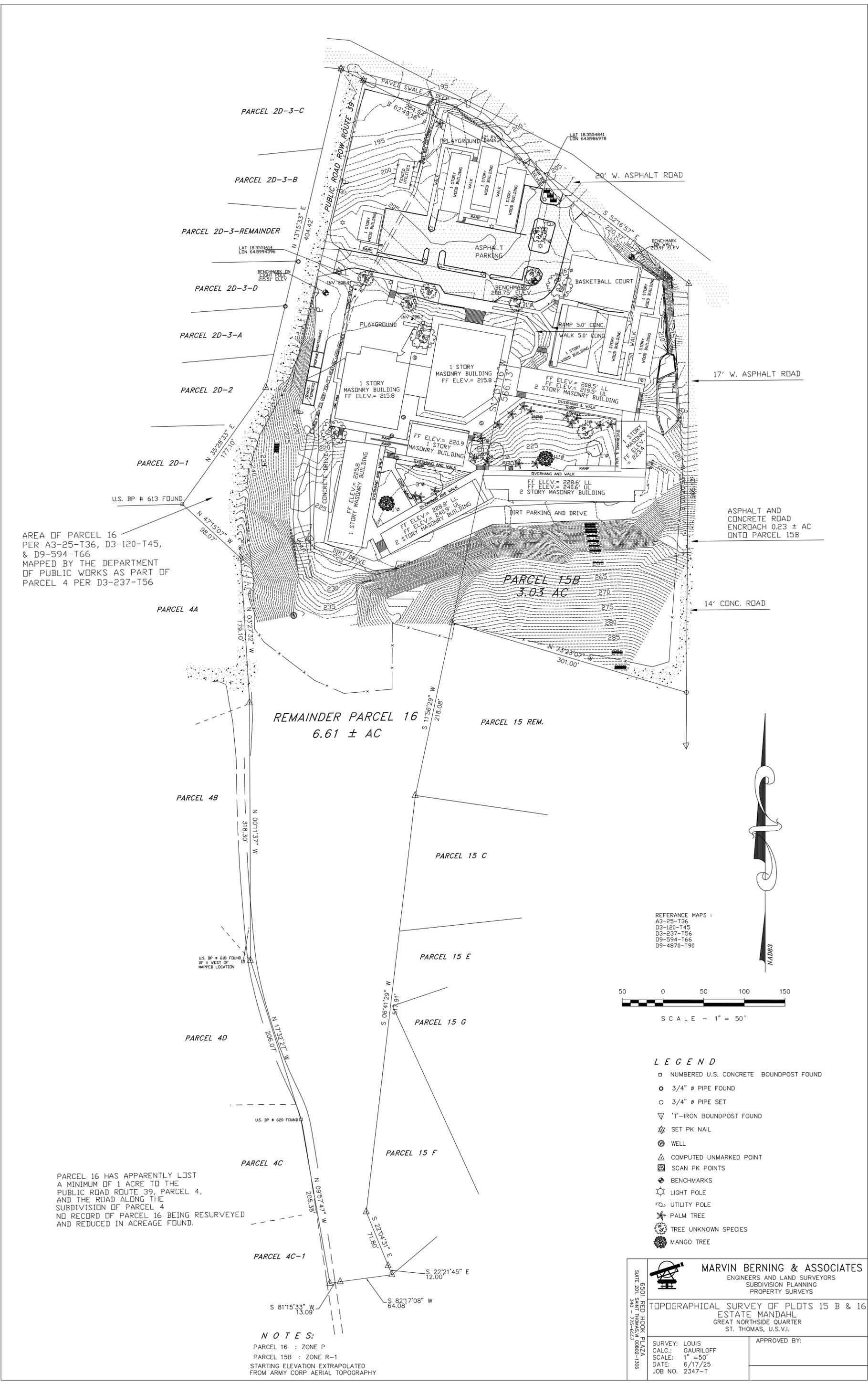
Attachment B – NOAA Atlas 14.

Attachment C – FEMA panel 7800000013G

FL Certificate of Authorization No. 6601

\\langan.com\data\MIA\data\8\300375803\Project Data\Discipline\Site Civil\Reports\Stormwater\SWM Report (Bowsky).docx

ATTACHMENT A  
TOPOGRAPHIC SURVEY

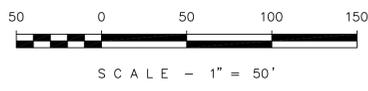


AREA OF PARCEL 16  
PER A3-25-T36, D3-120-T45,  
& D9-594-T66  
MAPPED BY THE DEPARTMENT  
OF PUBLIC WORKS AS PART OF  
PARCEL 4 PER D3-237-T56

PARCEL 16 HAS APPARENTLY LOST  
A MINIMUM OF 1 ACRE TO THE  
PUBLIC ROAD ROUTE 39, PARCEL 4,  
AND THE ROAD ALONG THE  
SUBDIVISION OF PARCEL 4  
NO RECORD OF PARCEL 16 BEING RESURVEYED  
AND REDUCED IN ACREAGE FOUND.

**NOTES:**  
PARCEL 16 : ZONE P  
PARCEL 15B : ZONE R-1  
STARTING ELEVATION EXTRAPOLATED  
FROM ARMY CORP AERIAL TOPOGRAPHY

REFERENCE MAPS :  
A3-25-T36  
D3-120-T45  
D3-237-T56  
D9-594-T66  
D9-4870-T90



- LEGEND**
- NUMBERED U.S. CONCRETE BOUNDPOST FOUND
  - 3/4" Ø PIPE FOUND
  - 3/4" Ø PIPE SET
  - ▽ 'T'-IRON BOUNDPOST FOUND
  - ⊗ SET PK NAIL
  - ⊙ WELL
  - △ COMPUTED UNMARKED POINT
  - ⊕ SCAN PK POINTS
  - ⊕ BENCHMARKS
  - ⊙ LIGHT POLE
  - ⊙ UTILITY POLE
  - ✱ PALM TREE
  - ⊙ TREE UNKNOWN SPECIES
  - ⊙ MANGO TREE

6501 SUITE 201, SAINT THOMAS, VI 00982-1306 340 - 773-6557	 <b>MARVIN BERNING &amp; ASSOCIATES</b> ENGINEERS AND LAND SURVEYORS SUBDIVISION PLANNING PROPERTY SURVEYS
	<b>TOPOGRAPHICAL SURVEY OF PLOTS 15 B &amp; 16</b> <b>ESTATE MANDAH</b> <b>GREAT NORTHSIDE QUARTER</b> <b>ST. THOMAS, U.S.V.I.</b>
SURVEY: LOUIS CALC.: GAURILOFF SCALE: 1" = 50' DATE: 6/17/25 JOB NO. 2347-T	APPROVED BY:

ATTACHMENT B  
NOAA ATLAS 14 RAINFALL DATA



NOAA Atlas 14, Volume 3, Version 4  
 Location name: Northside, Virgin Islands, VIR\*  
 Latitude: 18.3548°, Longitude: -64.899°  
 Elevation: 213 ft\*\*  
 \*source: ESRI Maps  
 \*\*source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

[PF\\_tabular](#) | [PF\\_graphical](#) | [Maps & aeriels](#)

PF tabular

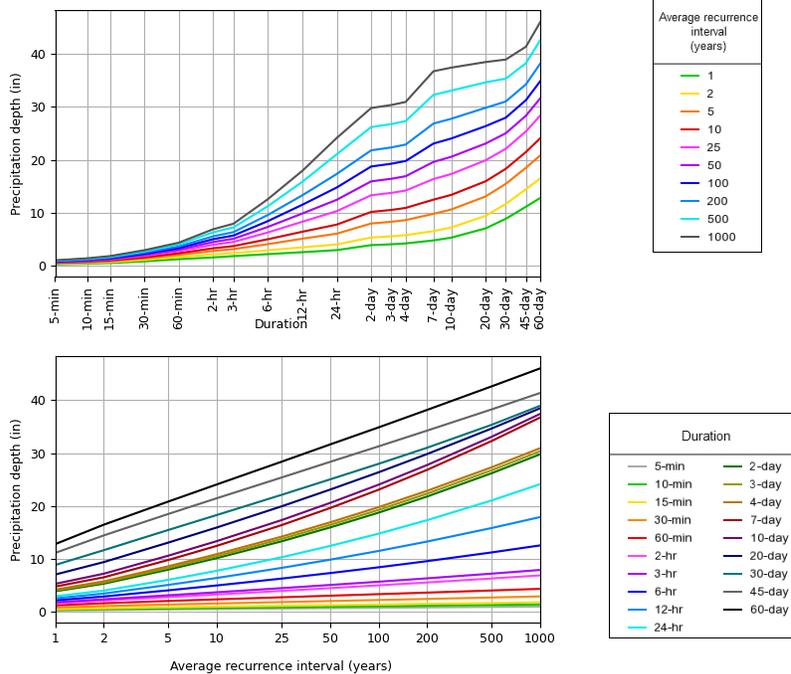
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.302 (0.268-0.360)	0.400 (0.348-0.461)	0.502 (0.438-0.570)	0.575 (0.498-0.658)	0.669 (0.570-0.775)	0.740 (0.621-0.869)	0.810 (0.672-0.965)	0.882 (0.719-1.06)	0.977 (0.779-1.19)	1.05 (0.822-1.30)
10-min	0.413 (0.366-0.491)	0.546 (0.478-0.630)	0.686 (0.599-0.779)	0.786 (0.681-0.899)	0.914 (0.780-1.06)	1.01 (0.849-1.19)	1.11 (0.918-1.32)	1.20 (0.983-1.45)	1.34 (1.05-1.63)	1.44 (1.12-1.78)
15-min	0.530 (0.470-0.631)	0.701 (0.610-0.808)	0.880 (0.769-1.00)	1.01 (0.874-1.15)	1.17 (1.00-1.36)	1.30 (1.09-1.52)	1.42 (1.18-1.69)	1.55 (1.26-1.86)	1.71 (1.37-2.09)	1.84 (1.44-2.28)
30-min	0.849 (0.753-1.01)	1.12 (0.977-1.29)	1.41 (1.23-1.60)	1.62 (1.40-1.85)	1.88 (1.60-2.18)	2.08 (1.74-2.44)	2.28 (1.89-2.71)	2.48 (2.02-2.98)	2.74 (2.19-3.35)	2.95 (2.31-3.66)
60-min	1.26 (1.12-1.50)	1.67 (1.45-1.92)	2.09 (1.83-2.36)	2.40 (2.09-2.74)	2.79 (2.38-3.23)	3.08 (2.59-3.62)	3.38 (2.80-3.97)	3.67 (3.00-4.42)	4.07 (3.25-5.07)	4.38 (3.42-5.43)
2-hr	1.59 (1.42-1.94)	2.15 (1.85-2.52)	2.82 (2.42-3.26)	3.32 (2.83-3.88)	3.99 (3.32-4.74)	4.51 (3.66-5.46)	5.04 (4.02-6.19)	5.58 (4.35-6.98)	6.34 (4.79-8.13)	6.92 (5.10-9.05)
3-hr	1.84 (1.58-2.17)	2.40 (2.05-2.82)	3.16 (2.71-3.66)	3.74 (3.18-4.36)	4.51 (3.74-5.35)	5.11 (4.15-6.15)	5.72 (4.58-7.01)	6.37 (4.99-7.91)	7.25 (5.51-9.20)	7.95 (5.89-10.3)
6-hr	2.22 (1.83-2.68)	2.94 (2.43-3.55)	4.10 (3.39-4.89)	5.02 (4.12-6.04)	6.31 (5.01-7.77)	7.35 (5.67-9.26)	8.45 (6.34-10.9)	9.61 (7.02-12.5)	11.3 (7.92-15.2)	12.6 (8.60-17.5)
12-hr	2.58 (2.08-3.20)	3.50 (2.83-4.35)	5.12 (4.11-6.30)	6.44 (5.08-8.02)	8.32 (6.34-10.6)	9.88 (7.27-12.9)	11.5 (8.20-15.5)	13.3 (9.19-18.3)	15.9 (10.5-22.6)	17.9 (11.4-26.1)
24-hr	2.97 (2.48-3.59)	4.04 (3.3-4.88)	6.08 (5.06-7.28)	7.79 (6.44-9.32)	10.3 (8.41-12.3)	12.5 (10.0-14.9)	14.8 (11.5-17.6)	17.4 (13.6-20.6)	21.1 (16.3-25.1)	24.2 (18.4-28.8)
2-day	3.91 (3.24-4.75)	5.35 (4.43-6.49)	8.00 (6.60-9.65)	10.2 (8.33-12.2)	13.3 (10.8-15.9)	16.0 (12.7-19.1)	18.8 (14.7-22.4)	21.8 (16.9-26.1)	26.2 (20.0-32.5)	29.8 (22.4-35.9)
3-day	4.07 (3.36-4.99)	5.57 (4.59-6.81)	8.32 (6.82-10.1)	10.6 (8.57-12.8)	13.8 (11.0-16.6)	16.4 (13.0-19.8)	19.3 (15.0-23.3)	22.4 (17.2-27.0)	26.8 (20.9-32.5)	30.4 (22.8-36.9)
4-day	4.23 (3.48-5.22)	5.80 (4.76-7.13)	8.64 (7.04-10.6)	10.9 (8.81-13.3)	14.2 (11.3-17.3)	16.9 (13.3-20.6)	19.8 (15.4-24.1)	22.9 (17.6-28.0)	27.3 (20.7-33.5)	30.9 (23.1-38.0)
7-day	4.80 (3.92-5.97)	6.56 (5.35-8.14)	9.82 (7.95-12.1)	12.5 (10.0-15.3)	16.4 (12.9-20.0)	19.6 (15.2-24.0)	23.1 (17.7-28.2)	26.9 (20.4-32.9)	32.3 (24.1-39.7)	36.7 (27.1-45.4)
10-day	5.32 (4.38-6.55)	7.24 (5.95-8.90)	10.6 (8.68-13.0)	13.4 (10.8-16.3)	17.3 (13.9-21.0)	20.6 (16.2-25.0)	24.0 (18.7-29.2)	27.8 (21.4-33.8)	33.1 (25.0-40.4)	37.4 (28.0-46.0)
20-day	7.08 (5.98-8.39)	9.44 (7.97-11.2)	13.1 (11.0-15.4)	16.0 (13.3-18.7)	19.9 (16.4-23.4)	23.1 (18.9-27.1)	26.4 (21.5-31.0)	29.8 (24.1-35.2)	34.7 (27.6-41.0)	38.5 (30.3-46.4)
30-day	8.88 (7.61-10.3)	11.7 (10.0-13.6)	15.5 (13.2-17.9)	18.3 (15.6-21.2)	22.1 (18.6-25.5)	25.0 (21.0-29.0)	28.0 (23.2-32.5)	31.0 (25.7-36.1)	35.3 (29.0-41.3)	39.0 (31.4-46.9)
45-day	11.2 (9.73-12.7)	14.5 (12.6-16.5)	18.5 (16.1-21.0)	21.5 (18.6-24.4)	25.4 (21.9-28.8)	28.3 (24.3-32.2)	31.3 (26.6-35.6)	34.3 (29.1-39.1)	38.3 (32.2-43.3)	41.4 (34.5-47.7)
60-day	12.8 (11.3-14.4)	16.5 (14.6-18.6)	20.9 (18.4-23.4)	24.1 (21.2-27.0)	28.4 (24.8-31.8)	31.6 (27.5-35.5)	34.9 (30.1-39.2)	38.2 (32.7-43.1)	42.6 (36.2-48.3)	46.0 (38.7-52.3)

<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

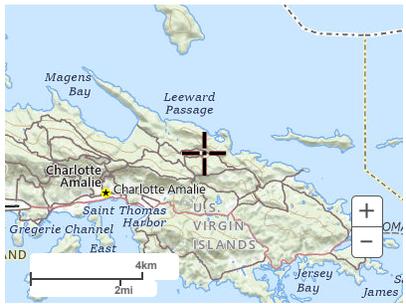
PDS-based depth-duration-frequency (DDF) curves  
 Latitude: 18.3548°, Longitude: -64.8990°



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Maps & aeriels

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce  
National Oceanic and Atmospheric Administration  
National Weather Service  
National Water Center  
1325 East West Highway  
Silver Spring, MD 20910  
Questions? [HDSC.Questions@noaa.gov](mailto:HDSC.Questions@noaa.gov)

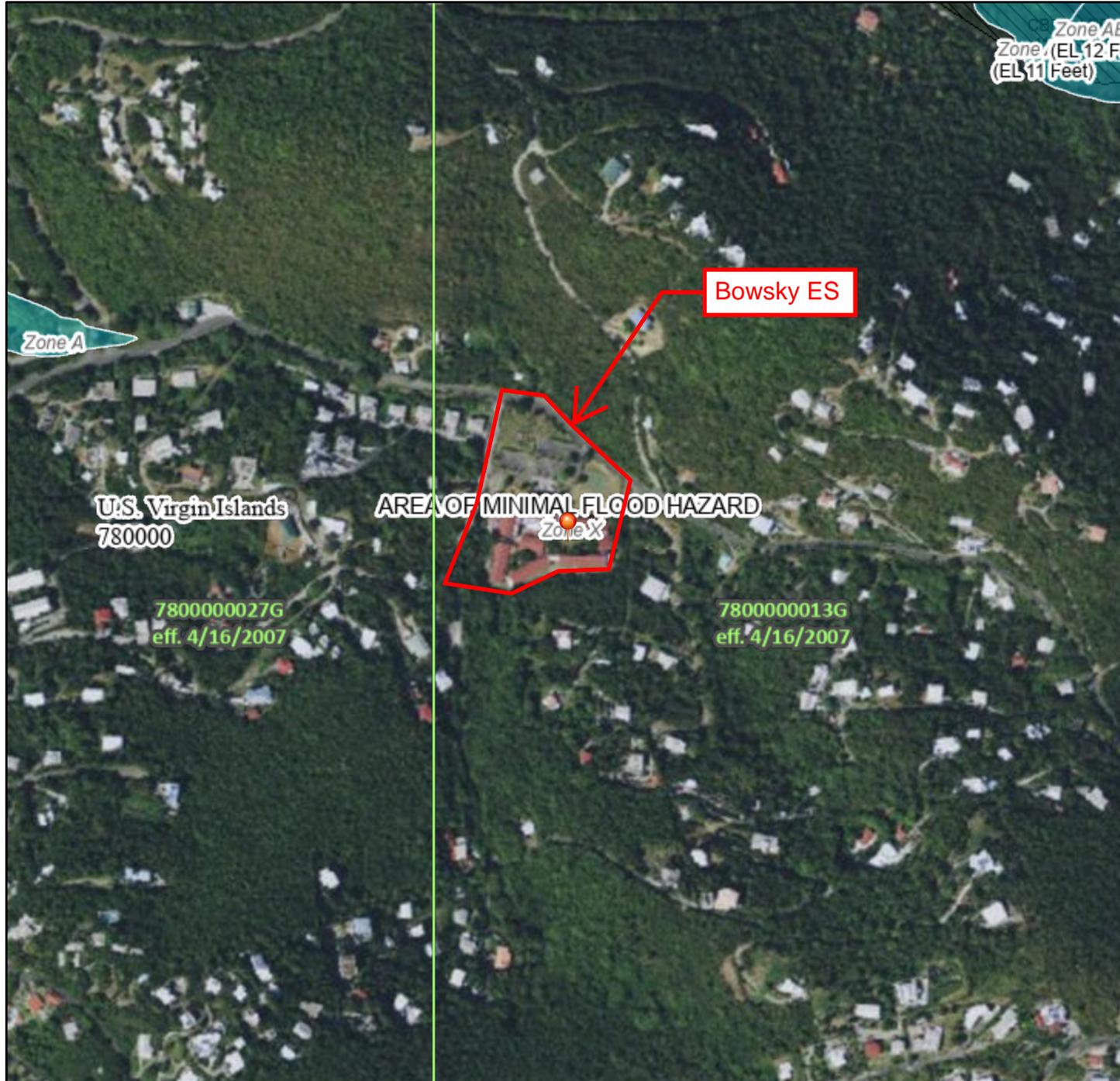
[Disclaimer](#)

ATTACHMENT C  
FEMA FLOOD MAP

# National Flood Hazard Layer FIRMMette



64°54'14"W 18°21'34"N



## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) Zone A, V, A99	With BFE or Depth Zone AE, AO, AH, VE, AR
	Regulatory Floodway	

		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D

### OTHER AREAS OF FLOOD HAZARD

		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D

### OTHER AREAS

GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall

OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance
		17.5 Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature

MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **5/13/2025 at 7:15 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



Basemap Imagery Source: USGS National Map 2023