2. PROFILE OF PHYSICAL ENVIRONMENT

Water Island, the smallest of the four inhabited U.S. Virgin Islands, became an official part of the U.S. Virgin Islands in 1996 when control was transferred from the U.S. Government to the Territorial Government of the Virgin Islands. The island is located ½ mile south-southwest of Charlotte Amalie Harbor and is comprised of 492 acres (198 hectares). Water Island is 4 kilometers (2.5 miles) long by 1.5 kilometers (.94 mile) wide. The maximum elevation is 98.4 meters (300 feet) above mean sea level.

The island’s cultural history is rich and includes Amer-Indians from the Preceramic and Ceramic cultures, who migrated to the Virgin Islands from coastal South America. The colonial history of Water Island begins in the 1670’s with the Danish West Indies Company and continued under their control for the next hundred (100) years. The Plantation Era and the subsequent emancipation of enslaved Africans brought large changes to the island’s natural terrestrial and marine resources as the original inhabitants and colonizers altered and exploited the land and seascape to meet their needs and the needs of the small emerging commercial ventures.

Farming, wood harvesting, livestock grazing, fishing, turtle hunting and limestone quarrying created significant stress on natural systems and led to the first major changes in the Water Island environment.

While the Water Island landscape has been significantly altered and disturbed in the past, a variety of common native plant communities exist, along with areas colonized and dominated by exotic plants. Predominantly a dry environment, the island has a different composition of plant communities from the larger and higher islands that surround it. The most common habitat type is *Dry shrublands*. In addition, sandy and rocky shore beaches,
woodlands, salt ponds and mangrove wetlands are also found and they create a very
diverse and rich landscape. (see Map 2.1).

The Water Island marine communities found just offshore are also abundant and important
environments. There are extensive coral reefs, colonized hard pavement and coral-covered
bedrock, especially along the east shores. Sea grass beds are common in many bays. In
all, the marine environment surrounding Water Island is quite diverse and supports a rich
flora and fauna important to the commercial fisheries of the Virgin Islands (Thomas and
Devine, 2005). Several large bays Sprat, Flamingo and Honeymoon are ecologically
important bays linked closely to adjacent terrestrial wetlands.

Undoubtedly the land use impacts on Water Island and St. Thomas have negatively
impacted the marine resources surrounding Water Island. The coral reefs and seagrass
beds are less extensive than previously observed. Any further changes in land use
development must be considered with respect to the potential impact on marine resources.
2.1. **Environmental Constraints**

Parcel and Island Size – The size of Water Island at 492 acres is appropriate for the development of additional housing. The selection of the target properties for such development is more problematic as a result of other landscape constraints than as a result of the size of the parcels. The 200 acres is comprised of 58 parcels ranging from 188.66 square feet to 37.22 acres. These land parcels are scattered around the island, generally in the southern 2/3 of the island (see Map 2.2). The quitclaim deeds transferring the real property from the Department of the Interior (DOI) to the Government of the U.S. Virgin Islands contains restrictive covenants. The restrictive covenants designated areas on Water Island as *permanent nondevelopment* and restricted development covenant (see Appendix B). As a result, the number of potential parcels for consideration is substantially reduced (see Table 2-1).

<table>
<thead>
<tr>
<th>RESTRICTION</th>
<th>ACRES</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Restriction</td>
<td>92.9</td>
<td>46.0</td>
</tr>
<tr>
<td>Restricted Development covenant</td>
<td>31.8</td>
<td>15.7</td>
</tr>
<tr>
<td>Permanent Nondevelopment</td>
<td>77.3</td>
<td>38.3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>202.0</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

1 The total acreage calculation generated from GIS data (202.0 acres) is different from acreage in Act Number 6751 (200 acres). This is a result of map projection which is used to fit the earth’s surface that is three-dimensional onto a flat surface that is two dimensional. A ground survey is considered the most accurate calculation of land acreage.
Access Constraints – While the distance of Water Island is relatively short to medical services, social services, utilities and other necessities on St. Thomas, access to adequate passenger ferry and barge services is a challenge. The current passenger and commercial off-loading areas are not located at points closest to the Charlotte Amalie harbor thus, requiring more travel time to services in Charlotte Amalie. Access to Water Island is limited to several small launch/ferry boats to transport passengers. Automotive vehicles and equipment are carried over on a small, single vehicle barge and off-loaded at Flamingo Pond at a primitive shoreline ramp. Private sea vessels used for trips to St. Thomas are anchored or moored at the Flamingo Pond or the Passenger Ferry dock (see Figure 2-3). The parking area currently serving the Passenger Ferry dock during peak demand presents another challenge to accessing transportation. Additional housing units and residents will increase the demand for adequate passenger ferry and barge service.

Geology/Soils/Topography - Water Island is composed primarily of bedrock of volcanic origin, with a thin overlying layer of soil. The soil on the interior and higher elevations is Cramer gravelly clay loam (Dammann and Nellis, 1992).

The northwestern portion of the island contains the higher elevations, with the highest point being 294 ft. (89.37 m). The south and east coastline of the island (the windward side) has more cliffs.
Dammann and Nellis (1992) notes the occurrence of seven salt ponds on the islands, with the largest (Flamingo Pond) opened for use as a marina.

**Figure 2-4** Windswept vegetation on the south east side of Water Island

**Topography and Slope Constraints -** Water Island, similar to the other islands in the U.S. Virgin Islands, has extremely steep slopes and varied topography throughout the island. Though its elevation is only 300 feet, the landscape undulates, rising and falling with many steep areas lying along the shore line. Many of the steep areas are precluded from development by the issues involved with topography, size of the parcels and access issues. Steep topography increases building costs and creates significant potential for erosion,
sedimentation and downstream marine community impacts. However, there are several sites on the island where the topography is more gentle or flat. These conditions are suitable for the construction of housing. Potential sites and topography will be discussed in following sections.

**Downstream community constraints** - The marine communities surrounding Water Island are abundant and diverse. Coral reefs, seagrass beds, colonized hardbottom and colonized bedrock shorelines are all densely populated with marine organisms. As the island lies offshore, exposed and cleaned by circulating ocean currents, the marine communities are likely less affected than mainland areas, especially on the shores farthest from inner Charlotte Amalie harbor. Sprat Bay and the entire southeast coast has a coral reef running parallel to the shoreline from about 100 feet just offshore to 1000 feet. Inside this, hardbottom pavement colonized by corals and other marine invertebrates is a dominant reef environment. Seagrass beds are dominant inside Sprat Bay, Honeymoon and the Flamingo Pond area. Any development in the adjoining coastal areas is likely to have a negative impact on the offshore marine resources, unless proper sites are chosen and the proper construction methods are use to protect these resources.

**Landfill constraints** - As a result of the Federal Government’s ownership and use of Water Island for military purposes, there were a number of waste disposal sites on the island that were cleaned of potentially toxic materials. These areas may come into issue when the final site for the project is chosen and detailed land use evaluation occurs. In addition, on the south side of Flamingo Pond, a landfill and transfer station has been established, precluding use of certain parcels. Also in this area is an automobile graveyard created by the residents and Public Works staff accumulating scrap vehicles. There is likely a
significant chance that some toxic materials have leached into soils and sediments around the pond. These areas preclude development of housing, but also create landfill problems that need to be addressed now to meet current standards and addressed in greater detail for additional residential development. Waste removal will be a costly service.

Figure 2-5 Abandoned vehicles near the solid waste transfer station

2.2. Natural Hazards
The 1980 study identified the existence of “significant stress factors”, and advised that development on the island should not exacerbate those stresses. Persons testifying in the U.S. House of Representatives Hearings on Water Island also noted the existence of natural threats. These natural sources of threats include earthquakes, tsunamis, and tropical storms.

Earthquake activity is an environmental constant in the U.S. Virgin Island (Appendix C), with three (3) minor quakes since January 2007 registering above magnitude 3:

- January 10, 3:07 a.m. magnitude 3.1, 75 miles north of Charlotte Amalie;
- January 7, 2:15 Atlantic Standard Time, magnitude 4.4, 63 miles north of Charlotte Amalie; and
Most of the earthquakes are centered north and north-west of Charlotte Amalie, and take place at relatively shallow depths. In addition to the potential damage from the quakes, they also have the potential to generate tsunamis.

The largest tsunami recorded in the U.S. Virgin Islands occurred on November 18, 1867, and is referred to as the 1867 Virgin Islands Tsunami (Appendix D). The tsunami was generated by a magnitude 7.5 earthquake in the Anegada Trough, located between St. Croix and St. Thomas. The report of the tsunami included eyewitness accounts of a wave approximately 12.1 meters high at the southern point of Water Island and 4.5-6.1 meters high at Charlotte Amalie. The tsunami caused significant damage to buildings along the waterfront on St. Thomas.

Tropical storms present a more significant threat, given the frequency and strength of hurricanes passing through the Virgin Islands. Since 1989, the Virgin Islands have weathered ten (10) tropical storms, six (6) of which attained hurricane strength, with Hurricane Hugo (1989) classified as a Category 4 hurricane and Hurricane Lenny (1999) classified as a Category 5 hurricane (Appendix E). These storms created severe destruction in the Virgin Islands, including the destruction of the hotel and many of the residences on Water Island. Due to storm damage, the number of housing units on Water Island decreased from 165 in 1990 to 148 in 2000.

2.3. **Zoning**

The Virgin Islands code Title 29 Public Planning and Development, Chapter 3 of the Virgin Islands Zoning and Subdivision Law has established 18 zoning designations. Water Island has only 2 of the 18 zoning districts – R-1 Residential Development – Low Density and W-1
Waterfront – Pleasure. (see Map 2.4) These zoning designations (districts) establish standards and policies concerning the development of land:

R-1: RESIDENTIONAL – LOW DENSITY is established primarily for residential purposes. The minimum lot size is one-half (1/2) acre. The maximum residential building height is limited to two (2) stories.

W-1: WATERFRONT – PLEASURE is established for the purpose of meeting the recreation needs of residents and visitors of the Virgin Islands. The standards for this designation provide for mixed uses – residential and retail. However, it also protects private residential areas from the intrusion of commercial and industrial uses. Hotels and Guesthouses are permitted uses with conditions set forth in Title 29 sections 231 and 232. The maximum building height in this zoning district is three (3) stories.

2.4. Existing Land Use and Infrastructure

The existing land uses on Water Island include low and medium density residential, public facilities, retail/commercial and hotel/resort (historical). In general, the residential homes are sited along older roadways and paths built to no proper standards. The roads are too narrow, unpaved or potholed in many cases, and overgrown by roadside brush and other vegetation. In several places, cars cannot adequately pass, corners are blind and roads form a spidery maze, difficult to navigate. The Cost of Community Service section of this report will focus more specifically on infrastructure needs.

There are several commercial businesses on the island. General businesses include small commercial operations for food concessions. The operation of bicycle tours is a major business activity on Water Island. This evident by the investment made to install bicycling facilities and transportation vehicle.
Since 2000, only two (2) Major Permits have been issued for projects on Water Island:

- Re-construction of Water Island Ferry Dock by the Department of Public Works, 2001; and,

Conditions to protect the environment from the negative impacts of these two developments focused mainly on sedimentation control measures (Appendix F).

The Minor Permits issued have largely been in response to proposals for reconstruction of damaged homes, addition to homes, and construction of new homes. During the period 2000-2006, thirty one (31) minor permits were issued for residential development. These fell into the categories shown by the table below.

<table>
<thead>
<tr>
<th>Type of Activity</th>
<th>Number of Permits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addition to existing residence (pool, storage room, etc.)</td>
<td>7</td>
</tr>
<tr>
<td>Addition of more rooms to existing residence</td>
<td>4</td>
</tr>
<tr>
<td>Restoration/renovation of existing residence</td>
<td>6</td>
</tr>
<tr>
<td>Construction of new residence</td>
<td>8</td>
</tr>
<tr>
<td>Improvement of roadway, wall, or other infrastructure</td>
<td>4</td>
</tr>
<tr>
<td>Repair of damage to existing commercial structure</td>
<td>1</td>
</tr>
<tr>
<td>New mixed residential and commercial (workshop/office)</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>31</strong></td>
</tr>
</tbody>
</table>
The special conditions for the minor permits are fairly standard, and generally include the following:

a. The Division of Coastal Zone Management shall be notified at least forty-eight (48) hours before work commences.
b. A Coastal Zone Management permit placard shall be placed in a conspicuous location on site as soon as work commences.
c. This permit is valid only for work as stated in Paragraph 2 “Scope”.
d. A building permit shall be obtained prior to commencement of work.
e. Silt fences shall be installed and properly maintained around the work area.
f. A grey-water system must be used in place of a septic tank and leach field\(^2\).
g. Upon the discovery of any archeological or historical site, or human burial site or remains upon private lands, the owner or his representative shall immediately notify the State Historic Preservation Office verbally and in writing.

The Division of Coastal Zone Management notes that the soils on Water Island have low water retention capacity, and has stated a concern regarding the disposal of sewage effluent. The current residences use primarily a multi-flow system for sewage treatment, though the Division is encouraging the use of constructed wetland systems for sewage treatment (personal communication). The hearings in the U.S. House of Representatives also identified sewage disposal from the (now destroyed) hotel as a major cause of concern. Given the low water retention of the soil, the nature of the underlying bedrock, and the low-lying nature of the island, any major development will have to provide some form of municipal/communal sewage treatment facility.

With the exception of the stated concern of sewage disposal from the hotel, there is no available documentation that provides any information on the impacts of development activity on the historical and environmental features of Water Island.

\(^2\) This specific condition is in relation to the proposed use of the structure as a workshop.
2.5. General Description of the 200 acres of Properties of Interest

Of the 200 acres on Water Island that are currently owned by the Territorial Government of the Virgin Islands, 30% or 60 acres have been designated to be transferred to the Virgin Islands Housing Finance Authority. The purpose of this land use study is to identify these parcels and perform a limited environmental and infrastructure analysis on this land to prioritize potential parcels for possible future development.

A study of this scope must make certain assumptions regarding the increase in number of residents and proposed number of units to be built on a given number of parcels. Cluster development is suggested as this can reduce construction costs, reduce impact to natural resources and improve the ease with which services can easily be provided. Otherwise, some parcels of interest may be too small to accommodate the increase proposed. Currently, the number of island residents is 161 persons, many of whom are part-time residents. An increase of 25% in number of residents would translate to approximately 40 additional persons. An increase of 50% of the current population would mean more than 80 new residents. While this is a small number, it is a significant increase in local numbers. Any increase in number of residents in government-built housing will necessitate an upgrade to many of the island services, especially, in the areas of transportation and health care/emergency services. A large increase in residents will likely increase the demand for public services; therefore, public services must improve to meet the additional demand.

On September 5, 2006, the staff of the University of the Virgin Islands – Eastern Caribbean Center/Conservation Data Center (UVI-ECC/CDC, conducted a site assessment and field trip to Water Island to gather data for use in this study. After careful consideration
of all potential parcels on Water Island, the following are the findings with respect to potential parcels and the environmental factors of importance.

2.6. **Field Observation of Parcels**

Of the 58 parcels spread across the island, three potential locations, based on field observation, are identified as promising possibilities for VIHFA development (see Map 2.5). Most of the other sites and parcels have significant constraints relating to steepness of slopes, size of the parcels, access to the parcels, landfill issues, infrastructure issues and downstream environmental issues. The three parcels with potential are located in the same general area and are suitable for the placement of multiple units. Only further analysis of the costs of such construction, infrastructure and the number of units can determine the best possible alternative solutions for this effort.

**Site 1 – Former Hotel Resort**

This area is comprised of multiple parcels and is the site of a former hotel (Water Isle Hotel and Beach Club contained 122 rooms in 1984. Minimal construction preparation would be needed for this site. The site is relatively flat. It has a 0-3% slope gradient with no topographic constraints with respect to drainage. The site is cleared of most vegetation and in close proximity to utilities and other essential services. The existing ferry dock, deli, fire department, waste transfer station, beach facilities and the barge landing docks at Flamingo Bay are all within a radius less than a mile from Site 1. Existing road foundation minimizes site disturbance and associated environment impacts.

No significant plant or animal community has been observed on Site 1. The present plant communities are scrub thicket and dry shrub lands with a few larger trees. Though some species of bird undoubtedly breed at this site no nesting was observed during the
field survey. In addition, no rare plant species were seen. However, an Environmental Assessment Report (EAR) would be required for the approval of a Coastal Zone Management (CZM) development permit. Previous work by Woodbury et al., 1992, provided a flora and fauna list for the island. The list contains a number of uncommon plants and animals that may be found on the sites.

Site 2 – Former Water Island Villas Site

To the east of Site 1, the former Water Isle Villas site and the surrounding upland parcels represent another good choice alternative. The multiple parcels are moderate in size have moderate slopes, some existing buildings and some infrastructure. There are existing roads and accesses. Site 2 like Site 1 is in close to all the essential services on Water Island.

Site 3 Tract (B)

Located to the north of Site 2 is a 4.0 acre vacant tract. The road serving this tract is not paved but graded and accessible. Essential services are within a half mile of Site 3. The vegetation has been disturbed. No significant or irresolvable drainage/flooding issues exist. Soils on the site are suitable for limited development.
Ownership and restrictions of land on Water Island based upon 1996 and 2005 quitclaim deeds from Interior Department to the U.S. Virgin Islands Government as of July 18, 2005.

Map prepared by University of the Virgin Islands - ECO/CDC, October 2006.


Parcel Boundaries
Map 2.3

Water Island, U.S. Virgin Islands
ZONING

LEGEND

Current Zoning

R-1 - RESIDENTIAL - LOW DENSITY
W-1 - WATERFRONT - PLEASURE

Map prepared by University of the Virgin Islands - ECC/CDC, January 2007.

Sources:
Zoning
Department of Planning & Natural Resources - Comprehensive & Coastal Zone Planning, 2006.

Parcel Boundaries
Water Island, U.S. Virgin Islands
POTENTIAL RESIDENTIAL LOCATIONS

Map prepared by University of the Virgin Islands ECC/CDC, January 2007.
Source:
Photo
US Army Corps of Engineers, U.S.V.I.
Map 2.5

Water Island, U.S. Virgin Islands
DEVELOPMENT CONSTRAINTS

**LEGEND**

- 0-3% Nearly Level
- 3.1-8% Gently Slope
- 8.1-35% Strongly Slope
- > 35% Very Steep Slope

Map prepared by University of the Virgin Islands
ECC/CDC, December 2006.

Sources:
- Spot Elevation, U.S. Army Corp,
- Parcel Boundaries, V.I. Office of the
Lieutenant Governor, Division of Tax
Assessor, 1999.

TOTAL 197,413 4.89% 10.18% 47.41% 37.52%