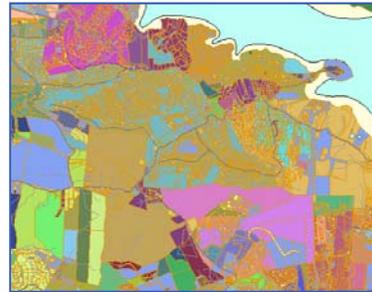
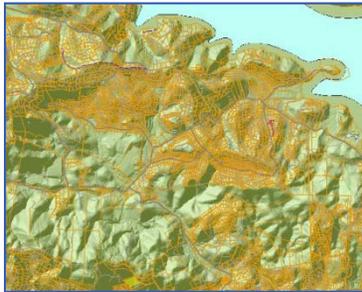




# US Virgin Islands



## Geospatial Strategic Plan

July 2010

with support from



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# 1. CURRENT GEOSPATIAL TECHNOLOGY SITUATION

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## 1.1 Who Is The U.S. Virgin Islands' Geospatial Community?

The USVI Territorial Government is a unique entity that combines some elements of two traditionally large consumers of geospatial technology: State Government and County Government. Like a state government the USVI has a legislature, courts and departments that manage more global issues such as environment, natural resources and emergency management. Unlike most states, the Territorial Government is also involved in property assessment, local land use control, permitting and the provision of public utilities such as water and electricity. Thus, in many ways the Territory, with its approximately 108,000 people spread across 133 square miles functions as *both* a state and a medium sized city or county.

Since both states and counties have traditionally been major consumers and users of GIS technology the Territorial Government has a tremendous variety of potential uses. At the same time, the USVI is only in the beginning stages of GIS development and the extent of GIS penetration is currently modest. The Lieutenant Governor's Office of the Tax Assessor and the Department of Planning and Natural Resources (DPNR) are the longest standing and most functional users. In addition to governmental departments other significant geospatial technology users include the University of the Virgin Islands and private non-profits that operate in the USVI (e.g. The Nature Conservancy). Finally, a variety of federal agencies are involved in mapping the territory whether or not they have permanent operations on-island.

In short, the highly centralized nature of the Territorial Government presents both opportunities and challenges:

- **Opportunities include:** The potential for a single, enterprise-wide GIS implementation to cover a very large cross section of the territory's users.
- **Challenges include:** The requirement for an enterprise-wide deployment to be relatively complex and for there to be broad-based administrative/political support to fund its creation and maintenance. In other words, if the Territorial Government doesn't pursue GIS, there are fewer other entities – such as city or county governments – that can push the geospatial agenda forward.

## 1.2 What Is The Geospatial Development Status Of The USVI?

The following presents two assessments of the USVI’s geospatial development status. The first assessment, uses a set of criteria developed by the National States Geographic Information Council (NSGIC), the trade organization that represents state government geospatial programs, including the USVI. The NSGIC criteria aim to identify the common characteristics of a “successful statewide GIS program.” The second assessment, presents the status of geospatial data development for each of the seven “framework data layers” considered to be part of the federal government’s National Spatial Data Infrastructure.

### 1.2.1 Geospatial Development Status Relative to the NSGIC “9 Criteria for a Successful Statewide GIS Program”

CRITERION	USVI STATUS
1. A <b>full-time, paid coordinator</b> position is designated and has the authority to implement the state’s business and strategic plans.	<p style="text-align: center;"><b>DOES <u>NOT</u> MEET CRITERION</b></p> <p><b>There is not currently an full-time, paid Territorial GIS Coordinator</b></p>
2. A <b>clearly defined authority exists for statewide coordination</b> of geospatial information technologies and data production.	<p style="text-align: center;"><b><u>MEETS</u> CRITERION</b></p> <p><b>The Virgin Islands Geographic Information Council (VIGIC) was formally recognized as the geospatial coordinating entity in 2006 via Executive Order</b></p>
3. The statewide coordination office has a <b>formal relationship with the state’s Chief Information Office (CIO)</b> .	<p style="text-align: center;"><b><u>MEETS</u> CRITERION</b></p> <p><b>The Bureau of Information Technology (BIT) Director sits on VIGIC</b></p>
4. A <b>champion</b> (politician, or executive decision-maker) is aware and involved in the process of geospatial coordination.	<p style="text-align: center;"><b><u>MEETS</u> CRITERION</b></p> <p><b>The current Lt. Governor is a strong advocate and Champion for geospatial technology.</b></p>
5. Responsibilities for developing the <b>National Spatial Data Infrastructure (NSDI) and a State Clearinghouse</b> are assigned.	<p style="text-align: center;"><b>DOES <u>NOT</u> MEET CRITERION</b></p> <p><b>There is not currently a state clearinghouse that feeds NSDI.</b></p>
6. The ability exists to <b>work and coordinate with local governments, academia, and the private sector</b> .	<p style="text-align: center;"><b><u>PARTIALLY MEETS</u> CRITERION</b></p> <p><b>VIGIC’s coordination activities encompass non-state stakeholders. However, the lack of a Territorial GIS Coordinator means that there is not much “active work”.</b></p>

CRITERION	USVI STATUS
7. <b>Sustainable funding</b> sources exist to meet project needs.	<b>DOES <u>NOT</u> MEET CRITERION</b> There is currently not adequate, sustainable funding for VIGIC to tackle active projects.
8. GIS Coordinators have the authority to enter into contracts and become <b>capable of receiving and expending funds</b> .	<b><u>MEETS</u> CRITERION</b> There is some ability to receive funds and enter into contracts via Lt. Governor’s office, acting on behalf of VIGIC.
9. The <b>Federal government</b> works through the statewide coordinating authority.	<b><u>MEETS</u> CRITERION</b> The Federal Government recognizes VIGIC and attempts to coordinate through that body.

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### 1.2.2 Geospatial Development Status Relative to Framework Data Layer Development

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FRAMEWORK LAYER	USVI STATUS
<b>1. Geodetic Control</b>	Unlike the vast majority of the country, the NOAA- National Geodetic Survey (NGS) does not have any accurately determined vertical control survey monuments in the USVI and thus there are no data sets available. Efforts to improve the control and reference framework (i.e. “leveling”) are currently active, although not fully funded.
<b>2. Parcels</b>	<b>Complete Territory-wide</b> through Lt. Governor’s Office of Tax Assessor. Currently, approximately 80% of the digital parcel data are considered up-to-date and there are ongoing refinements to these data.
<b>3. Transportation/Roads</b>	The creation and maintenance of these data are currently considered “not coordinated” by VIGIC. The <b>best digital data</b> is derived from the <b>U.S. Census TIGER</b> files. There is some local work on these data through USVI Department of Public Works.
<b>4. Hydrography</b>	The creation and maintenance of these data are currently considered “not coordinated” by VIGIC. The <b>best digital data</b> for land-based hydrography is derived from the <b>USGS</b> . There is some local work on these data through USVI Department of Planning and Natural Resource (DPNR). The best off-shore hydrography is available from NOAA’s nautical charts.

<b>5. Elevation</b>	The USVI has detailed elevation data created via a project completed by the U.S. Army Corps of Engineers in 2007. These <b>LiDAR data</b> are capable producing <b>territory-wide 2 foot contours</b> . The lack of vertical control identified above could provide challenges to the accuracy of these data sets.
<b>FRAMEWORK LAYER</b>	<b>USVI STATUS</b>
<b>6. Aerial Photography</b>	Territory-wide, high-quality <b>digital orthophotography</b> was completed in <b>2007</b> via USGS and the Office of Lt. Governor. This data set has territory-wide <b>1 foot pixel resolution</b> . A new flyover, in association with imagery being flown for Puerto Rico, will produce new digital orthophotos at 1 foot pixel resolution. This effort will be completed during 2010 with funding supplied by the USGS.
<b>7. Political/Administrative Boundaries</b>	Given the makeup of the territory, there are a minimal number of political and administrative sub-divisions. The Election System Office of the USVI is <b>interested in developing</b> “polling district boundary” layer.
<b>8. Population/Census</b>	<b>U.S. Census</b> and the University of the Virgin Islands, Eastern Caribbean Center (ECC) maintains and distributes <b>census data</b> for the territory.

### 1.3 Geospatial Strengths

The USVI has several inherent strengths that would enable it to move forward rapidly on a broader deployment of geospatial technology:

1. **Excellent start on key data:** The USVI already has in place excellent data for three of the most expensive and valuable data sets: orthophotos, LiDAR-based elevation, and parcels. Only an extremely small number of states or territories can claim to have statewide/territory-wide data of this quality. Thus, in many ways the largest and most important geospatial data investment have already been made. The key going forward is to leverage these existing investments to the greatest benefits.
2. **The Virgin Islands Geographic Information Council (VIGIC) provides a forum and authority for geospatial coordination:** The territory has already developed a broad-based governance mechanism to coordinate geospatial activities in the USVI. Thus, if there is further activity there

is already a framework for oversight and guidance.

3. **Engagement from the Lt. Governor’s Office (LGO):** The LGO has been actively involved in GIS for many years and the current Lieutenant Governor has been a strong, and vocal advocate for advancing GIS throughout this geospatial strategic planning process. The LGO is one of two territory agencies that currently has a fulltime GIS staff person, located in the Office of the Tax Assessor. In addition, the LGO provides administrative oversight of VIGIC.
4. **Small, island geography:** Many geospatial costs, particularly for data, are directly related to the size area to be mapped. As an inherently small place, in absolute terms, the costs for developing high-quality data are lower. In addition, some data development costs and complexities arise due to requirements to “edgematch” to neighboring jurisdictions. As an archipelago, all mapping in the USVI is self contained, although there are potential requirements for offshore, underwater mapping (e.g., for bathymetry). Ultimately, there is great potential to build an incredibly rich and deep territory-wide database.

## 1.4 Geospatial Weaknesses

1. **Geospatial data is not discoverable, downloadable nor on-line:** While the table in section [1.2.2](#) and strength #1 (above) document that large amounts of high-quality geospatial data currently exists, it remains extremely difficult to find those data, much less obtain them. Ultimately, there are not any resources that index the territory’s data nor provide tools for discovering and downloading them. Currently, finding digital data requires a network of personal connections and relationships and exchanges of DVDs and/or private FTP links. Ultimately, the largest returns on geospatial data investments occur when the data are used as widely as possible (i.e., small incremental benefits accrue to a large number of organizations, above and beyond the original sponsoring agency). Currently, most states deploy and manage their own “geospatial data distribution portals” and many of these portals serve as clearinghouse nodes as part of the FGDC’s Geospatial One Stop (GOS) web portal.
2. **Lack of standard street naming and street addressing:** Currently, the USVI maintains a local addressing system that is rooted in the colonial past and the estate-based sub-division of land.

Examples of addressing shortcomings include:

- Not all streets are named
- Streets are not uniquely named
- Address numbering along a street is not sequential

While workable for centuries, the current system lacks many features of a modern addressing system and is inhibiting the modernization and full implementation of various systems, including GIS. Specific examples of systems that benefit from a modern, standardized addressing system include:

- 911 emergency response systems that have the potential to show the dispatcher an accurate map showing the location of the incoming call
- Personal GPS navigation systems that work best when there is comprehensive street naming and sequential number of addresses along a road
- Internet mapping portals such as Google Maps, MapQuest and Bing Maps that allow potential visitors to identify the locations of hotels and attractions

In the aftermath of the devastating Haitian earthquake the public safety risks caused by a limited addressing system that does not allow optimized responses became clearer. During the 2009 VIGIC Conference and at the January, 2010 strategic planning meeting for government department heads hosted by the Lieutenant Governor<sup>1</sup>, various public safety officials relayed their understanding that addressing limitations are a cause of concern that complicates their daily activities. For additional information on current addressing limitations and future plans, please see Appendix 3 which provides the testimony given at a USVI legislative hearing on addressing conducted by the Committee on Economic Development, Energy and Technology.

3. **Inter-agency coordination challenges:** In spite of great interest in geospatial technology, and a large number of departments investigating these technologies, there is limited tangible coordination and collaboration. In short, people are *talking*, but they are not necessarily

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<sup>1</sup> Please see Appendix 1, Project Methodology, for a more detailed description of these planning meetings, and Appendix 2 for a copy of the presentation materials from the Lt. Governor's department heads meeting.

*working* as closely together as is possible. This is not a situation that is unique to the USVI.

Indeed, at the 2009 VIGIC Conference, the British Virgin Islands described a very similar situation and how overcoming this challenge was a key factor in being able to move forward with a more advanced system, including a web-based GIS viewer for government users.

4. **Lack of a strong geodetic control framework:** Unlike the vast majority of the country, the USVI does not have a highly accurate geodetic control network, or any appropriate vertical control survey monuments in the territory. This prevents the most detailed and accurate surveys from being completed. For example, in 2006 the Director of the National Geodetic Survey sent a letter to the Federal Emergency Management Agency’s Mitigation Director who had recently released modernized Flood Insurance Rate Maps (FIRM) that referenced the National Geodetic vertical Datum of 1929 (NGVD29) and North American Vertical Datum of 1988 (NAVD88) . The NGS Director relayed to FEMA that “NGS does not provide any data for accurately determined vertical control survey monuments in the Virgin Islands. Therefore, the (FIRM) panels are incorrect to list NGS as the source for vertical reference data used in the compilation of these maps.”<sup>2</sup> The further implication was that the source for the vertical control used by FEMA was unknown to the NGS. This lack of accurate geodetic control can lead to other surveying challenges. Problems emanating from such challenges can lead to inaccurate and at times conflicting surveys, which can lead to boundary disputes that end up in court. The NGS worked with Puerto Rico during 2006 and 2007 to establish such improvements in that territory and has had ongoing conversations with the USVI that have led to some additional survey coordination and work. It will be important for the USVI to remain in contact with NGS to attempt to add a stronger and more comprehensive geodetic control network.

## 1.5 Geospatial Opportunities

1. **Opportunity to move forward quickly:** As described above, many key geospatial components are already in place in the USVI. In particular, large down payments have already been made on the most expensive data components of a government-wide system. This existing work allows the territory to move forward quickly without needing to wait for time consuming data automation and while needing a much smaller volume of investment. In addition, the

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<sup>2</sup> Letter from NGS Director, David Zilkoski, to Michael Dabney, Mitigation Director of DHS-FEMA Region II, dated July 12, 2006.

investments that are made will show tangible results in a short amount of time. In short, a few strategic investments can help address the weaknesses identified in this study and move the USVI towards regional geospatial leadership for the Eastern Caribbean.

2. **Combined State/County/Municipal aspects of Territorial Government:** As described above, territorial government has some components that are similar to state governments and other components that are more similar to county or municipal government. Unlike a state that needs to coordinate with dozens of counties that are practicing GIS; or, a county that needs to coordinate with multiple cities practicing GIS within its boundaries; in the USVI all government functions, and by association government GIS efforts, are found within the territorial government. The bottom line is that there are fewer levels of government within the territory and there are fewer government actors practicing GIS that need to be coordinated with. Thus, there is greater potential for strong internal coordination and potentially geospatial centralization within the territorial government. With a well organized and coordinated enterprise GIS for the territory, the main coordination activities will be with the federal government, and private sector practitioners.
  
3. **Potential for Federal partnership funding:** A variety of federal agencies ranging from the Department of Homeland Security (DHS) to the United States Geological Survey<sup>3</sup> (USGS) to the National Geospatial-Intelligence Agency (NGA) have programs that have provided grants to state and territorial governments. The USVI has already been successful in accessing some of these grants and with a concerted effort and well articulated strategy for geospatial development, there is great potential for securing additional funding from these sources. This strategic planning effort will help to articulate the territory's geospatial development strategy as well as the benefits that the technology will offer to the territory, including its federal partners. Securing this funding will need to be a priority and will require the coordinated effort of different governmental departments as well as the support and advocacy of the territory's delegate to congress.

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<sup>3</sup> This strategic planning project is funded by a USGS Cooperative Assistance Program grant.

## 2. VISION & GOALS

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In light of the current progress on geospatial data development and the documented strengths, weaknesses and opportunities outlined above, the sections below articulate the territory's overarching **strategic goal** as well as a series of specific, **programmatic goals** that will enable the strategic goal to be realized.

### 2.1 Strategic Goal

To develop a territory-wide spatial data infrastructure that can be shared by all units of the government and makes the territory's geospatial data assets readily available to the territory's partners and the general public. The U.S. Virgin Islands spatial data infrastructure (USVI-SDI) will be a key asset that serves the residents and visitors *daily* and makes the Territory *resilient* in times of natural or manmade disasters. The USVI-SDI will assist in the efficient and effective delivery of government services and functions that include, but are not limited to:

- Economic development
- Protection of the environment and natural resources
- Providing public safety
- Supporting tourism
- Delivering government services

An enterprise GIS approach, spanning the entire territory will be pursued for establishing the USVI spatial data infrastructure.

### 2.2 Programmatic Goals

Together, the following **seven programmatic goals** represent the activities that are necessary to create an enterprise GIS approach for the territory that is capable of realizing the strategic goal enumerated above and the construction of the USVI-SDI. These seven priority goals have been divided between three categories: organizational goals, data development goals and technological goals.

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#### 2.2.1 Organizational Goals

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##### 1. **FULL-TIME PAID TERRITORIAL GEOSPATIAL INFORMATION OFFICER/COORDINATOR**

Given the nature of the USVI territorial government and the large number of agencies that

cover a diverse scope of functions - including functions that are most often found in both state and county governments on the mainland – it will be critical that the territory identify and fund a position that is responsible for coordinating geospatial activities across all agencies, and on behalf of the entire government. Currently, the only fulltime geospatial staff are found within agencies (i.e., LGO, Office of the Tax Assessor and DPNR) and they have very limited ability to coordinate or perform work outside of their agency’s mandate. A territory-wide “geospatial information officer” (GIO) would be responsible for coordinating across agencies, building communal resources that could be shared by agencies and developing and enforcing geospatial policy and standards. The GIO would also be responsible for maintaining and updating this Geospatial Strategic Plan, potentially as a component of the territory’s overall comprehensive plan (as administered by DPNR).

The GIO would provide a focal point for territory wide, multi-departmental efforts such as the update of orthophotos or the construction of a web map serving capability. In addition, the GIO would serve as a staff resource to the VIGIC and would be in a position to act on its recommendations. Such a capability will be key to ensuring that VIGIC remains vibrant and effective. The GIO would not be a replacement for departmental GIS staff and activity, but rather would be a *complement* that works *with* the departments to help the territory wisely invest in geospatial technology while yielding the largest returns on its investments.

## 2. FINDING SUSTAINABLE FUNDING THAT CAN SPAN ADMINISTRATIONS

Geospatial activities in the USVI have suffered from varying levels of support and interest that have come-and-gone with the changes of administration. The current administration, particularly the Lieutenant Governor has been actively supportive of geospatial technologies and initiatives. Successful statewide/territory-wide efforts require a stable, sustainable funding that can span administrations. While the funding levels are not large, many geospatial activities are long-term in nature and it is critical that the funding not be subject to major variation. Without this kind of sustained commitment there is a real threat that the existing investments that have been made will be stranded and that the territory won’t yield a full return on investment.

If a new GIO position can be created, the following describes a few factors to consider that will help ensure that it is successful in implementing the vision that is reflected in this strategic plan:

- GIO/Coordinator position must be fully funded on an ongoing basis.
- Staffing is largest and most important element of the budget, but initial staffing only involves one position.
- Since the activities of the GIO would span and complement the activities of multiple agencies, it could potentially be funded through contributions/assessments from multiple agencies.
- The GIO's office should be situated/housed within the government so that it does not become endangered or dissolved during a change of administration. There is no single formula that has worked in all locations and the GIO and GIS offices are found in a variety of agency locations across the country. It will be critical for the USVI to choose a location from which the GIO can be successful and where sustainable funding can be obtained. The following provides several examples of the location of statewide GIS offices and the factors that led to choosing those locations:
  - An evolving trend has seen a large number of states, situate their GIO within the **Department of Information Technology**. This is due to the fact that GIS is an information technology and increasingly states are centralizing their information technology activities to pursue enterprise approaches and projects. However, for these kinds of implementations to be successful the information technology department needs to:
    1. Be effective and ready to expand its scope into new areas such as GIS. If the organization is less effective, then it will be difficult to provide a stable home, and the GIS program risks being labeled with the reputation of the parent organization
    2. It needs to *want* to take on GIS technology. If the department does not actively want the GIS, there is a major risk that it will not be adequately supported.
  - In at least one state, Arkansas, the GIO is located in a **small, independent department** that reports directly to the Governor.
  - Other states – notably Rhode Island, Delaware and Minnesota – situate their GIS within their **Departments of Administration**. The administrative departments often interact with a variety of other departments and contain

planning functions. Locating GIS in these offices makes sense since GIS is interdisciplinary by nature and is an important planning tool.

- In still other states, the GIO is located within a **department with a focused mission** such as **critical infrastructure** or the **environment**, but the GIO is provided “coordination authority” to work with other agencies from that administrative location. Examples of this include the New York program which is located in the Office of Cyber Security and Critical Infrastructure Coordination (CSCIC) or Massachusetts where MassGIS has been located in the Executive Office of Energy and Environmental Affairs (EOEEA)<sup>4</sup>.

It will be critical for VIGIC and the administration to determine the best location for the GIO position. Given the relatively small scale of the territorial government it remains feasible that the GIO could be situated so as to report directly to the Lieutenant Governor, who currently has active involvement with GIS, or alternatively the Governor.

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## 2.2.2 Data Development Goals

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### 3. TERRITORY-WIDE STREET NAMING/ADDRESSING INITIATIVE

As described above as a weakness (see [Section 1.4](#)), the USVI’s existing addressing system is antiquated and not well suited for new technologies such as E911 emergency response and personal GPS navigation. This topic and set of issues has been brewing for some time and as long ago as 1991 the DPW undertook efforts to improve and make street naming more comprehensive. Recognizing these shortcomings and needs, and building on work begun in 2009, in April of 2010 the USVI Legislature’s Committee on Economic Development, Energy and Technology convened a hearing on street naming and addressing and took testimony from a variety of government officials involved in addressing. This testimony paints a strong picture of the needs for and benefits of an improved addressing system for the USVI, and the testimony of the LGO’s Communications Director and the GIS Coordinator from the LGO’s Office of Tax Assessment is included as Appendix #3 to this report.

As the testimony in Appendix #3 documents, there are a large set of problems with the existing addressing system and there are a large series of benefits to be harvested by

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<sup>4</sup> After being located in EOEEA since 1989, MassGIS is moving to the information technology department now that there is better support and understanding of GIS issues within that organization.

confronting these issues. These are not easy problems to solve and it will take both careful planning and a sustained, multi-year commitment and effort to implement a comprehensive, new addressing system for the territory. This is a crucial priority from a number of different and converging perspectives:

- a. Address data are a **fundamental data component of enterprise GIS technology**. Addresses are found throughout government data sets and street addresses provide the most common framework for finding specific locations. In addition, GIS technology is well suited for the complex tasks of managing and publishing addresses information to the public.
  
- b. **A systematic and standardized addressing system is a necessary precursor for new technologies**. Technologies such as E911, GPS navigation and web mapping portals such as Google Maps or Bing Maps that employ geocoding (i.e. the process of converting a street address into a latitude/longitude coordinate) are based on various assumptions about how addresses are organized. For example, such systems generally assume that all streets are named and that address numbers are arranged in numerical order along a street segment. This type of standardization is not currently found in the USVI (see image below for an example of USVI data with unnamed roads as depicted in Google Maps).



- c. Due to increasing use of technology by public safety and emergency response personnel, **good addressing enhances public safety**. When dispatchers can see the location of an incoming 911 call on a map, or first responders can use GPS-based navigation to efficiently get to an emergency, the response is more rapid and accurate. Similarly, in the event of a catastrophic event – such as a hurricane or earthquake – good addressing provides an invaluable tool for planning the response as well as managing the recovery. Good addressing will allow the territory to more easily and accurately map both public safety facilities (e.g. police and fire stations, hospitals, etc.) as well as sensitive receptors such as nursing homes, day care centers or schools that require special attention in an emergency.
- d. The territory is currently undergoing a detailed study aimed at **planning for wider availability of high-speed, broadband internet** that is funded by the National Telecommunication and Information Administration (NTIA). This high profile effort has suffered from the lack of good addressing data and has endorsed the territory’s efforts to improve addressing in reports to NTIA<sup>5</sup>. The availability of addressing data would greatly facilitate the determination of where broadband coverage is currently available and accessed within the territory. This effort is emblematic of numerous planning activities that require access to good addressing information.

The general requirements for improving the addressing in the USVI are relatively simple:

- **Design/adopt a systematic and standard<sup>6</sup> addressing system** that accounts for the unique history and geography of the USVI.
- Complete the **naming of all streets** in the USVI.
- **Assign/Re-assign addresses** to conform to the new standard, while properly managing the legacy addresses.

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<sup>5</sup> During an NTIA conference call (on April 28, 2010) for grant recipients, John Sternquist from Stratum Broadband – the territory’s broadband consultant – reported that the USVI doesn’t have an address point reference data set and recommended that a “spinoff” of the broadband project would be to start building one for the territory.

<sup>6</sup> There are several existing “addressing standards” that can be referenced or adopted by the USVI. One example includes the Federal Geographic Data Committee’s draft United States Thoroughfare, Landmark, and Postal Address Data Standard.

See: <http://www.fgdc.gov/standards/projects/FGDC-standards-projects/street-address> for further details.

- Develop and deploy a geospatially enabled “**master address repository**” (MAR) database that will house and manage addresses for the territory.
- Implement the new standard across the territory including comprehensively **posting new signs and address numbers and incorporating the new addresses into existing government databases** (e.g. the Tax Assessor’s Computer Assisted Mass Appraisal – CAMA – system).
- Perform ongoing **outreach and education** to government stakeholders and the general public on the forthcoming changes.

It is recommended that this initiative unfold in three phases:

- **Phase 1 - Education and consensus building:** will involve conducting a workshop and educational activities to make sure that government officials and the legislature agree on the requirements, objectives and approach for tackling re-addressing.
- **Phase 2 – Detailed planning and budgeting:** will involve conducting a detailed study that involves requirements gathering, MAR design, implementation planning and detailed budgeting for implementing this initiative.
- **Phase 3 – Implementation:** will involve a 1-2 year project to carry out the plan and implement the new addressing system across the territory and for all streets and structures.

Given the scope and duration of this effort there will be significant fiscal resource requirements in the range of \$500,000 - \$1,000,000. With phases 1 and 2 complete and a strong game plan for tackling these issues in hand, the USVI would be in a good position to aggressively pursue grant funding opportunities to raise some of this money. Given the public safety benefits, emergency response and public safety organizations such as the U.S. Department of Homeland Security (DHS) and its Federal Emergency Management Agency (FEMA) may be receptive to funding this initiative.

#### 4. **COMPLETION AND FINALIZATION OF PARCELS**

As documented above, the USVI has made good progress on parcel data automation and has a functional, working territory-wide parcel data layer. That said there are some

known shortcomings with the data that limit their utility in for certain purposes (e.g. web map publication) and should be addressed as quickly as possible. Given that there is only one person in the LGO Office of the Tax Assessor doing GIS work, there is limited ability to get this done in a timely fashion. Rather, the GIS Coordinator is slowly chipping away at these issues:

Manage the parcel data as a single territory-wide geodatabase; currently, each island is its own database and there are minor differences in the data schemas for each data set.

- a. Complete, refine and improve attributes and linking to the Assessor’s CAVU CAMA systems. Currently, the GIS Coordinator estimates that approximately 85% of the parcel polygons properly link to CAVU and the remaining 15% need to be checked and fixed. Other examples of inconsistent



attribute coding are found when “estates” are thematically mapped. The image above shows a section of St. Thomas where tan areas are not coded with an estate attribute and other estates are depicted in a non-contiguous fashion.

- b. Complete and validate the geometry for all parcel polygons and properly code “non-parcel” polygons. For example, during testing several “unclosed” polygons were found. In addition, road rights-of-way should be coded so that they can be easily differentiated from parcel polygons.

- c. Improve accuracy of the linework and the match to the orthophoto base map. As depicted in the image to the right, for some areas the parcel lines do not



match the digital orthophoto base map very well. These types of inconsistencies can be fixed through a “best fit” adjustment process.

## 5. DEVELOP DIGITAL POLLING DISTRICT LAYER

The Supervisor of Elections is interested in developing a current “polling districts” data layer. Creating this data layer would modernize the polling map maintenance process. Given the existence of hard copy source maps, this project could proceed quickly and with minimal cost. To the extent possible, during automation the lines demarking the polling district boundaries should be made coincident with parcel boundaries so that there is no ambiguity as to which district a given parcels falls within.

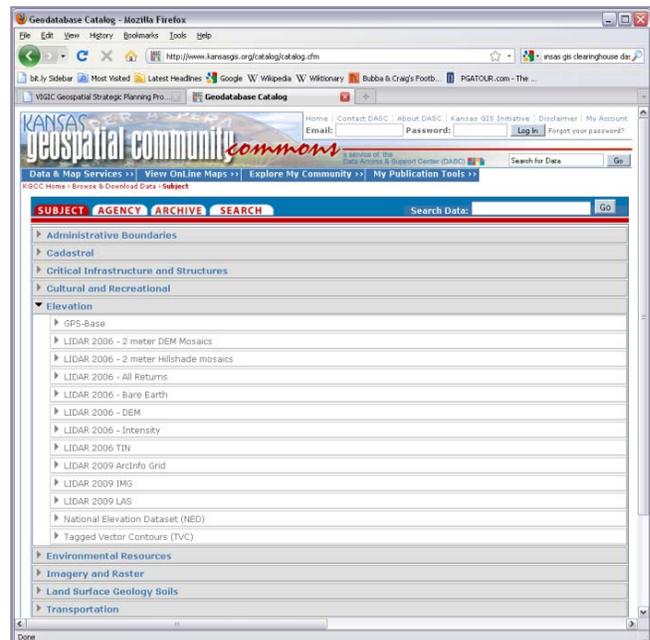
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### 2.2.3 Technological Goals

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## 6. DEVELOPMENT OF A GEOSPATIAL DATA CLEARINGHOUSE

As described above as a weakness (see [Section 1.4](#)), in spite of a wealth of existing, high-quality geospatial data there is currently no mechanism for finding the USVI data that exists and obtaining copies. Rather, people that are interested in geospatial data need to “know someone” or start “asking around.” To address this situation, most states have established “geospatial data clearinghouses” that publish an index of government geospatial data holdings - including metadata - and the best ones also provide a



Sample screen shot of the data download page taken from Kansas’ geospatial data clearinghouse, the Kansas Geospatial Commons. This site is managed by the Kansas Geological Survey out of the University of Kansas.

mechanism for easy downloading of data (see image to the right).

The best clearinghouses also do not limit their holdings to the state's own data, but they might include copies of federal data (e.g. FEMA flood maps, US Census geography, etc.) and even neighboring state or country data (e.g. for the USVI, data from Puerto Rico or the British Virgin Islands). In addition to simply providing digital data in its native format (e.g., ESRI personal geodatabase), a good clearinghouse may make the data available in multiple formats (e.g., KML). Some clearinghouses, such as Kansas' also make the data available for *browsing* via on-line map viewers or for *consuming* via standard web services.

These clearinghouses provide three types of general benefits:

- a. **They benefit government agencies** (as well as the government's consultants) by providing ready access to the best available geospatial information. The clearinghouse acts as a one-stop shop to obtain comprehensive and current geospatial data.
- b. **They benefit the public** by making government geospatial data readily available for a variety of research, tourism and business uses.
- c. **They benefit government GIS data stewards** by providing an efficient, centralized data distribution capability. Rather than spending time talking on the phone, processing orders and burning and shipping DVDs/CDs, data is simply provided to the clearinghouse once. Anyone seeking data can be simply directed to the clearinghouse and this reduces the time and effort an agency spends on data distribution.

Finally, a clearinghouse would also be able to serve as the territory's "clearinghouse node" in the FGDC's geospatial one-stop portal (GOS).

There are several geospatial data clearinghouses that are managed via partnerships between state government and local universities including Kansas, Rhode Island, Pennsylvania and Delaware. It is recommended that territorial government consider partnering with the University of the Virgin Islands for the development and management of a geospatial data clearinghouse.

## 7. DEVELOPMENT OF AN ENTERPRISE GIS TECHNOLOGICAL INFRASTRUCTURE

For the long term it will be most efficient for the USVI to deploy GIS resources for the Territory in an “enterprise GIS” fashion. In this model, the “enterprise” would be considered all of territorial government. That said, an enterprise GIS would not be a replacement for departmental efforts, but rather it would provide a common and standard infrastructure that all departments could utilize. An enterprise approach help to remove duplication of effort between departments and would also help the government to further leverage investments that are currently made at a departmental level more broadly and across the entire enterprise.

An enterprise GIS approach for the USVI might include the following components:

- **Shared base-line geospatial resources** that are accessible to all government agencies/departments that require them. Examples of shared resources include:
  - Access to map and imagery services
  - Access to geocoding services
  - Web application hosting
  - Data distribution through a geospatial data clearinghouse (see above)
- Centralized management of an “**enterprise geospatial data repository**” for in-house, governmental use. This repository could be associated with, and have similar contents to the geospatial data clearinghouse described above, but unlike the clearinghouse, it would be optimized for high performance access by government agencies and not for public access and data distribution. In addition, the enterprise GIS repository may contain some data that are not publicly available and require authorized access (e.g. endangered species, names of school aged children, etc.).
- **Enterprise licensing and/or pooled license management** for GIS software.

- **Training and mentoring programs** for geospatial staff. Such programs might include active collaboration with UVI as an outlet for providing these kinds of programs and building local GIS capacity. The UVI has extensive experience in developing and administering GIS courses and in partnering with local agencies such as the Lieutenant Governor’s Office and federal agencies such as NOAA, FEMA and USGS on delivering continuing education workshops and conferences.

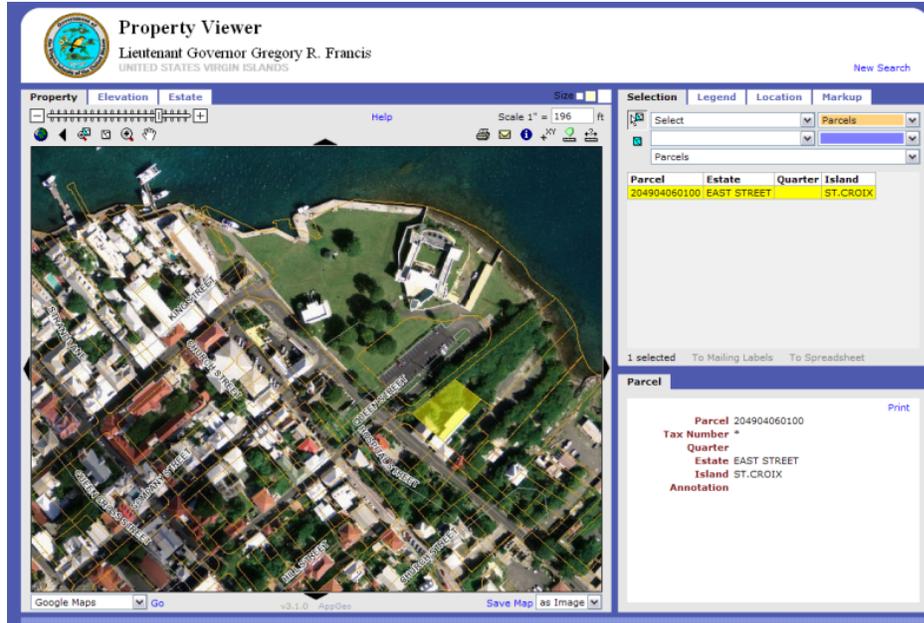
Obviously, to execute on this path there will need to be available staff and resources. The Territory GIO position described above (in [Section 2.2.1](#)) would be a key resource – and most likely a necessary precursor - in helping to establish and manage an enterprise GIS for the territory.

Ultimately, an enterprise GIS approach has something to offer all levels departments that are engaged in, or investigating GIS:

- **New adopter agencies** (i.e., those just getting involved with GIS): lowers the barriers to entry and saves the costs of new investments since there is existing infrastructure and potentially enterprise licensing to tap into.
- **Specialized adopter agencies** (i.e., those agencies that are utilizing GIS but are getting more involved and sophisticated in their uses): Controls the cost of growth by providing a shared infrastructure to capitalize on. For example, an agency that wished to deploy a web-based application would not need to purchase/deploy geospatial web server software and instead could use the enterprise geospatial hosting capacity.
- **Mature adopter agencies** (i.e., those agencies that are heavily involved in GIS and maintain full-time staff): These agencies participate in building the enterprise infrastructure and the investments that they make can be more broadly extended throughout the enterprise. These agencies help push the technological envelope *on behalf* of the enterprise.

As a means of demonstrating the value of an enterprise approach at the outset of this initiative, it is recommended that the **prototype on-line GIS viewer** (see image below) developed as part of the strategic planning effort be finalized and deployed as a live application. The availability of this application will help provide a bridge between the status quo where there is no public data availability and the rollout of enterprise GIS for the territory, estimated for some time in 2011. Recommended enhancements to the prototype on-line GIS viewer include:

- Adding a greater variety of data layers
- Providing access to a wider variety of CAVU-based property information
- Extending the search capabilities



### 3. REQUIREMENTS FOR ATTAINING THE STRATEGIC GOAL

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The following sections provide a concise summary of data, technology, standards and funding requirements necessary for the USVI to move towards realizing the strategic and programmatic goals outlined above.

#### 3.1 Existing Infrastructure & Suitability Assessment

There is minimal technical infrastructure in place that is capable of supporting an enterprise-wide geospatial approach. Currently, GIS activity is pursued on a department by department basis and principally with desktop GIS software and local data storage.

#### 3.2 Data Requirements

Three principal data requirements were identified:

1. Pursuing a territory-wide addressing initiative. This initiative would result in two new GIS data sets:
  - i. High-quality, territory-wide **street centerline** data set with all roads named and with standard address ranges appearing on all segments
  - ii. Territory-wide **address point** data set with a point representing all structures within the territory that possess an address
2. Development of a Territory-wide **polling district** data sets
3. Correction and enhancement of the existing **parcel data set** to improve its overlay with the orthophotos and increase its match-rate with the CAVU database

As noted in the weaknesses (section 1.4) there is a need for an **improved geodetic control and reference framework** for the territory. Such a framework is a critical element for allowing the highest levels of mapping and surveying accuracy to be achieved and over the long term will be an important asset in maintaining the territory's spatial data infrastructure. This type of project would need to be pursued in close collaboration with the National Oceanic and Atmospheric Administration's (NOAA), National Geodetic Survey (NGS) and the cost for undertaking this work was estimated by NOAA<sup>7</sup> at approximately \$1,000,000 with an annual maintenance cost of \$50,000 - \$100,000. Although such a project would be valuable, it would require a long-term funding commitment, and is not required to achieve the priority goals set forth in this plan. As such, it is not as an implementation component of

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<sup>7</sup> Via email correspondence from Eric Linzey of NOAA.

this plan and it is recommended that the USVI continue to communicate with NOAA on these requirements and line up support and funding for this type of effort *following* the implementation of the seven priority programmatic goals described above. Indeed, if a new GIO position is created, the GIO would become a critical advocate for this type of initiative.

### 3.3 Technology Requirements

A complete enterprise GIS deployment for the USVI will include several major technological components:

- **Database server infrastructure** for housing the public geospatial data clearinghouse and the internal geospatial data repository
- **Web server infrastructure** for the hosting of browser-based GIS applications and viewers
- **Server-based geospatial software** for geospatial data management and web serving. The territory can extend its existing utilization of ESRI desktop software by extending into the server arena and ESRI's ArcGIS Server product; or, it can investigate Open Source options such as PostGIS (built on PostgreSQL), GeoServer or MapServer.
- Geospatial data communications can be bandwidth intensive and a robust enterprise GIS infrastructure should be able to serve users regardless of which island they are working on. As such, a complete enterprise GIS would need access to a **high-speed network that can provide high-performance, inter-island communications** (i.e. St. Thomas/St. Croix/St. John). Alternatively, if such networking is not possible, then a data replication strategy could be pursued that would synchronize the geospatial data holdings across multiple servers on different islands.

### 3.4 Funding Requirements

The three main funding requirements outlined in this report are:

- Ongoing funding for a **full-time Territory GIO**
- Developmental and operational funding for enterprise GIS approach and the construction of an **enterprise GIS infrastructure**
- One-time developmental funding for planning and implementing a comprehensive **territory-wide addressing/re-addressing initiative**

See below (Section 4.2) for a budget spreadsheet that more fully describes the scope of recommended investments.

## 3.5 Standards

A critical component of an enterprise GIS approach is whenever possible, applying existing standards, particularly for geospatial data. When existing standards do not exist, or are not adequate, then the USVI should seek to articulate its own standards as many other states have done<sup>8</sup>. At least two major standards are germane to initiatives discussed in this plan:

- Existing **addressing standards** from the FGDC and/or the National Emergency Numbering Association<sup>9</sup> that will help underpin a Territory-wide addressing initiative
- The **FGDC metadata standard** for describing the contents of the proposed geospatial data clearinghouse

## 3.6 Organizational Needs

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### 3.6.1 Executive Support

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To pursue an initiative of this nature that would span the full enterprise of territorial government it will be critical to have strong executive support. This is extra important since this initiative requires budgetary funding and will span 1-2 years. For the USVI, this type of executive support must include **both** the Governor and the Lieutenant Governor and all of their respective department heads. Currently, the Lieutenant Governor has taken an active interest and leadership role with geospatial technology while the Governor's office has actively observed and participated in this geospatial strategic planning process.

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### 3.6.2 Coordination & Oversight Procedures

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The existing Virgin Islands Geographic Information Council is well situated to provide project oversight for the development of an enterprise GIS for the USVI. This body is already made up of a broad-based group of GIS stakeholders and is familiar with the GIS issues facing the territory. In addition, VIGIC has been actively involved throughout this geospatial strategic planning process.

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<sup>8</sup> For example, Massachusetts has its own parcel standard. <http://www.mass.gov/mgis/standards.htm#Parstandard> for further details.

<sup>9</sup> See: <http://www.nena.org/standards/informational> for further information.

As described earlier, VIGIC has suffered from an inability to “move out” on its recommendations and lacks access to both staff and budgetary resources. If this initiative moves forward, and a Territory GIO position is created, these challenges will have been partially addressed and VIGIC will be well positioned to act in an advisory and oversight role, and as a “Board of Directors” to the enterprise GIS development projects that follow.

### 3.7 Assessing Risk

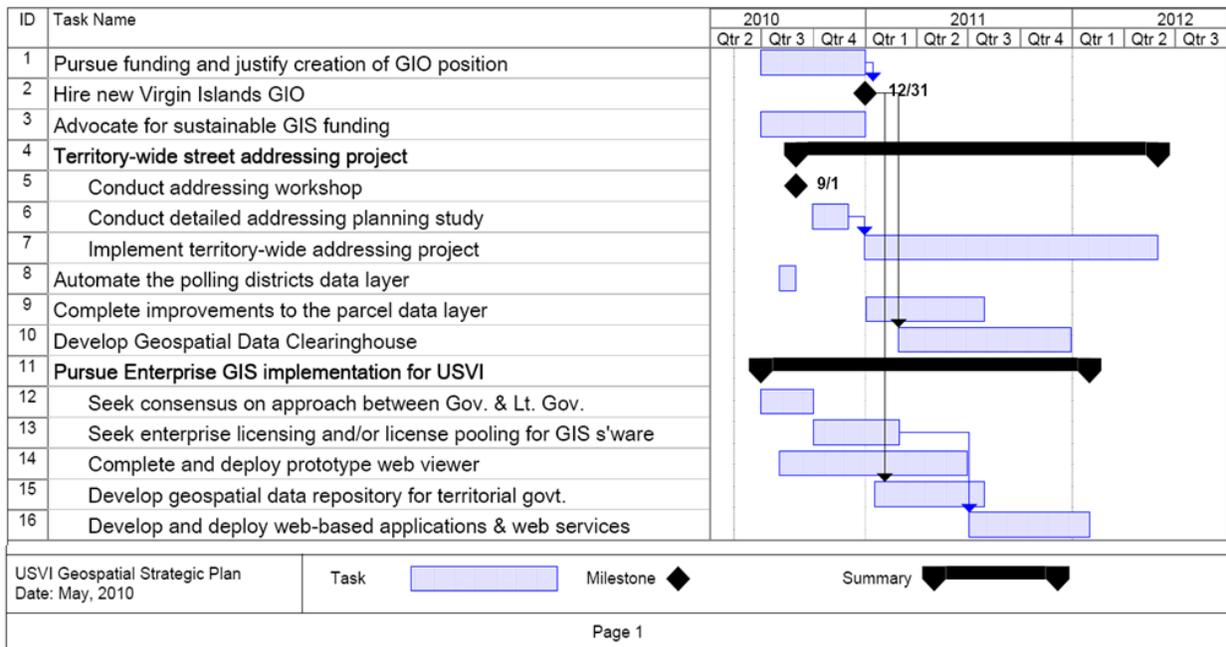
Some of the activities that are recommended above involve considerable changes and there are two principal risks to seeing these change carried out.

1. **Managing inter-departmental competition and conflicts:** With the deployment of an enterprise approach there can be perceptions that departmental autonomy is being lost. Managing this risk will involve active communication and outreach to all departments, but particularly to the “mature adopter” departments. Mature adopters will need to understand that they are not “losing” anything and that they will actually gain if GIS becomes stronger across the enterprise. Managing this risk will also take active leadership from senior executives who must articulate that benefits that accrue *across the enterprise* are as important as the self-interested perspective of any single department.
2. **Inadequate funding for the territory-wide addressing project:** The addressing project has the potential to be highly visible and lead to broad-based public recognition of geospatial technologies and the attendant need to invest in those technologies. As such it is critical that this project be successful and that will require adequate funding. One of the key reasons for conducting detailed planning at the outset is so that the costs for doing this work properly are fully understood, and can be budgeted for. This type of fundamental project cannot be done “on the cheap.” If such a project is pursued without adequate resources there is a high chance of failure, and such a failure could set back geospatial development and harm the reputations of project proponents.

## 4. IMPLEMENTATION PROGRAM

### 4.1 Timeline & Milestones

The timeline below present a plausible scenario for pursuing the recommendations put forward as programmatic goals. The intent of the timeline is to highlight the approximate duration of initiatives and the dependencies between various activities. This timeline should be considered “provisional” and is highly dependent on the availability of funding.



## 4.2 Budget Plan

The spreadsheet below presents a general budget for pursuing the recommendations put forward as programmatic goals. Given that the territory will have choices in how to pursue various components, all costs are presented as a “low-cost” to “high-cost” range. The actual cost will depend on decisions made during detailed implementation planning and based on market responses to the territory’s solicitations.

One-time Items	Low Cost Estimate	High Cost Estimate
Automation of polling district data layer	\$1,500	\$3,000
<b>Parcel data layer improvements (assuming 57000 polygons)</b>		
General improvements to topology and attribute coding and consolidation into territory-wide data set	\$10,000	\$15,000
Improved overlay to orthophoto base map	\$20,000	\$30,000
<b>Territory-wide addressing project</b>		
Addressing workshop	\$5,000	\$7,000
Detailed addressing planning study	\$50,000	\$60,000
Implementation of addressing/re-addressing	\$500,000	\$1,000,000
Completion and 1 year hosting of prototype On-line GIS Viewer	\$12,000	\$20,000
Development and implementation of a geospatial data clearinghouse in association with UVI	\$25,000	\$50,000
Hardware to support enterprise GIS deployment for geospatial data repository and web application serving	\$30,000	\$50,000
Software to support enterprise GIS deployment for geospatial data repository and web application serving	\$25,000	\$50,000
<b>TOTAL one-time expenditures:</b>	<b>\$678,500</b>	<b>\$1,285,000</b>
<b>Recurring, Annual Items</b>		
Salary for Territory GIO	\$50,000	\$80,000
Annual software and hardware maintenance	\$10,000	\$20,000
Operational budget (i.e., supplies, training, travel, etc.)	\$5,000	\$10,000
<b>TOTAL annual expenditures:</b>	<b>\$65,000</b>	<b>\$110,000</b>

## 4.3 Marketing the Program

There are two critical audiences that this program needs to be marketed to. First, there is **internal marketing throughout the territorial government**, including both the Governor’s and Lieutenant Governor’s departments. It will be critical that there is government-wide consensus that this is the proper path to follow, and as described above, it will be critical that there is senior executive support and leadership to carry out these recommendations. Both project participants and VIGIC should be actively involved in these internal marketing and educational efforts. It is strongly recommended that as the enterprise GIS initiative develop and promote a “brand name” that can be instantly recognized. States such as Massachusetts have been successful in following this approach and now, “MassGIS” is synonymous with a strong and vibrant state GIS practice.

Second, there is **marketing to the general public**, particularly for the addressing components of this program that will impact the day-to-day activities of residents. News coverage associated with the Committee on Economic Development, Energy and Technology’s hearings on addressing has already served to create some awareness within the general public. This awareness should be fostered and amplified at every opportunity so that the public understand both the benefits of the addressing initiative and the changes that will impact their lives.

## 4.4 Measuring Success & Recalibration

Due to the fact that the USVI is in the early stages of developing a coordinated, enterprise-wide approach, this plan recommends that additional planning studies and prototyping efforts be undertaken. Examples include:

- **Detailed planning study for the addressing initiative** prior to implementation
- **Extending the GIS web-viewer prototype** to bridge the gap before full enterprise GIS deployment

Pursuing this approach provides the USVI to measure the success of early efforts and re-calibrate based on the findings of the study, or user reaction to the GIS web-viewer. Such flexibility will be essential to help navigate a fluid political and fiscal situation and to leave room for adaptation in reaction to new technological developments.