

PSAP Grant Program Grant Ranker

View Application--13--Fredericksburg GIS Implementation

Grant Period: 2010

Tier: Strengthen current equipment and service delivery capability by upgrading existing wireless E-911 related equipment or services (**STRENGTHEN**)

Grant Program: Continuity and Consolidation **Grant Type:** Individual PSAP

Priority: GIS: high priority (refer to GIS-related Grant Request Prioritization Matrix for a description of GIS projects that would have a high funding priority) (**GIS HIGH PRIORITY**)

Primary PSAP Applicants: Fredericksburg Police Communications

Jurisdictions Served: Fredericksburg, City of

Project Director:

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Project Description:

Total Project Cost \$149,514.00

Amount Requested: \$149,514.00

Statement of Need:

One of the primary roles of an individual PSAP is to provide safety and security for the citizens, property, critical infrastructure, and natural resources within its boundaries. The residents and businesses within the City of Fredericksburg expect and deserve an optimum response to police and medical emergencies, and natural disasters from the public safety providers. In order to best provide that protection to the community, public safety officials require comprehensive geographic information system (GIS) technology that correlates the location of streets and addresses, access points, and hazards to the location of a caller on 911. GIS is a critical tool to supply essential services to those who access the Fredericksburg PSAP, and is recognized as a top-tier priority from the Virginia Wireless E-911 Services Board. The City of Fredericksburg currently relies on computerized street address range information for emergency dispatching of services. Our computerized mapping system interpolates a caller's location based upon the assumption that there is an equal distance between structure addresses along a given road segment. The Fredericksburg PSAP has encountered difficulties with emergency response due to this inexact mapping, and needs integrated GIS parcel mapping and structure addressing that will impart the precise location of, and access points to, addressed structures within the mapped extent of the parcels on which they are situated. This data manipulation will enhance the consistency and efficiency of dispatching emergency services to the correct location. Important to note is the vast amount of institutional knowledge that

comprehensively describes the history of mapping within the City over the last thirty years. Learned details, changes in symbology over time, and a record of events are housed within the memory of one person, the Graphics Coordinator, who has dedicated many years of service to the City of Fredericksburg. He is quite arguably the only person who can read the maps for all of the minutiae accurately. Over 90% of the maps remain in mylar, rather than electronic format, recorded with countless variety of undocumented nuances over time by hand and not backed up. Transferring this centrally important City data to electronic format will require his expertise and institutional knowledge, as without it critical information will be lost. The Graphic Coordinator is expected to retire within the next three to four years. From the perspective of public safety, the following elements have been identified as high priority for for GIS implementation: • Access Point locations • Emergency Service zones • Fire Hydrants • Emergency Landing zones (helicopter) • Hazardous Materials locations • Mutual Aid boundaries • PSAP boundaries • Police and Sheriff districts/precincts/beats • Structure Address locations

Mirroring the economic downfall of the entire country, Fredericksburg's declining retail tax base has significantly reduced its ability to fund new projects, even those addressing emergency services. The City has enacted a hiring freeze across all departments and has implemented numerous measures to moderate spending. Despite the relevance of GIS technology to public safety, without support from the E-911 Board it is highly unlikely that Fredericksburg will be able to purchase GIS improvements for the 911 PSAP within the foreseeable future. Once the grant-funded first phase of the GIS project is completed, the City of Fredericksburg has committed a minimum of \$20,000 annually to maintain and update the mapping components as required. Additionally, the GIS project is intrinsic to long-term plans for emergency preparedness in working with adjoining jurisdictions to create and maintain regional GIS information for the benefit of providing mutual aid for emergency services. Furthermore, the GIS project will support our planned regional GIS mapping effort by allowing us to quickly identify the location of wireless 911 callers, and to automatically determine the jurisdiction responsible for servicing that address. Given the City's relatively small geographical footprint at 11.3 square miles, as well as our close proximity to the populations of surrounding jurisdictions, our current mapping capabilities can make this dispatching accuracy a decided challenge. The GIS project has been recognized as a priority by Fredericksburg city officials for some time, as evidenced by a needs assessment study conducted 2005 through 2006 and its inclusion in the compelling issues forwarded to City Council for their consideration this year. (see attachment) If funded through the E-911 Services Board grant program, the GIS parcel mapping and structure addressing hardware and software will be supported by the City's Department of Information Systems for maintenance and sustainability.

Comprehensive Project Description:

Goals and Objectives: The primary goal of the Fredericksburg GIS Project is to convert and update current map data to integrate with existing Phase II wireless 911 technology through computerized parcel mapping and structure addressing. These objectives will be completed within twelve months of the receipt of grant funding. **Parcel Mapping:** The City of Fredericksburg will employ the services of a qualified contractor to convert existing paper tax maps into digital parcel data that resides in an ArcGIS geodatabase. The current set of approximately 500 parcel maps is maintained by the Commissioner of the Revenue, and the City currently lists roughly 7,650 parcels in their Bright and Associates Real Estate database. The current parcel dataset will be converted from hard copy tax maps to the ArcGIS environment and provide a link to the Real Estate database. Proposed services include: 1. Geodatabase Parcel Data Model Development 2. Conversion of Parcel data from hardcopy tax maps to ArcGIS 3. Conversion and Generation of Parcel and Tax Map Annotation 4. GPIN Development 5. Real Estate / GIS data link 6. Map Book Development 7. Quality Control and Assurance

The Parcel Mapping phase of the GIS Project is anticipated to take 6-8 months to complete. This estimate is based upon the number of parcels in the City, the format of the source information, and timely availability of City staff to review, approve, or assist with resolving parcel boundary and annotation issues identified during the conversion process. The budget for this task is \$83,500. **Structure Addressing:** Structure location and address are critical data components required for effective emergency response. This information, in computerized form, allows the exact location of a call to the PSAP to be automatically mapped. Without discrete address locations, our 911 dispatching system currently predicts the location of a structure based upon the address range in which it falls and the distance covered by that address range. This method places the location of the caller along the road centerline based on the range, and can result in an interpolation that is significantly different from the actual location of the call for service. The development of GIS structure location and addresses should be completed once the GIS road centerline and parcel maps are updated and completed, respectively. This will ensure consistency in addressing and reduce the cost of development by utilizing existing data resources for

address determination. The City already has addresses established over time using several addressing schemes. The structure addressing is currently shown on a paper copy of the parcel maps maintained by the Commissioner of the Revenue (COR). The parcel data layer should include the situs and building layer as part of the attribute information. This will be used as the primary source for address numbering. Structure footprints are overlaid on the parcel data. The address number attribution is then assigned to the structure footprint using the underlying parcel situs address. This will result in the bulk assignment of structure addresses. The bulk address assignment will result in the majority of structures being assigned the correct address in the computerized system. The next step is to refine the structure data set; clean-up will need to occur in cases:

- A structure is on one or more parcels
- Two or more structures are on one parcel
- No address was included in the parcel source data
- The structure does not fall within a parcel

The correct address will need to be determined based on COR data records, utility billing records, and as a last resort, field verification. Based on a consultant's experience in developing addressing data for local governments, it has been determined that a certain portion of the addresses will need to be verified in the field. The consultant will provide field crews and tools to verify the location and/or address of structure points, as necessary. The anticipated schedule for this task is four months, following the completion of parcel data conversion. The budget for this task is \$28,150. Sustainability: The City of Fredericksburg has committed to a minimum of \$20,000 in funding support annually for maintenance and upgrades as required for the GIS project, and \$5000 for training of personnel.

How will the equipment purchased will support future technologies for PSAP readiness?:

The map information required by the PSAP for dispatching purposes is the base map information upon which many other map layers will be created in the future to satisfy the expanding needs of the City. The current project is the first important step to deploy a successful GIS that will allow the City of Fredericksburg to maintain the PSAP's mission critical map information. As wireless technology becomes even more refined and advanced, the base mapping layer that will be created by this project will support additional mapping layers that can be integrated with the PSAP functional operations to provide the highest level of service to the community.

Budget and Budget Narrative:

Project Funding Plans: GIS Parcel Mapping Parcel Mapping is the critical first step to convert paper maps to electronic versions which can be integrated with the CAD systems in the E-911 PSAP to pinpoint and verify caller location. 1. Geodatabase Parcel Data Model Development 2. Conversion of Parcel data from hardcopy tax maps to ArcGIS 3. Conversion and Generation of Parcel and Tax Map Annotation 4. GPIN Development 5. Real Estate / GIS data link 6. Map Book Development 7. Quality Control and Assurance

	\$83,500	Structure Address Development
Structure addressing assigns a discrete address location to each verified structure on the parcel layer, ensuring accurate information is disseminated to emergency responders. 1. Address Number Attribution 2. Data Clean-up	\$11,000	Server and Licenses
A dedicated computer server is required to support the GIS functions in the PSAP. 1. Hardware to Support Parcel Conversion and Address Attribution 2. Software to allow PSAP personnel to access data 3. ArcInfo Licensing Server Bundle	\$47,500	
License	\$7,514	Total Project Cost
	\$149,514	

Evaluation:

PSAP grant Evaluation Our GIS contractor will have a solid infrastructure for quality control and assurance (QA/QC) in support of our E-911 GIS database development. The contractor will be using this infrastructure to perform the data development quality assurance and quality control tasks in this project. As part of the overall QA/QC processes, the following batch processing algorithms are performed against the digital parcel conversion databases:

- Automated topology checks are done to ensure that all graphic rules are followed.
- Automated verification routines to ensure that all streets, parcels, and structures are correctly attributed.
- Automated graphical verification routines to ensure that all annotation placement and symbol placement requirements are met.
- Automated parcel verification routines to ensure that all parcels have a valid match in the real estate database and all real estate records have a match in the parcel layer. Inconsistencies will be provided in the Parcel reconciliation report.
- Check Plots – For each Tax Map, a separate check plot will be used as a point of reference to perform a visual QC by comparing each check plot to the scanned Tax Maps. As it is expected that dispatching inaccuracies from the PSAP will be reduced following the

implementation of the GIS project, a random audit of response times for emergency services will be conducted on a quarterly basis, with emphasis placed on the geographic areas of the City that will be most affected by the mapping upgrade.

Attachments

Cover Memo for Attached Resolution.doc
Recommended Strategy for GIS Implementation.doc



RECOMMENDED STRATEGY FOR GIS IMPLEMENTATION

*****Figures contained within are unconfirmed & provided as estimates only as an RFP is the best way to obtain current and competitive pricing for all elements of the GIS proposed project.*****

PHASE I

Originally planned for FY2008 was implementation of an in-house GIS to store and manage the City's data. This would eliminate the need for multiple individual "smoke stacked" (or segregated) personal geodatabases currently required to do business in Transit, the Police Department, and Public Works. A central database will allow for the storage, maintenance, retrieval, analysis, sharing and backup of GIS data across City offices. Crucial elements of this effort are the development a City Data Model, base parcel layer conversion, address point creation, and a GPIN (Geographic Parcel Identification Number) assignment. There are no optional components for this phase of the project.:

Server (Hardware & Software)	\$50,000
Data Model & Data Conversion	\$100,000 *could be higher given data quality
Training	\$25,000
Desktop (Hardware & Software)	\$20,000
GIS Coordinator *	\$90,000 includes benefits (to be added as funds become available)

TOTAL for Phase I \$285,000

***The City should anticipate approximately \$20,000 in annual system maintenance fees beginning in 2nd year.**

PHASE II

Please consider that without the hardware and software investments for staff outlined below for Phase II, the GIS database created in Phase I will not be disseminated to its intended user base.

Additional independent layers of GIS data determined to be highly desirable (pg 32, GIS strategic plan)

- \$66,250 photogrammetrical maps digitized from state orthophotography (used to develop layers)
(* = photogrammetrical work is pre-requisite for the layer)
- Subdivision & neighborhood boundaries (\$1,000)
- Building footprints (\$10,500)*
- Fire hydrants (\$1,500)* - obtainable via GPS equipment if purchased (see below)
- Rights-of-way/easements (\$12,000)
- Hydrography/Water Tanks (\$5,300)* (See VA Stormwater Management Act, General Permit for Stormwater Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems (MS-4) Section II B.3.b(1).)
- Land use plans (\$3,100)
- Environmentally sensitive areas (\$3,500)
- Hazardous materials locations (\$5,000)
- Bridges (\$1,500)

Also included:

- Voter district boundaries (\$2,500)
- Access point locations (GPS)



RECOMMENDED STRATEGY FOR GIS IMPLEMENTATION

- Stormwater conveyance and outfall sewer locations - obtainable via GPS equipment if purchased (see below)
- Improvements to Transit Bus Routing Web Application (\$54,000)

SubTotal: \$166,150

Once this is complete, the GIS data can be made available to city offices with the following investment:

Hardware, Software & Training for Staff

- GIS workstations \$7,500
 - GIS software \$40,300
 - Training on GIS software \$12,600
- SubTotal: \$60,400**

Purchase of GPS System

- GEOCollector 1-3 meter \$3,600
 - GPS Analyst for AcrGIS Desktop \$2,000
- SubTotal: \$5,600**

Not listed in the GIS Needs Assessment, but highly recommended, is an examination and evaluation of GIS need for Utilities to manage the flow of water and wastewater to service homes and businesses, as well as to track the location and condition of water mains, valves, hydrants, meters, storage facilities, sewer mains, and manholes. No cost available at this time.

TOTAL for Phase II: \$232,150

PHASE III

Many additional desirable layers of GIS data may be implemented in this phase such as special tax districts, pathways, city businesses, tourist destinations, rental properties, as well as application interfaces to existing databases, such as real estate/assessment, community development, and business license.

POTENTIAL SCHEDULE

PHASE I – FY09, FY10 outside (best case 18 months, worst case 2 years)

PHASE II – One Year Following (best case 12 months, worst case 2.5 years)

PHASE III – One Year Following (best case 12 months, worst case 1.5 years)

RECOMMENDED IMPLEMENTATION STRATEGY for Phase I

Begin by releasing a Request For Proposal (RFP) for all phases of the project, with an option to award multiple contracts over the course of the project. Estimated timeframe to complete this stage is 6-9 months, with an estimated 1-2 months for Contract Negotiation(s). Data Model/Data Conversion should be completed 3-6 months following the execution of a contract, server installation and configuration can be implemented simultaneously with DM/DC. Allocating 1 month for system testing, the City should realize an operational Geographic Information System (GIS) in 18 months. This projection assumes a full time GIS Coordinator is available to work in conjunction with the Graphics Coordinator.

Cover Memo for Attached Resolution

The attached resolution is the strategy paper prepared for City Council which describes the proposed implementation of three tiered phases of GIS. This grant application submitted to the E-911 Wireless Services is requesting funds for Phase I of the recommended strategy and is roughly delineated in line items one and two (server and data model and conversion) of the proposal. The remaining items in the attached resolution outline the larger GIS implementation plan that has not yet been approved by Council.