

# GIS EXCELLENCE AWARDS 2018



NOVEMBER 7, 2018

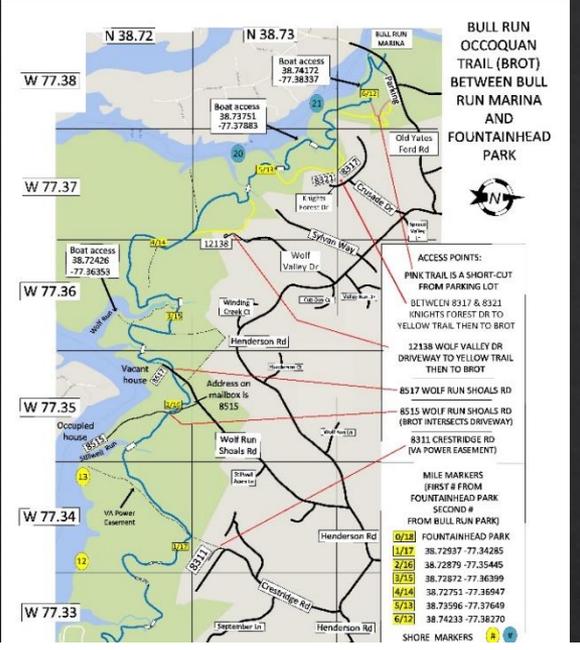
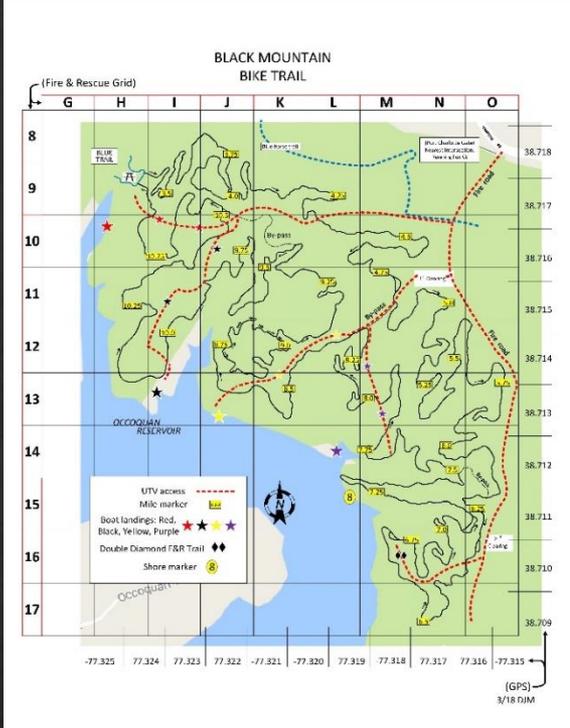


# CARTOGRAPHIC CATEGORY

**Third Place**

FRD Emergency Response Maps for the Fountainhead Regional Park Mountain Bike Trails

**David May**  
Fire & Rescue



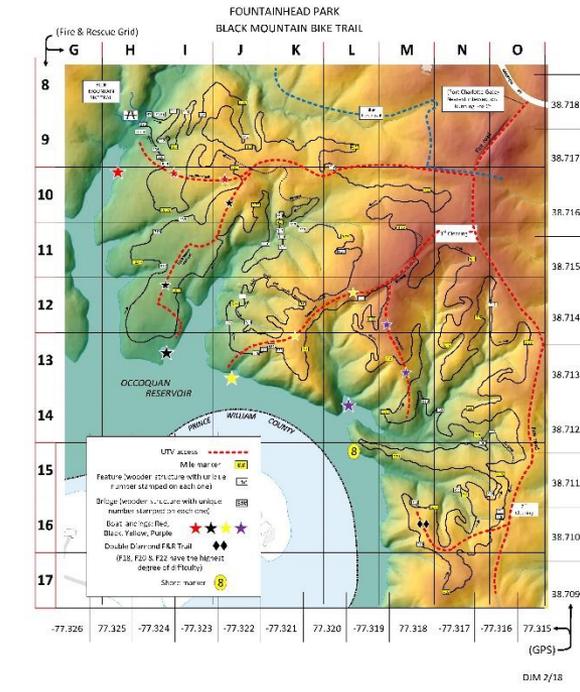
The mountain bike trails at Fountainhead Regional Park and the Bull Run Occoquan Trail are a popular and challenging destination for the region's mountain bike enthusiasts. Unfortunately, these challenging trails also mean bike accidents that sometimes require emergency medical responses by Fairfax County Fire and Rescue Department (FRD) units and personnel.

We created these maps to assist in the location of medical emergency victims and to determine the fastest access routes and extrication points. Previously, too much time was spent in the woods searching for the mountain bikers who needed assistance. Even with the cell phone coordinates of the caller obtained by the 911 dispatcher center and provided to the first responders, there was difficulty in determining the quickest way to the patient and the best way to remove them. Using an internet-connected device to access trail maps wasn't the answer. Often cell phone service and internet connectivity isn't available due to the terrain and remoteness of the trails. After Fire Station 41 received a new Utility Vehicle (UTV), we started looking for ways to better utilize it on the mountain bike trails when responding to emergencies within Fountainhead Regional Park. Hardcopy maps or digital maps stored on standalone devices was the answer.

The resulting large maps reside in the Battalion Chief's and EMS Supervisor's vehicles. In addition, these detailed maps can be accessed in the field on FRD-issued iPads as well as at the Department of Public Safety Communications (DPSC) 911 dispatch center. With a more generalized format in smaller size, each fire vehicle also carries a letter-size printed version.

The existing publicly available Fountainhead Park trail maps that were previously carried were accurate trail maps (to scale) but lacked details about points along the trails that were significant to first responders. We used Fairfax County's Geographic Exploration & Mapping (GEM) application and other software tools to create these maps. The GEM application was used to obtain the background base map image because it provides a good shaded relief elevation base.

Using the Windows Snip tool, the map extent was snipped from the GEM application and used as the background image in Visio. For the "Black Trail" map, elevation data could be custom snipped. Other maps required snipping from individual GEM tiles. Additional data specific to the mountain bike trails was georeferenced and retraced onto the elevation background. Finally, additional specific data and the new access routes were entered using GPS coordinates.



# CARTOGRAPHIC CATEGORY

**Second Place**  
 Ellanor C Lawrence Park Trail Maps  
 Andrew DeLuca  
 John Shafer  
 Park Authority

**ELLANOR C LAWRENCE PARK TRAIL MAP**

**FAIRFAX TRAIL BUDDY WEB APP:**  
 For more trails info and the Fairfax Trail Buddy app visit us at: <http://www.fairfaxcounty.gov/parks/trails>  
 DATE: OCTOBER 2018

**IN AN EMERGENCY**  
 Please dial 911 and provide this sign number: **EC 4**

**ELLANOR C LAWRENCE PARK TRAIL MAP**

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 DATE: OCTOBER 2018

**IN AN EMERGENCY**  
 Please dial 911 and provide this sign number: **EC 1**

Ellanor C Lawrence Park contains an expansive trail network that is heavily used by residents. To improve the visitor experience at the park, new trail wayfinding maps and signage were created and installed at the park. Any out of date data on the existing trails and trail related facilities were updated via field data collection to provide the most accurate and up to date maps. Four maps were created for placement at key trailheads as part of this project. These maps varied in orientation based on which direction trail users would be entering the park. For example, trail users entering from the North would first encounter a South oriented map to more closely match their vantage point. Trail and park elements in these maps have been put into focus along with reference information to provide general orientation. These maps also include a code which can be provided to 911 dispatch in the event of an emergency to direct first responders to the caller's location. Additionally, the maps include a QR code link to the Trail Buddy web application which provides trail and hiking information for residents on their smart phone. These new maps are a welcome addition at the park and provide the county's residents with better information to improve their hiking experience.

# CARTOGRAPHIC CATEGORY

## First Place

### Routine Mosquito Trap Sites - 2018

Lauren Lochstamfor  
Health Department

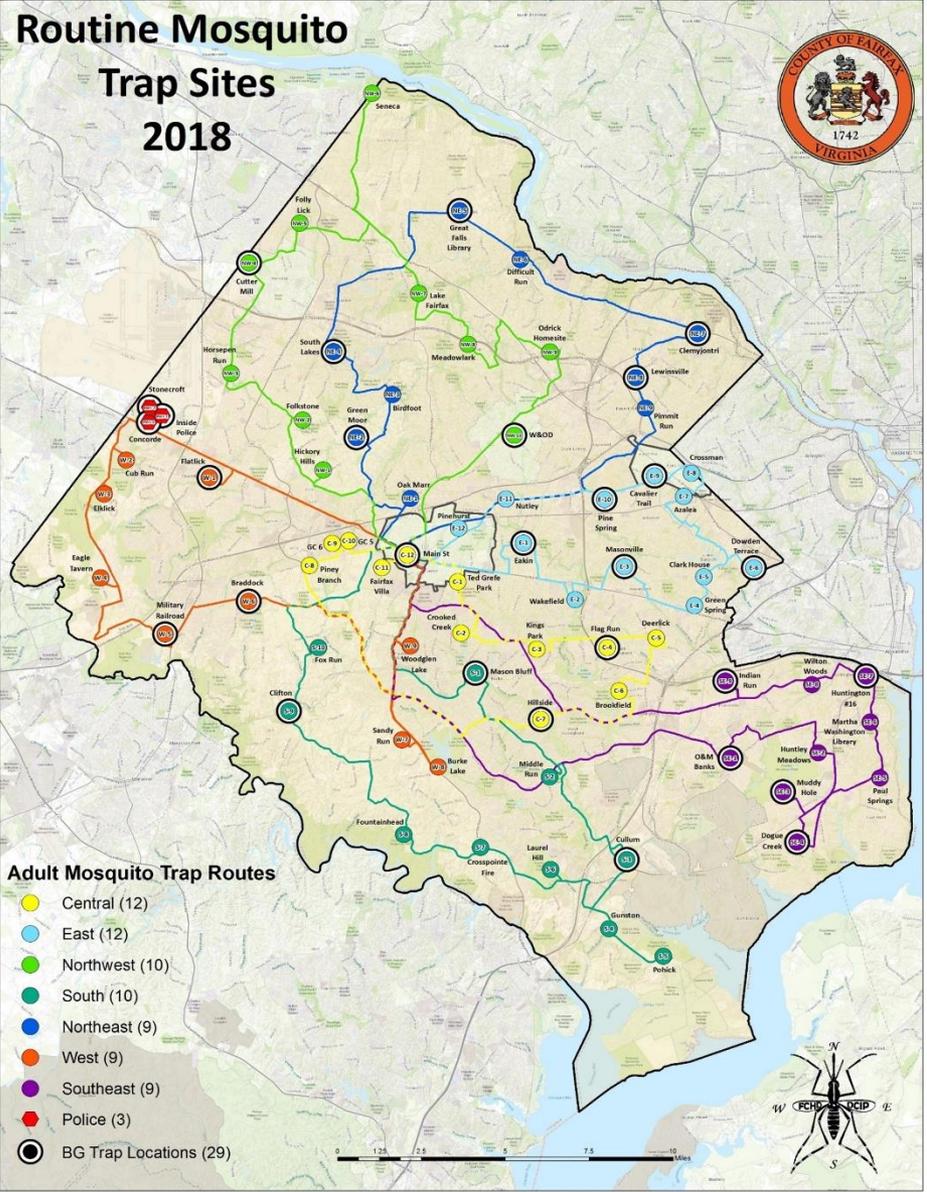
The Disease Carrying Insects Program (Health Department, Division of Environmental Health) performs weekly adult mosquito surveillance for West Nile virus from May through October at 74 static locations throughout the County. At all 74 locations, two types of mosquito traps are utilized (CDC Miniature Light Trap and Gravid trap). A third trap type (BG Sentinel® trap) is set at 29 of the 74 locations. Mosquito traps are set for 24 hours, requiring two work days for setting and picking up the traps. For operational consistency, routes are created to divide the trapping schedule between morning and afternoon routes. The maximum number of traps per route is currently limited by space available in the trucks that we use. The routes are set up so that technicians can run a route in the morning, return to the office (located in the City of Fairfax) for their lunch break, and then run the afternoon route.

In 2018, using the Network Analyst extension of ArcMap, we created 7 trap routes based on our existing trap sites. These routes were created using the constraints of time, the number of traps for each route, and the time spent at each trap location. Our eighth route was specifically created for a Police training facility, which we perform additional services at while setting and picking up traps.

The resulting Routine Mosquito Trap Sites map was created to show all the trap locations and routes. This map was created as a wall map to use for our operations. Routes and trap sites are color coordinated. Where routes overlap, hashed colored lines were used. We can easily glance at to see if there is a BG Sentinel® trap at a site, the trap site names and numbers, and which major roadways are utilized for each route. The latter is important when there are traffic incidents and we need to re-route technicians in the field.

The final maps are laminated and can be written on to add notes, to highlight particular sites or to point out other locations and their proximity to existing sites.

One additional fun feature of the map that we would like to point out is the utilization of our custom DCIP logo as a compass.



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# ANALYTIC CATEGORY

## Third Place Worlds Collide: Roads & Sewers, Utilizing GIS to Analyze Utility Impacts of the Transform I-66 Outside the Beltway Project

**Tom Grala**  
**Matthew Doyle, Stephanie Thomson, Shwan Fatah, Randall Cyr, Joy Khoshe Saleem, Lana Tran, Sharad Regmi, Mohamadi Badana**  
*Capital Facilities*

### Worlds Collide: Roads & Sewers Utilizing GIS to Analyze Utility Impacts of the Transform I-66 Outside the Beltway Project

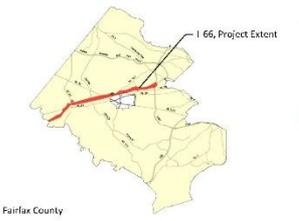
CAP – Wastewater Design & Construction Division – Thomas Grala, Matthew Doyle, Badana Mohamadi, Stephanie Thomson  
WWM – Wastewater Collections Division – Shwan Fatah, Randall Cyr, Joy Saleem  
WWM – Wastewater Planning & Monitoring Division – Lana Tran, Sharad Regmi



#### Project Background

The Transform I-66 Outside the Beltway project is a public-private partnership between the Virginia Department of Transportation (VDOT), the Department of Rail and Public Transportation (DRPT), and private partner, I-66 Express Mobility Partners, delivering \$5.7 billion of transportation improvements in the I-66 corridor. The project is currently underway and is scheduled for completion in December 2022. This project has the potential to have a large impact on County owned sewerage facilities in the project area. Because of the design-build approach and the high-profile nature of the project, efficient methods to review the impact of the project were needed to balance the quality of review with timeliness.

#### Project Extent



#### Project Analysis

The I-66 project will involve considerable construction of new transportation improvements that will impact Fairfax County sewer utilities. The project is being done using a Design-Build approach. Because of this approach, various portions of the project are moving forward in the design process at varying time intervals and in various locations. Likewise, the construction phase of the project will also potentially be happening at various locations given the wide geographic area and the need to relate submissions and status to various localities. It was clear to the team that GIS would be a valuable tool to help in managing project activities.

CIS analysis for this project included aspects relating to the County sewerage system and analysis related to the I-66 project review process.

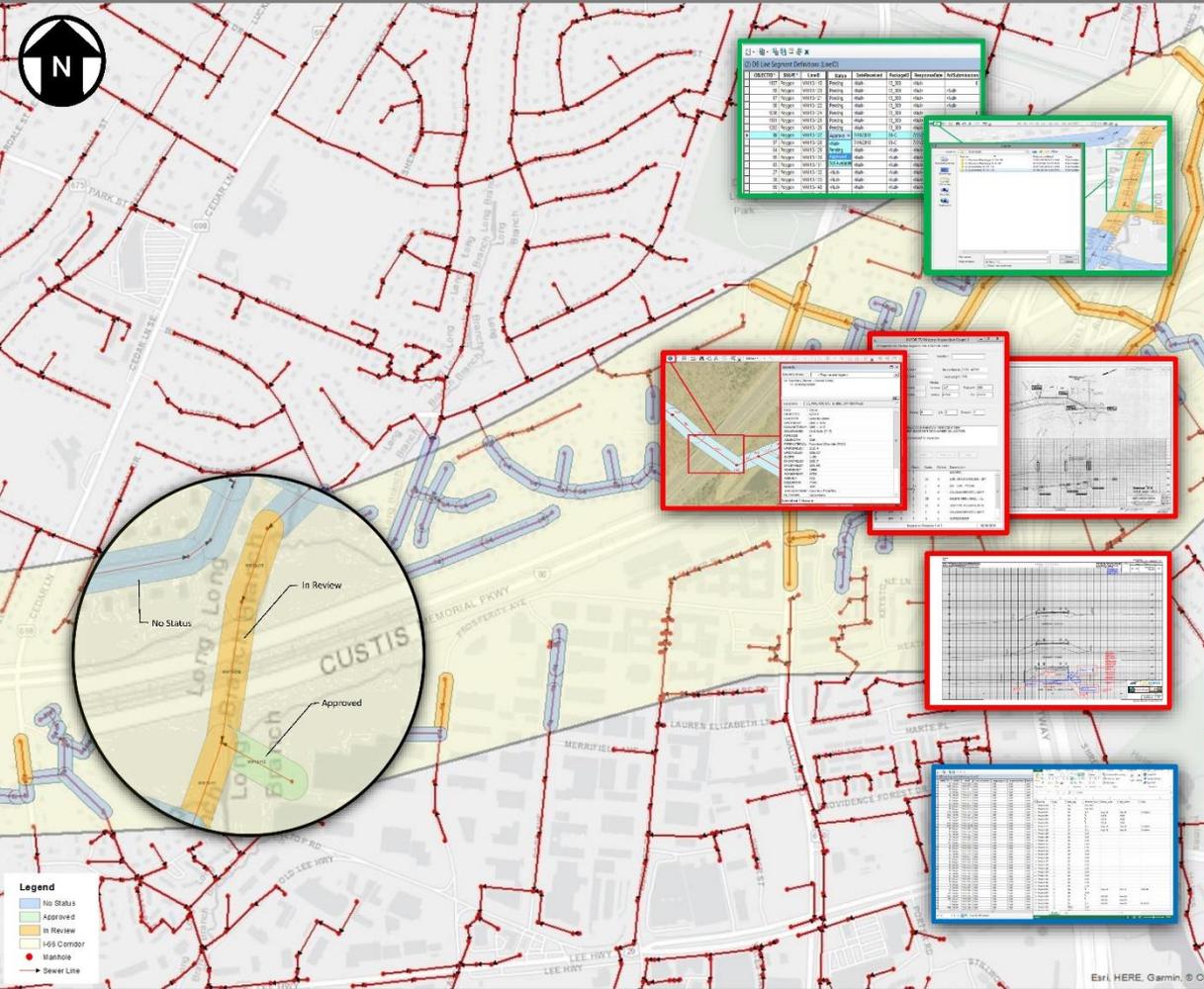
In order to coordinate the review of this project, the project team needed to develop efficient methods to understand where changes related to the project were taking place. The team needed ready access to current sewer related assets configuration and conditions. Methods to administer the large amounts of data making proposed changes to the sewerage system were needed. A system was also needed to keep all team members informed of current project status despite being in different departments and different buildings. A shared GIS environment was developed to accomplish the team's needs.

A new **GEODATABASE DESIGN** was established for the project. The database design included a polygon feature class to relate project activity locations to County sewer assets. The database includes attributes to assist with the management and **DESIGN REVIEW** packages received.

When an I-66 design review package is received, the County's existing sewer related GIS data can be used to understand existing pipe attributes. When plans are reviewed with comments made, or approvals given, our geodatabase can be updated to track the status of the project.

The GIS environment setup for the project allow team members to have the status of the project by understanding color-coded location status, querying the status of various impacted locations, and using hyperlinks to have access to the latest information. This information served as the basis of our understanding of the status of our assets and the potential **CONSTRUCTION IMPACTS** of I-66 project on our facilities.

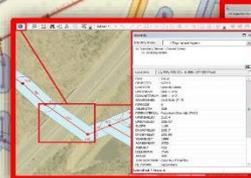
The team is currently using this information to administer and analyze the I-66 project coordination effort. It is anticipated that the use of this information will continue, with potential further enhancements over the duration of the project through 2022.



**Legend**

- No Status
- Approved
- In Review
- I-66 Corridor
- Manhole
- Sewer Line

ID	STATUS	DATE	STATUS	REASON	DESCRIPTION	APPROVALS
101	In Review	10/11/21	Partial	Design	10/11/21	Sub
102	In Review	10/11/21	Partial	Design	10/11/21	Sub
103	In Review	10/11/21	Partial	Design	10/11/21	Sub
104	In Review	10/11/21	Partial	Design	10/11/21	Sub
105	In Review	10/11/21	Partial	Design	10/11/21	Sub
106	In Review	10/11/21	Partial	Design	10/11/21	Sub
107	In Review	10/11/21	Partial	Design	10/11/21	Sub
108	In Review	10/11/21	Partial	Design	10/11/21	Sub
109	In Review	10/11/21	Partial	Design	10/11/21	Sub
110	In Review	10/11/21	Partial	Design	10/11/21	Sub



ID	STATUS	DATE	STATUS	REASON	DESCRIPTION	APPROVALS
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102	In Review	10/11/21	Partial	Design	10/11/21	Sub
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104	In Review	10/11/21	Partial	Design	10/11/21	Sub
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106	In Review	10/11/21	Partial	Design	10/11/21	Sub
107	In Review	10/11/21	Partial	Design	10/11/21	Sub
108	In Review	10/11/21	Partial	Design	10/11/21	Sub
109	In Review	10/11/21	Partial	Design	10/11/21	Sub
110	In Review	10/11/21	Partial	Design	10/11/21	Sub

#### GEODATABASE DESIGN

The team designed a project-specific Geodatabase to track, organize, and manage project information. The functionality allows polygon features to be created that would incorporate I-66 information with the intent of relating them to available County sewer information. The attributes being tracked include items such as the date the design package was received, review status, and other project data. End user functionality is included to allow hyperlinks to the design packages received for easy lookup and access. Other functionalities added include the relate table to relate our geodatabase design to I-66 project information and updates. The geodatabase design considers end users' needs to query, interpret, and display project information. GIS environmental with County related data, the project specific database, and other resources was created for the review team's use.

#### APPROACH TO DESIGN REVIEWS

When packages are received for review, the team uses the existing County GIS sewer data to understand the current state of sewers in areas impacted including such information as pipe size, slope, and amount of cover over the pipe. This information is in the sewer line attribute table. County GIS functions are available to access sewer maintenance history records that give us an understanding of the current pipe condition, and remaining life span. Additionally, a County GIS function is available that allows us to view un-built information for any sewer line, and obtain an understanding of location and profile. The design review packages submitted by the Contractor are examined in relation to the existing sewer information. Plans that conflict with the existing sewer data are marked up and sent back for revision. If no conflicts are apparent according to the existing data, the plans are approved and the project team moves forward to coordinate and oversee the proposed construction activity.

The approval status of the plans reviewed are updated in the geodatabase developed for the project. The team can keep track of the locations of the project design submissions and approval status. All team members are able to access this information.

#### APPROACH TO CONSTRUCTION IMPACTS

Sewer lines from the approved design packages can be identified in the geodatabase. Status can also be queried from the attribute table. Green colored polygons indicate a sewer line from an approved package. The geodatabase has functionality to assist with the inspection of construction activities. Approved plans can be quickly accessed through the hyperlink function and brought into the field. Inspection coordination is also assisted by the relate table function in GIS. The team is able to relate locations to a construction schedule table provided by the Contractor to understand anticipated construction activity and timelines.

# ANALYTIC CATEGORY

In the planning phase for the Northern Virginia Training Site located along Braddock Road, staff and the taskforce proposed to create a 3-D model of the site to visual impacts on the neighboring communities. In the past similar exercises, have been performed by our GIS staff to visualize the impacts in terms of massing models. When the idea was brought to our attention, we decided to take it a step further and utilize the LIDAR data the county acquired to perform a line of site analysis.

In this scenario, we created extruded buildings from the buildings GIS layer and then created a series of multi-patches for the proposed buildings, observer points and the target sites of the proposed buildings. Once those items were created a series of geo-processing tasks were performed to create the site lines and finally to run the line of site obstruction.

In conclusion of the analysis, we could see where the existing tree canopy (Full Leaf) would provide a good buffer for the proposed development even with the increased height of the new construction. However, this not take into effect other factors, such as, winter (leaf off) and tree removal that would affect the neighboring communities.

The taskforce was presented with slides, a video created using ArcGIS Pro that showcased a couple of scenarios and different vantage points and Web Scene application that anyone could access and view the analysis and data. The taskforce really enjoyed the presentation and valued the effort put forth to address their concerns. Ellen J. Hurley, Planning Commissioner for Braddock District, stated "This is fantastic. I hope to see more representations like this at our Planning Commission meetings".

## Interactive mapping application

<https://bit.ly/2AdQEKA>

**Second Place**

## Northern Virginia Training Center Line of Sight Analysis

**Dan White**

*Department of Planning & Zoning*

# Northern Virginia Training Center Line of Sight Analysis

Line of Sight Analysis:

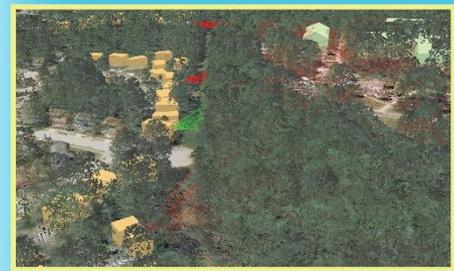
- Utilized two tiles of LIDAR data with 27,576,860 points.
- Performed the Analysis with the tools in ArcGIS Pro.
- Created Extruded Adjacent buildings by extruding the planimetric buildings layer.
- The Buildings for the proposal are multi-patches created with-in the ArcGIS Pro environment, as well as the observer and target points.
- Result is a line analysis with Red representing obstructed view and Green lines are visible from the observer point.



LIDAR of the Northern Virginia Training Center Site, colored in the RGB values from the LIDAR dataset.



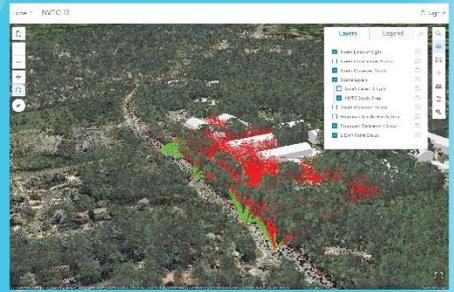
Multi-patch Buildings sitting on the LIDAR terrain with line of sight lines visible. Red Indicates obstructed view, while green indicates visible from the vantage point.



A vantage point looking from the neighboring community towards the NVTc site with the true color LIDAR and the Line of Site Analysis.



A vantage point looking south towards the training site from a higher vantage point to show the quality of the LIDAR dataset.



Web Scene created to allow the task force, staff and the public to view and interact with the Northern Virginia Training Site Line of Site Analysis.

Ellen J. Hurley, Planning Commissioner for Braddock District, stated "This is fantastic. I hope to see more representations like this at our Planning Commission meetings".



# ANALYTIC CATEGORY

## Interactive mapping application

<https://bit.ly/2J5JJWq>

**First Place**

# Utilizing Collector for ArcGIS, a GoPro, a Bike and an Intrepid Intern to Rapidly Assess Hundreds of Miles of Trails

**Keith Appler**

**Bill Schell, Chip Galloway, Shaukat Faheem, Gary M. Much, Steven**

**E. Rudy, Sean Poling**

*Public Works Director's Office*



## Utilizing Collector for ArcGIS, a GoPro, a Bike, and an Intrepid Intern to Rapidly Assess Hundreds of Miles of Trails

DPWES – Maintenance & Stormwater Management Division



### Project Overview

The Fairfax County Maintenance & Stormwater Management Division (MSMD) maintains over 230 miles of asphalt trails spread across almost 400 square miles. A full trail inventory assessment had not been recently completed so many unknowns existed regarding urgent trail conditions or safety concerns. Due to limited personnel and budget to inspect, assess and prioritize trail maintenance activities, a pilot project was developed to have an efficient and repeatable inspection process. This came in the form of a bicycle equipped with an iPad mini with ArcGIS Collector, a GoPro Hero 6 camera and an engineering student intern.

The ArcGIS Collector application utilized a simple qualitative rating system to assess each trail segment and allowed the inspector to capture point observations of maintenance concerns to be quickly addressed by county staff. A GoPro Bluetooth remote was affixed to the handle bar to enable the rider to capture clear, representative geotagged images of trail conditions as they rode.

An ArcGIS Online Operations Dashboard was setup to track project metrics, monitor the location of the rider while in the field utilizing a broad crumb layer and view geotagged photos captured with the GoPro. The GoPro photos were transferred to a network folder each night, mapped to points and appended to a feature service using an ArcGIS Pro geoprocessing tool so staff could access the prior days' work in the dashboard. The pilot program was successful in assessing the full trail inventory in little more than two months at a fraction of the cost it would have been if contracted out. It demonstrates a repeatable inspection process that can be expanded if necessary and the application potential of GoPro cameras in mobile field assessment.

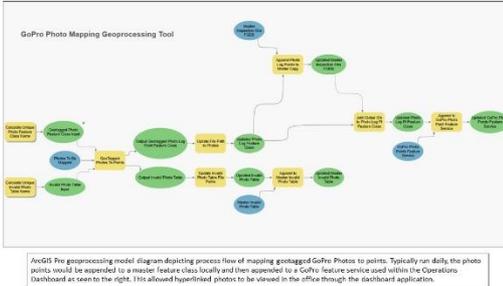
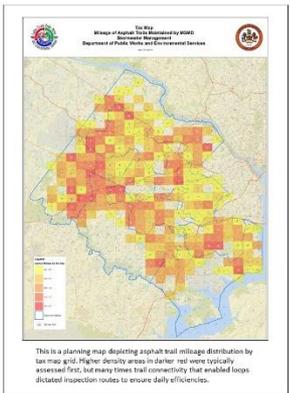
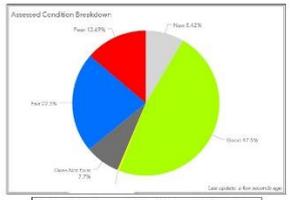
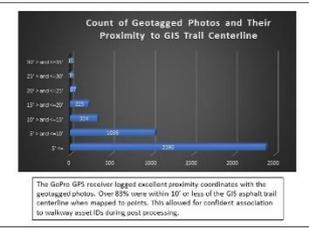


Above are photos of the bicycle setup. It included ArcGIS Collector installed on an iPad Mini with a GoPro Camera, both were mounted on the handle bars. A GoPro camera remote is mounted to the right handlebar. A portable battery backup was run from the battery to keep the GoPro charged during the day.

### Asphalt Trail Assessment Ranking System



Assessment Ranking	Description
New	A "new" asphalt walkway has been recently installed, resurfaced, or constructed. Must show no signs of damage or degradation.
Good	Free from major problems, but may have one or two minor maintenance issues. Little to no sign of deterioration.
Fair	Maintenance issues, but functionality is not greatly impacted. Will require no more than 5-10 years.
Poor	A combination of the following issues: significant faults, cracks, bumps, settlements, or missing pieces.
Does Not Rate	Improperly categorized as asphalt - could be concrete, stone dust, or even natural rock outcrop. Ineligible due to no error or new projects such as the following:



This is an example view of the Operations Dashboard which provided real-time trail assessment results along with a broad crumb trail of the inspector's location every few seconds. It was configured to monitor progress, review work and ensure rider safety during hot weather throughout the summer time project. Widgets were configured to monitor daily progress (feet of trail inspected a day), overall assessment breakdown for any assessed trails, overall progress (# of trail segments completed) and miles inspected per day.

# BEST WEB APPLICATION




## Fairfax County Fire and Rescue Department Management System for Emergency Vehicle Preemption (EVP) Program

Project Members: Yong Kim (Internet Architect III), Dahae Hwang (GIS Analyst II), Eric Fisher (GIS Analyst III), Laurie Stone (Strategic Planner), Yoon Choi-Lee (Administrative Assistant), Brian Edmonston (Battalion Chief), Richard Merrell (Captain II)

### PROJECT BACKGROUND



The Fairfax County Fire & Rescue (FRD) responds to over 101,000 incidents a year. The challenge to responding FRD units is how to reduce response times and travel to the incidents safely without increasing risk to the community. Since 2015, the FRD has increased the deployment of EVP at traffic intersections throughout the County.

**Why we need vehicle emergency preemption?**

- + **Improved Response Times**  
Reducing response times anywhere between 14 - 23% (Traffic Signal Preemption for Emergency Vehicles, January 2006)
- + **Help Reduce the Risk of Accidents at Intersections**

### BUSINESS NEEDS

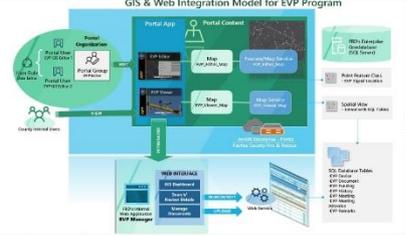
Multiple people in different sections of the agency all needed access to information about the EVP Program in order to ensure the program's continued success



In 2018, in order to improve the FRD EVP business process, a multi-faceted application and an associated data model have been developed by a team of FRD programmers and analysts. This FRD EVP Management System allows FRD staff to track and manage all aspects of the program and includes a GIS-based dashboard that provides staff with the current location and status of the signalized intersections and preemption devices.



Fire & Rescue GIS Portal



GIS & Web Integration Model for EVP Program



Web Application 'EVP Manager'



Interactive Map Application 'EVP Program Dashboard' provides at-a-glance views of EVP data. The GIS functionality is integrated within the EVP management application.

Web Application 'EVP Manager'

Microsoft ASP.Net Web API 2, ASP.Net MVC 6,  
Entity Framework 6, AngularJS 1.7, jQuery 3.3  
Bootstrap 4.4, HTML 5, Microsoft SQL SSRS  
Web API link: <http://firenet/FRDapps/EVPapi>

Third Place

FRD Management System for  
Emergency Vehicle Preemption (EVP)  
Program

Yong Kim  
Dahae Hwang, Eric K. Fisher,  
Laurie A. Stone, Yoon K. Choi-  
Lee, Brian Edmonston, Richard L.  
Merrell  
Fire & Rescue

As Fairfax County continues to transform from a suburban to an urban community, the population density increase results in increased traffic congestion which adversely affects these response times. The challenge to responding Fire and Rescue Department (FRD) units is how to reduce response times and travel to the incident safely without increasing risk to the community.

FRD has response time objectives to deploy emergency medical resources to medical emergencies within 5 minutes and suppression resources to a structure fire so that the first engine company arrives within 5 minutes, 20 seconds from dispatch. To reduce response times, FRD began an initiative to install emergency vehicle preemption (EVP) technology at signalized intersections. There are approximately 1,000 signalized intersections within Fairfax County and when EVP technology is added to a traffic signal it gives priority to FRD units while in an emergency response mode. This is predicted to decrease response times

FRD's EVP project team collaborates with many internal and external stakeholders: the Board of Supervisors, the County Executive, the Virginia Department of Transportation (VDOT), the Washington Metropolitan Area Transit Authority (WMATA), as well as Fairfax County's Department of Transportation (FCDOT) and Department of Planning and Zoning (DPZ).

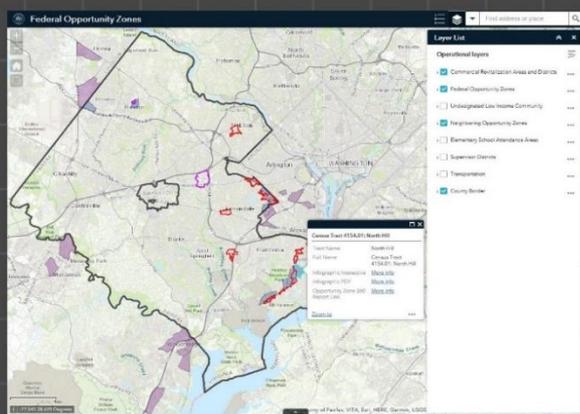
Within FRD, uniformed staff officers, administrative staff, planners, programmers and analysts all play a role in maintaining the program and the information associated with the program. In 2018, a team of FRD programmers and analysts developed a multi-faceted application and an associated data model to improve the FRD EVP business process. This FRD EVP Management System allows FRD staff to track and manage all aspects of the program, including: funding, proffers, new installations, and ongoing maintenance and repairs. Correspondence, meeting agendas and minutes, agreements and memorandums of understanding (MOUs) must all be filed and maintained as well. The EVP Management System supports all this and includes a GIS-based dashboard that provides staff with the current location and status of the signalized intersections and preemption devices. This GIS functionality is integrated within the application.

During the conceptual phase of the EVP project, FRD GIS became integral by assisting with codifying EVP data. FRD GIS staff created a comprehensive signal data layer to support the project using datasets from multiple agencies. FRD now maintains this GIS dataset and makes it available to its partner agencies. A component of the EVP Management System is a GIS application which allows FRD staff who are not GIS analysts to maintain this signal dataset layer.

# BEST WEB APPLICATION

**Second Place**  
**Opportunity Zones**  
**Sophia Dutton**  
**Alexandra Krafchek**

*Office of Strategy Management for  
 Health and Human Services*



## WHAT & WHERE ARE THEY?

Within the Federal Tax Cuts and Jobs Act of 2017, a new tax incentive program called Opportunity Zones was created by Congress as a means to encourage economic development and revitalization in targeted areas across the country. This program allows private investors to receive tax benefits in return for investing in qualified areas through established Opportunity Funds.

Nine tracts located in the Route 1 corridor, and in the East and North parts of the county were designated as Opportunity Zones within Fairfax County. The tracts include North Hill, Hybla Valley, Mount Vernon Woods, South County Center, Willston Center, Bailey's North/Glen Forest, Skyline Plaza, Herndon South and Lake Anne.

## FOR WHAT PURPOSE?

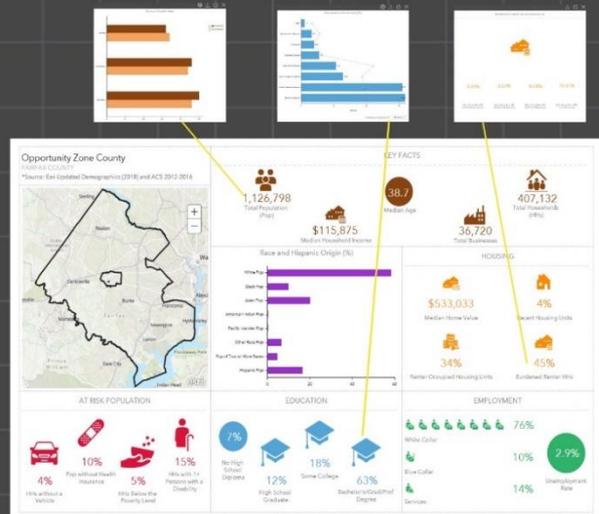
Overall, this web mapping application will be used to increase the economic vitality in the county by increasing awareness among the community and existing businesses on this new tax incentive program, attracting managers of Opportunity Zones funds and their investors to Opportunity Zones located within Fairfax County as part of a targeted promotion and marketing campaign, and as investments are made, providing access to data to track the changes and progress in each designated community over time. County staff, non-profits and community groups can also use this data to influence and ensure that future policies and investment decisions within Fairfax are in line with the social and racial equity focus of the One Fairfax Policy.



## HOW WAS IT MADE?

Esri Business Analyst software was used to develop the Opportunity Zones web mapping application (shown above). This application allows users to pinpoint the location of the nine identified Opportunity Zones in Fairfax County. Each Opportunity Zone in the map includes a pop-up (shown above) with a customized interactive infographic (shown to the right with pop-up examples) containing census based data related to their demographics, race and Hispanic origin, housing, at risk populations, education and employment. As a comparison, information on Fairfax County as a whole was also provided as an infographic. In addition, a PDF version of the infographics and a link to an in-depth report created by Opportunity 360 in partnership with PolicyMap are also offered in each pop-up.

Layers on the map with the Commercial Revitalization Areas and Districts show where multiple incentives could come into play and benefit investors, and where new local incentive zones can be included in the future as they are established. In addition, a layer with undesignated low-income communities allows users to see if there are other residents nearby who could benefit from services based in an Opportunity Zone and plan accordingly.



County web page -  
**Opportunity Zones**  
<https://bit.ly/2RNsOt>

Interactive mapping  
 application  
<https://bit.ly/2RRFuSx>

Infographic (requires  
 download)  
<https://bit.ly/2OX9PAv>

# BEST WEB APPLICATION

## First Place

### Embark Richmond Highway Story Map

Alexis Robinson

Department of Planning & Zoning

The Embark Story Map is a web application that combines the attributes of a written narrative with a digital map whose features allow the audience to learn specific details about the Embark Comprehensive Plan amendment within the context of the community's geography. In its design, the story map brings to life written narrative and summaries of the approximately 300-page plan through interactive maps, three-dimensional renderings, videos, and other visualizations. This is not the first story map to be used in this manner by the department, but it is the first to include a high level of detail about a planning process, especially of this scale. The platform distills multiple, complex aspects of the plan reducing the reliance on technical jargon. The total viewership of the story map reached almost 1,200 in just ten months, capturing the impact of the story map on accessibility.

Individual sections describe the location and character of the corridor and the corridor-wide and community business center (CBC) guidance and vision elements, with links to the comprehensive plan and related projects. Story map viewers can easily identify attributes, such as the study boundaries and existing land uses, and relate them to conceptual maps in the new plan. Interactive maps of the corridor are a main focus, with consistent elements such as the CBC boundaries, potential bus rapid transit (BRT) station locations and 1/2 mile radii. Additional elements that are seen at different zoom levels include public facilities, public open space, and current transportation facilities. Each tab also includes a narrative of high-level details that would be found on the project website or handouts on each topic.

Graphics such as renderings and images of current and conceptual development within the Corridor, specifications for urban design, street facilities networks, open space facilities, and videos of community outreach materials and related projects are also included. Over 30 visuals and interactives are used in the story map to give as much detail as possible about the plans. One of the more challenging aspects of this story map is the two additional story maps that are built into it to better convey the information in the Guidance tabs. Those tabs use a layout that allow the viewer to scroll through different views of the map, focus on specific CBCs, and pop up larger graphics pertaining to the bookmarked topics.

Interactive mapping application

<https://bit.ly/2q33ENa>

County web page

<https://bit.ly/2Cu2T79>

# EMBARK RICHMOND HIGHWAY STORY MAP

## PROJECT OVERVIEW:

Embark Richmond Highway (Plan Amendment 2015-IV-MV1) was an initiative focused on creating a multimodal future for Richmond Highway Corridor where residents, workers, and visitors can walk, bike, or drive to the places they want to go. This effort responded to recommendations from the Route 1 Multimodal Alternatives Analysis, conducted by the Virginia Department of Rail and Public Transportation (DRPT), and assessed and refined the recommendations from the study by providing more detailed guidance in the Comprehensive Plan for the implementation of transit in the corridor. Embark Richmond Highway included coordination with the Virginia Department of Transportation (VDOT) and federal agencies to conduct Environmental Assessments (EAs). The Embark Richmond Highway Study was adopted on March 20, 2018.

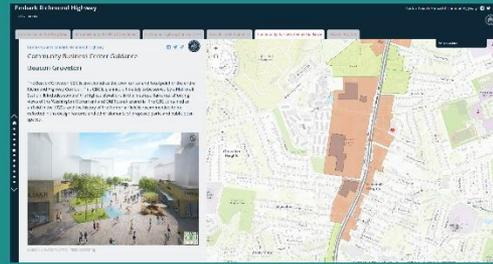


## STORY MAP PURPOSE

The Embark Richmond Highway Story Map is a dynamic web application that significantly enhanced community engagement during the Embark Richmond Highway comprehensive planning study and subsequent implementation efforts, and overall has promoted greater public understanding of the plan recommendations. The recent adoption of the revised Richmond Highway plan is viewed as a major milestone in the revitalization of the corridor, and the story map has been commended by the Lee and Mount Vernon Supervisors as an influential and technological step forward for community outreach. The platform invites a broader range of community members to understand the comprehensive plan recommendations at their convenience, at their own pace from their home, office, or third place, through an easily accessible, aesthetically appealing, and user-friendly platform.

## AESTHETICS AND EASE OF USE

There are so many inconveniences for community meetings, whether it be child care, health care, work schedules and many other reasons. The story map's accessible format broadens the audience that would have been reached than those that attended the community meetings, which tend to be few and repeaters. This medium allowed us to communicate the relationship between the current community and adopted urban design recommendations in a simplistic way, without too much technical jargon. Story map viewers are able to easily identify attributes, such as the boundaries of the project area, and relate them to conceptual maps in the Comprehensive Plan amendment. The story map includes a breakdown of the location and current character of the Richmond Highway Corridor, Corridor-wide recommendations, individual Community Business Center recommendations, highlights of community meetings, links to the text and related projects to Embark Richmond Highway.

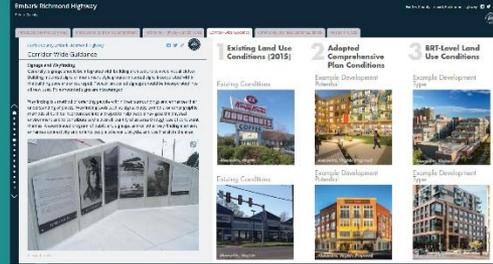


## INCORPORATION AND PUBLIC OUTREACH

In its design, the story map brings to life written narrative and summaries of the approximately 300-page plan through interactive maps, three-dimensional renderings, videos, and other visualization graphics. The platform distills multiple, complex aspects of the plan (for example, the remixed land uses, innovative urban design and placemaking concepts, multimodal transportation improvements, including the county's first bus rapid transit system and a road widening project, and environmental considerations), reducing the reliance on technical jargon. Individual sections describe the location and character of the corridor and the corridor-wide and community business center guidance and vision elements, with links to the comprehensive plan and related projects. Story map viewers can easily identify attributes, such as the study boundaries and existing land uses, and relate them to conceptual maps in the new plan. A section of the story map also is dedicated to the planning process and community outreach events, highlighting outcomes of community meetings.

## INNOVATION AND ADAPTABILITY

The story map was published the first week of January 2018 before one of our biggest community meetings. The story map was used, although seldom, after a demonstration at the January community meeting but viewership jumped on the three-hundreds the night of the Planning Commission Public Hearing for the Embark Comprehensive Plan amendment, with its mention during the hearing. Following the Planning Commission public hearing there was regular usage of the story map by project inquirers. The Story Map was also commended by the Lee and Mount Vernon Supervisors as an influential and technological step forward for community outreach. On the night of the Board of Supervisors public hearing the viewership of the story map jumped up to over 800 views and continued to hold at this number for the week after the adoption of the Plan amendment. Since publication the Story Map has been continually updated with progress of the Embark Richmond Highway project and related projects.



# MOST SIGNIFICANT DATA CONTRIBUTOR

## Land Survey Branch's Contribution to National Geodetic Survey "GPS on Bench Marks"

Yilia Vega-Claudio

Benjamin L. Neal, Bryan Wilson, Christopher J. Jensen, Cody Allen Harp-Taylor, Dennis Vazquez-Cancel, Gregory B. Harper, Gregg M. Housley, Jennifer L. Miller, Martin Ortiz-Gonzalez, Matthias Strecker, Tonya R. Mills, Vickie McEntire Anglin, Yeoanny Venetsanos

Capital Facilities

Land Survey Branch (LSB) is responsible for GIS spatial data control. Physical monuments are spatial control for quality control and analysis of contractor supplied photo imagery, LiDAR data, and spatial control for engineering development and construction. National Geodetic Survey (NGS) maintains nation-wide mathematical adjustments of spatial values, x, y, and z, or latitude, longitude, and elevation. NGS adopts a new mathematical model representing the Earth, and publishes values on known points around 2022 when they introduce North American-Pacific Geopotential Datum of 2022 (NAPGD2022).

2022 preparation requires defining the new GEOID18. A geoid is a surface approximating the shape of Earth. Through "GPS on Bench Marks," NGS sought data from surveyors across the country to define the geoid. Our data improves the geoid, especially in the mid-Atlantic region.

Through this project, our monuments contribute to NGS's models defining the geoid and NAPGD2022. This significantly improves our stormwater run-off calculations and accuracy predicting flood inundations. Fairfax will have the best possible transformation to future elevation models. Every county mission and private undertaking using elevation data benefits.

LSB will submit GPS observational data from 39 monuments for NGS to include in NAPGD2022 and publish future positional values. Including our monuments in NGS's database shifts publishing the evolving positional data of these points to NGS. LSB retains responsibility for physical monuments. Without this work, Fairfax would be without spatial control data after NGS adopts the new models. NGS will support only monuments with new observations submitted to this dataset. These control monuments in NAPGD2022 insure accurate spatial control for GIS and for construction and land development in Fairfax County.

Simultaneously observing GPS monument constellations in sessions over four hours, twice or more, on each of 39 monuments created "network observations." GIS aided collecting, categorizing, and reporting the network observations. Story Map aided planning these 39 monument observations. Explorer for ArcGIS web map assisted planning over 200 effective routes to recover and visit monuments during network observations. Survey 123 housed collected observation metadata. We processed GPS data through an NGS application, OPUS (On-line Positioning User Service), then shared with NGS pertinent data for "GPS on Bench Marks."

## Land Survey Branch's Contribution to National Geodetic Survey "GPS on Bench Marks"

**One world, Three Earths**  
What's my elevation? It depends!

**Terrestrial** Physical surface (H)  
**Geoid** Equipotential Surface (R)  
**Ellipsoid** Mathematical Surface (h)  
Is not real, is an approximation of the Terrestrial  
Example: Clark 1866, WGS 1984

$H = h - N$   
H = Physical Height  
h = Geoid Height  
N = Geoid Height

The objective is to provide NGS with current positional data on monuments in order to create the best mathematical model of the shape of the Earth in Fairfax County so that our elevation data and positional information is the most accurate possible. NGS will incorporate the data from these monuments into the new geoid definitions created for the future North American-Pacific Geopotential Datum of 2022 (NAPGD2022)

**Survey 123**  
The application Survey 123 was useful to collect data such as Station Name, Mark's PID, Date, Receiver Model, Fixed Height Pole, Observer Initials, Start and Stop Time, Weather data, and Close-Up, Eye Level, & Horizon Pictures.

**Global Positioning Satellite (GPS) Observations**  
Land Survey Branch used five GPS units for sessions receiving data for 4+ hours twice on each of the 39 monuments. Five monuments were observed simultaneously, creating "network observation"

"...we have your data and it is being included in the prototype of GEOID18 that we are working on now. In fact, Fairfax has the best coverage in the region!"  
Galen Scott, Constituent Resources Manager, National Geodetic Survey

**Shared Solutions**

**Story Maps**  
The Map Journal Story Map aided in master planning for each network observation to accomplish the campaign observation of all 39 monuments. The Explorer for ArcGIS web map assisted the field crews in planning a route to effectively visit the monuments each day.

**Old School Surveyors**

Department of Public Works and Environmental Services  
Capital Facilities  
Land Survey Branch  
GIS Day 2018

Interactive mapping application

<https://bit.ly/2RZgqsQ>

# BEST USE OF GIS FOR PUBLIC OUTREACH

# EMBARK RICHMOND HIGHWAY STORY MAP

## PROJECT OVERVIEW:

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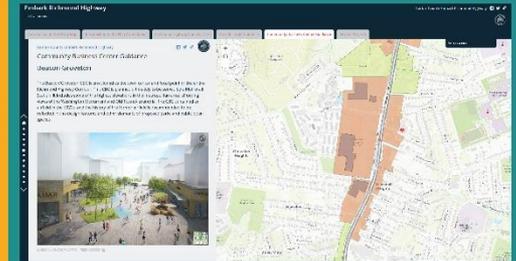


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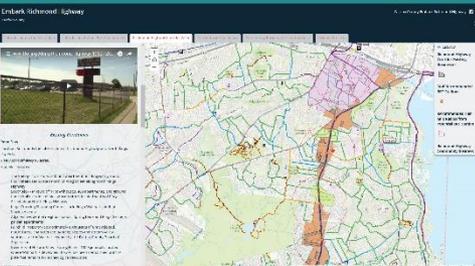
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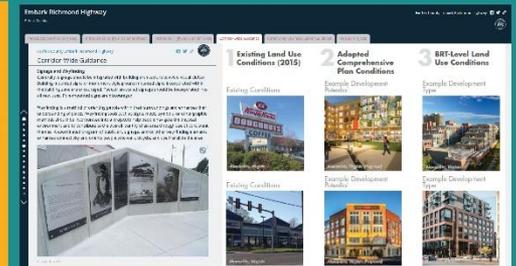
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**Embark Richmond Highway Story Map**  
**Alexis Robinson**  
*Department of Planning & Zoning*

**Interactive mapping application**

<https://bit.ly/2q33ENa>

**County web page**

<https://bit.ly/2Cu2T79>

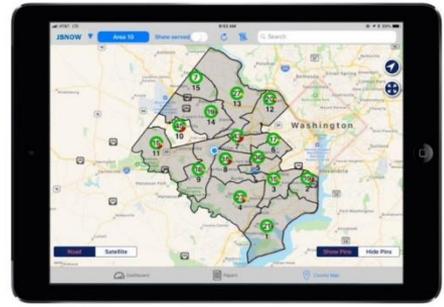
# BEST GIS INTEGRATION

**Advanced Civil Enforcement System (ACES)**  
**Kimberly Ramm**  
**Tyler Corey, Laura Willey, Justin Sherwood,**  
**Steven Quesenberry, Jason Travis, David**  
**Bartee, Sarah Teague, Brandi L. Hart,**  
**Jacqueline McDowell**  
*Sheriff's Office*

The Fairfax County Sheriff's Office, in collaboration with the three Fairfax County Courts (Circuit Court & Records (CCR), General District Court (GDC), and Juvenile & Domestic Relations District Court (JDRDC)), the Fairfax County Department of Information Technology (DIT), the Fairfax County Geographic Information Systems (GIS), and the Fairfax County Court Technology Office (CrTO), implemented the Advanced Civil Enforcement System (ACES), a ground-breaking, hybrid solution automating and integrating the civil enforcement processes between the Sheriff's Office and the three Fairfax County Courts. The system provides a comprehensive civil process solution, with real-time workload management capabilities while prioritizing, tracking, serving and executing legal documents on individuals and businesses in civil matters throughout Fairfax County. ACES interfaces with the Fairfax County Geographic Information System (GIS) ArcGIS improving the Sheriff's Office efficiencies with real-time automated document sorting into service areas with custom routing, mapping, and geofencing. As papers are transmitted or entered into the system, the GIS ArcGIS validates all addresses, reducing time spent on manual verification. The system runs within a secure, stable cloud infrastructure that includes automated redundancy and backup features. ACES is an innovative solution transmitting service data over cellular and Wi-Fi networks to create an easy-to-use, state-of-the-art civil process system.

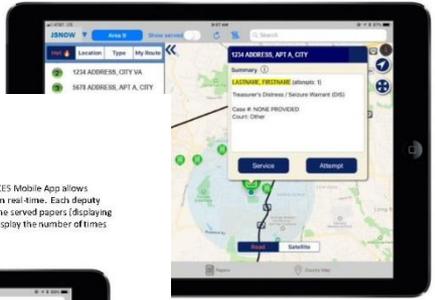
2018 GIS Awards: GIS Integration  
 Advanced Civil Enforcement System (ACES)

The ACES Mobile App provides the command staff with a dashboard providing a real-time status on how many papers are left to be served in each of the Sheriff Service Areas.



2018 GIS Awards: GIS Integration  
 Advanced Civil Enforcement System (ACES)

As the deputy drives through their service area, addresses for papers located within 200 feet of their cruiser automatically pop-up, reducing the need to manually search for the paper in the system. The deputy requires minimal touches in the ACES Mobile App to enter service return information by selecting the Service or Attempt buttons.



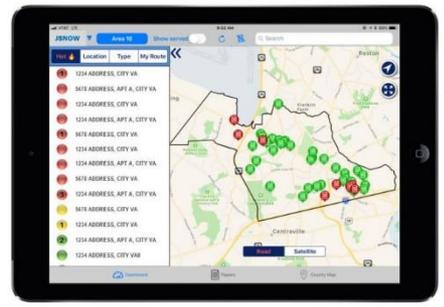
1 deputies and staff  
 each year, and  
 equipment and  
 re cloud  
 1 was completed  
 re. ACES provides

processes  
 using the large



2018 GIS Awards: GIS Integration  
 Advanced Civil Enforcement System (ACES)

Once the deputy receives the papers into their Area work queue, the ACES Mobile App allows deputies to securely manage their workload, serving and executing documents in real-time. Each deputy sees only the papers to be served in their Area. The deputy can choose to see the served papers (displaying a black bubble) or hide them from the Area work queue. The priority bubbles display the number of times the deputy attempted to serve a document.



# BEST GIS INTEGRATION

The Health Department performs routine mosquito inspections of county-maintained stormwater dry ponds where inspectors check ponds for immature mosquitoes and treat with a larvicide, as needed. The inspection program began in 2016.

In 2017, over 8,100 site inspections were performed, 35,000 mosquito larvae were collected and identified, and about 675 pesticide applications were made. In early 2018, staff began working on a mobile solution to field and site navigation, as well as field and lab data collection, using two ArcGIS mobile applications: Collector and Survey123. A staff member taught herself how to customize Collector and Survey123 with the goal of leveraging available technical and software resources to increase staff efficiency in the field and lab by reducing reliance on over 1,400 physical maps and scores of handwritten forms (inspection, larval identification, pesticide treatment records) while maintaining consistent, reliable data collection. Previously, all handwritten forms were later entered into electronic spreadsheets, which took at least 100 staff hours. The apps were customized for program-specific needs and field trials were performed by program staff prior to rollout in Spring 2018.

The geodatabase developed for Collector was based on the physical maps and inspection forms. A point layer captured basic site information (e.g., site identifier, site address, access comments, and photos) for all existing routine inspection locations. Three additional layers were created that related back to the point "site" layer: inspections, treatments, and identifications.

Survey123 was leveraged to eliminate paper forms and documentation. Each related layer had a survey created within Survey123 to capture the required inspection information based on the site conditions present. Other functionalities include photo documentation, area measurements based on physical location and aerial imagery, and conversion calculations (e.g., square feet to acres) when determining pesticide application rates/quantities.

Using Collector, custom URL callouts launch the requisite survey in Survey123 and pull through relevant record information such as site GUID, site identifier and site address. The URL callouts greatly reduce data entry error and allow for consistent information to pass from the site into each survey.

Work progress can be monitored in real-time with minimal data clean-up. Field staff benefit from having previous inspection information available to them. Program staff can share information cross-agency with DPWES and more easily respond to public complaints or inquiries regarding mosquito concerns and dry ponds. As the program expands, additional apps to monitor non-routine inspections will be created.

# Mobile Mosquito Management – A GIS Mobile App Initiative

**Lauren Lochstampfor**  
Health Department



## Mobile Mosquito Management – A GIS Mobile App Initiative

### Using GIS to Change Field Data Collection Methods from Paper-Based to Electronic

Lauren Lochstampfor – Senior Environmental Health Specialist, Disease Carrying Insects Program, Division of Environmental Health, Health Department



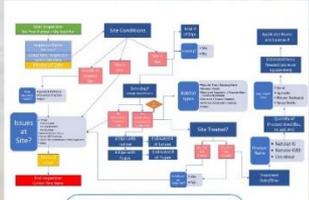
### 2016

- List-based inspections of 1300+ sites
- Paper-based record keeping
- No mobile navigation to sites
- Use GEM to identify locations and then look for them in the field



**Inspection Zones**

Created inspection zones for daily work assignments. Based on 2017 inspection records of how many sites inspectors can complete in one day.



**Geodatabase Plan**

Created Geodatabase in ArcMap for use with Collector and Survey123. Planned what information to capture based on workflow and inspector feedback.

### Routine Inspections



**App Utilization**

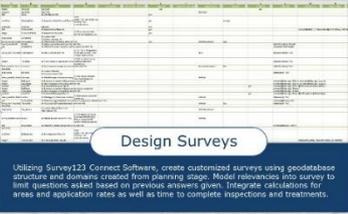
Determine how to use Collector and Survey123 to capture required field data. Collector enables us to maintain an inventory of routine inspection structures. Survey123 allows us to collect multiple records for each site.

### 2017

- Used ArcMap to create paper maps of 1300+ inspection locations and area overviews
- Organized inspection assignments by Supervisor District
- Overview maps created of individual sites created with detailed site specific information, aerial imagery, and pictometry
- Continued paper-based record keeping
- Continued lack of mobile navigation to sites
- Large and bulky map binders were difficult to carry into the field
- Significant amount of hand written data was collected and entered electronically by staff
  - 8100+ Inspections
  - 35,000+ Mosquitoes identified to species
  - 675+ Pesticide applications



Page 1



**Design Surveys**

Utilizing Survey123 Connect Software, create customized surveys using geodatabase structure and domains created from planning stage. Model relevances into survey to limit questions asked based on previous answers given. Integrate calculations for areas and application rates as well as time to complete inspections and treatments.



**Create Web Map**

Created a Web Map in ArcGIS Online to use in Collector project. Integrate layers for inspection zones and sites, access and parking for sites, stormwater assessments, park trails, and adult mosquito trap locations. Symbolized inspection completion status using color. Create custom URL callouts to pull data from features into surveys and eliminate errors in data entry. Show post inspection, treatment, and identification results in pop-ups.



**Collector**

**Survey123**

### Benefits of Going Mobile

- No more paper maps or forms!
- No additional data entry—all data collection performed in field by technicians
- Navigate to addresses for sites with mobile apps
- Visual ability to see where and when inspections are completed
- Historic inspection, treatment, identification information as well as site photos available in the field
- Increased ability to track additional information from inspections and report issues to stormwater management

### Future Plans

- Public face data to allow residents to monitor mosquito inspections in ponds near their homes
- Increased collaboration with DPWES to quickly report issues with structures
- Perform additional analysis on new data types collected with surveys (ie. Inspection times vs site wetness)
- Develop additional app for non-routine inspections, adult mosquito surveillance, outreach tracking, and citizen assists / complaints tracking

**Web map**

<https://bit.ly/2PEIMH8>

**County web page**

<https://bit.ly/2PCKOCD>

# Fairfax County Government Center Campus Stormwater Management Facilities

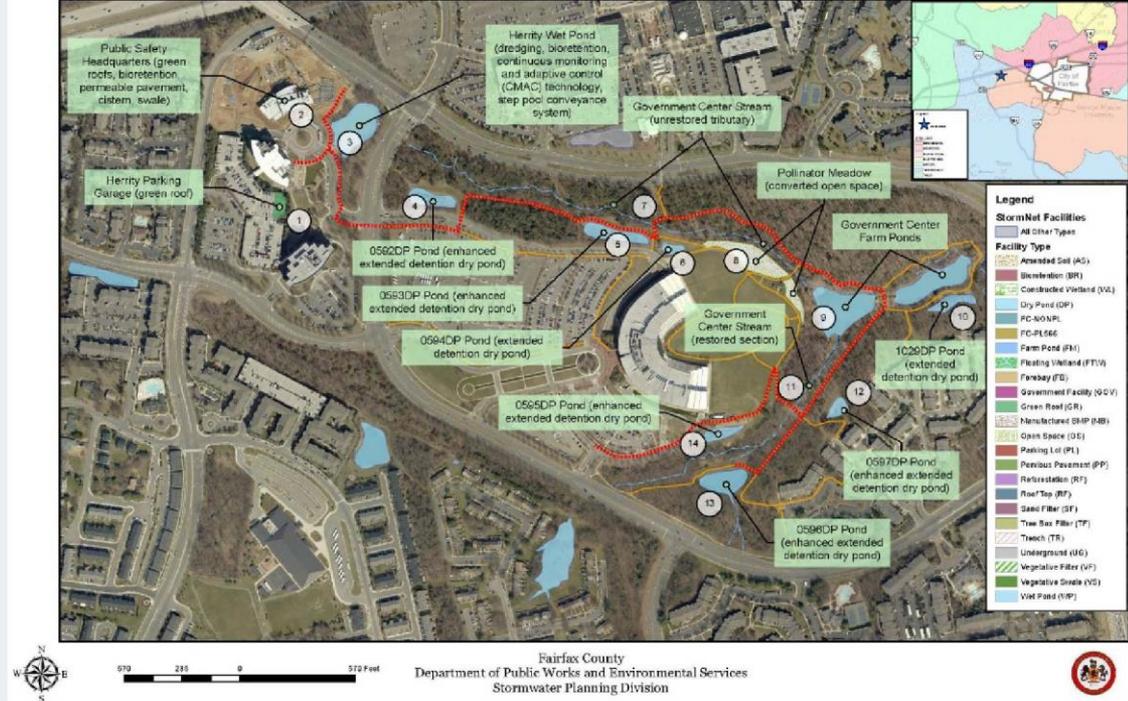
There are many examples of stormwater management facilities at the Fairfax County Government Center complex. On this walking tour you will see wet and dry ponds, a native meadow, restored streams, an automated valve, bioretention areas, vegetated swales, permeable pavers, a step pool storm conveyance system, and a rainwater harvesting feature.

## Herrity Parking Garage Green Roof

A green roof is a widely-known low impact development practice that traps rainwater and allows it to soak into the medium that is planted over a waterproof membrane. This filters and slows the release of rainwater.



## Fairfax County Government Center Complex Stormwater Management Walking Tour



This app will guide you on a walking tour of stormwater management facilities around the Fairfax County Government Center. The purpose of the facilities is to collect runoff, control flooding, encourage detention & infiltration and improve water quality.

The GIS story map was created as a "rainy day option" for the Chesapeake Bay Commission, which met in Fairfax County in September and toured the Government Center's stormwater management facilities. The Commission is a policy leader in the restoration of Chesapeake Bay and serves as a liaison to Congress.

On this walking tour you will see wet and dry ponds, a native meadow, restored streams, an automated valve, bioretention areas, vegetated swales, permeable pavers, a step pool storm conveyance system, and a rainwater harvesting feature.

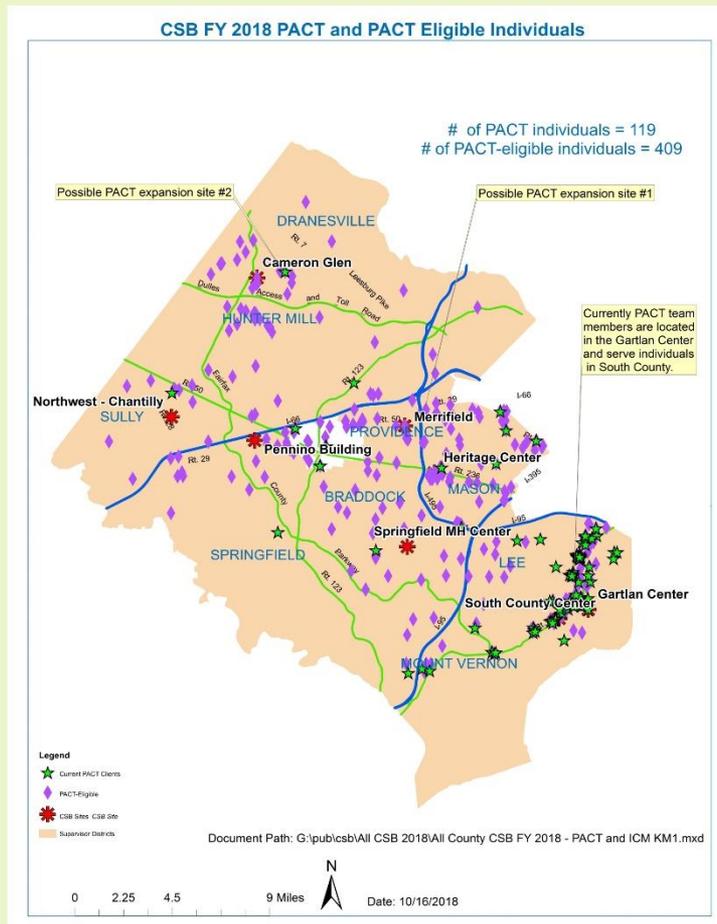
The next time you take a walk around the Government Center campus trails, open the new GIS app and learn about the variety of stormwater management facilities in use. You can take the tour from your desktop, too. There are lots of photos, and the facility descriptions are short and sweet.

**Interactive mapping application**

<https://bit.ly/2QUns0B>



# CSB PACT and PACT Eligible Population



## Abstract

The CSB currently runs the Program of Assertive Community Treatment (PACT), an evidence-based, multi-disciplinary team model that provides enhanced support services for individuals with mental illness, substance use and co-occurring disorders. The PACT team uses a holistic approach that emphasizes diversion from hospitalization or incarceration by increasing the intensity and type of services. PACT is a cost-effective treatment model. The cost per individual served is about \$12,000 per year compared to over \$28,000 for a 30-day psychiatric hospital stay.

There is currently one PACT team that works out of the Gartlan Center serving individuals in south county. In FY 2018, there were 119 individuals who received this level of service. But the CSB wanted to know if there was a need for additional PACT teams in the county. And if so, where would that team be best located? The CSB used point analysis of the current CSB clients who would be considered eligible for this level of care. Based on this analysis, an additional 409 individuals were found to be PACT eligible. These were mapped and resulted in identifying additional need in both the central and northern parts of the county. Proposed PACT sites include the Merrifield Center in Fairfax and the Northwest Center in Reston.

The results of this analysis are being used by the CSB and key community stakeholders to advocate at the local, regional, and state levels for additional PACT-dedicated resources, to best serve the needs of individuals in the community at a lower cost.

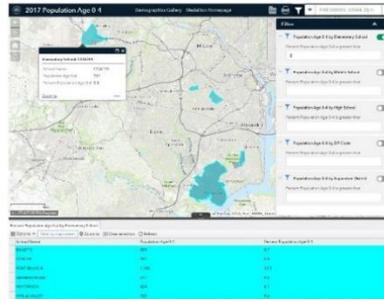
# OSM GIS Integration

Over the past year, staff from Office of Strategy Management (OSM) has collaborated with GIS on numerous projects for Health and Human Services, and the county as a whole. The division has used three separate platforms on four separate projects, including web mapping applications, infographics and a story map. The diversity of the platforms, detailed below by type, allows for different functionality and the ability to reach multiple audiences, including internal staff, non-profits, the community and potential investors. GIS has the ability to aid in planning purposes by geographically mapping population based data along with service locations, transportation routes, etc. By bringing these tools together to provide tailored data, OSM seeks to advance county operations. The increased integration with GIS has allowed the division to gain insights into available data and aid in the strategic planning for Fairfax County. The work has been demonstrated in front of community groups, committees and the Board of Supervisors, with positive feedback from each audience. The tools developed have increased efficiency by allowing the community to access data on their own, as well as streamlined the ability to respond to data requests directly.

## Web Mapping Applications

### 1) Medallion

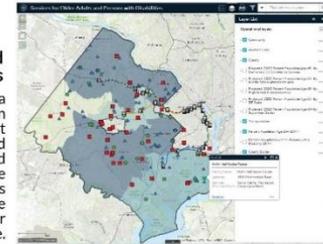
These interactive applications provide the user with tools designed to query and visualize demographic variables in Fairfax County. The applications are organized into three primary categories: Demographics, Income, and Health. Most variables are aggregated to five different geographies: elementary school attendance area, middle school attendance area, high school attendance area, ZIP codes, and supervisor districts.



<https://www.fairfaxcounty.gov/health-humanservices/medallion>

### 2) Services for Older Adults and Persons with Disabilities

This interactive application can be used as a tool to assess the relationship between where adults age 65+ or households with at least one person with a disability reside and where county, community and assisted living services for these populations are located. This can be used to identify needs and gaps in services, especially given the projected growth in the older population for Fairfax County in years to come.



<http://fairfaxcountygis.maps.arcgis.com/apps/webappviewer/index.html?id=76dfda1d5c0c41da8eae3d3923684146>

### 3) Opportunity Zones

Within the Federal Tax Cuts and Jobs Act of 2017, a new tax incentive program called Opportunity Zones was created by Congress as a means to encourage economic development and revitalization in targeted areas across the country. This interactive application was developed as a way to provide information on the nine identified Opportunity Zones within Fairfax County to the public at large, including potential investors, as well as track the changes and progress over time.



<https://www.fairfaxcounty.gov/health-humanservices/opportunity-zones>

## Infographics

### 1) Opportunity Zones

An interactive infographic was created for each of the Opportunity Zones mentioned above, as well as one for Fairfax County as a whole for comparison. Each infographic contains information on demographics, race and Hispanic origin, housing, at risk populations, education, and employment.

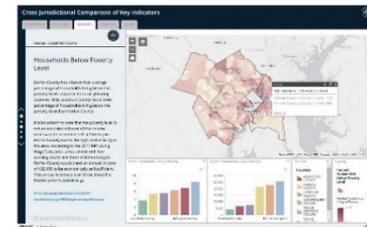


<https://www.fairfaxcounty.gov/health-humanservices/opportunity-zones>

## Story Maps

### 1) Cross Jurisdictional Comparison of Key Indicators

This story map highlights similarities and differences in various population-level indicators, such as race, educational attainment, and median household income, between Fairfax County and neighboring counties in Northern Virginia and Maryland. These neighboring counties include Montgomery County (MD), Arlington County, Loudoun County, Prince William County, and Prince George's County.



<http://fairfaxcountygis.maps.arcgis.com/apps/MapSeries/index.html?appid=75ae162ab6144b20bc3971cf92755a48>

Continued use of GIS is integral to OSM's work. For example, the data in Medallion will need regular updating to allow for timely user-friendly information, as well as trend data. Furthermore, OSM will be leveraging all these GIS tools for projects related to the Human Services Needs Assessment due Spring 2019, new work to benefit the health and human services system, and continued collaborations with other county agencies.

County web page -  
Medallion

<https://bit.ly/2RUw3Se>

County web page -  
Opportunity Zones

<https://bit.ly/2RNsiOt>

Interactive mapping  
application

<https://bit.ly/2Ov9yoE>

# Services for Older Adults and Persons with Disabilities

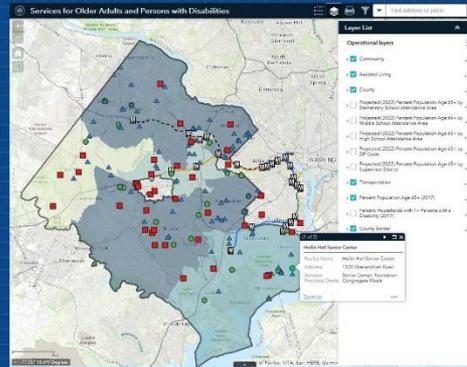


OSM developed the Services for Older Adults and Persons with Disabilities interactive mapping application as a tool to assess the relationship between where adults 65+ or households with at least one person with a disability reside and where services for these populations are located.

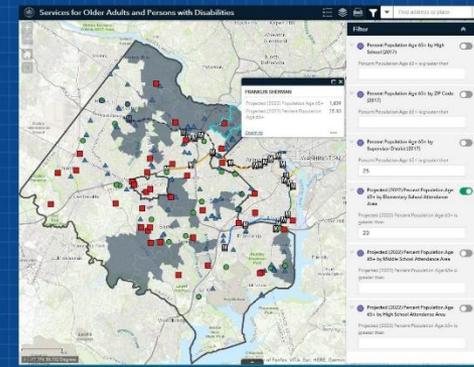
This web mapping application allows for county staff and stakeholders to assess the current services available to older adults and persons with disabilities within Fairfax County, and geographically identify any unmet needs or gaps in those services. As the older population of Fairfax County continues to grow, this information is critical in making strategic decisions for long term planning of future services.

Points on the map that have pop-up information include the following:

- 1) County and Community services listed in the Human Services Resource Guide with specific addresses where standard services are provided and can be mapped (e.g. not clients' homes)
- 2) Assisted living facilities (found through researching the Spring/Summer 2018 edition of *Retirement Living Sourcebook* and cleaning data provided by the Department of Management and Budget's Demographics unit)



The map above shows the expanded layer list with all items displayed by default checked and, therefore, turned on. A pop-up for the Hollin Hall Senior Center is also shown.



The map above shows the filter function with the Projected (2022) Percent Population Age 65+ by Elementary School Attendance Area that are greater than 20%. A pop-up for the Franklin Sherman Elementary School Attendance Area is also shown.



The map above shows the attribute table at the bottom, displaying the information from the pop-up shown. The options button is expanded to show the feature in which the data from the attribute table can be exported to a CSV file. The print function is also shown which allows the user to create a PDF, JPG or PNG and print the map they create, including a legend and customized map title.

Background data on the map defaults to Percent Population Age 65+ (2017) by Supervisor District, but by zip code and school boundaries for elementary school, middle school, and high school are available as well. Percent Households with 1+ Persons with a Disability (2017) is available as background data in the geographies specified above. There is also an option to see where the population age 65+ is projected to be in 2022, an added benefit for planning purposes. These geographies also have pop-ups. Transportation information is also available in the application including, Metrorail stations and lines (on by default), and bus routes, shelters, Park and Ride lots, VRE, and future Metro lines (available as layers).

## Interactive mapping application

<https://bit.ly/2Ov9yoE>

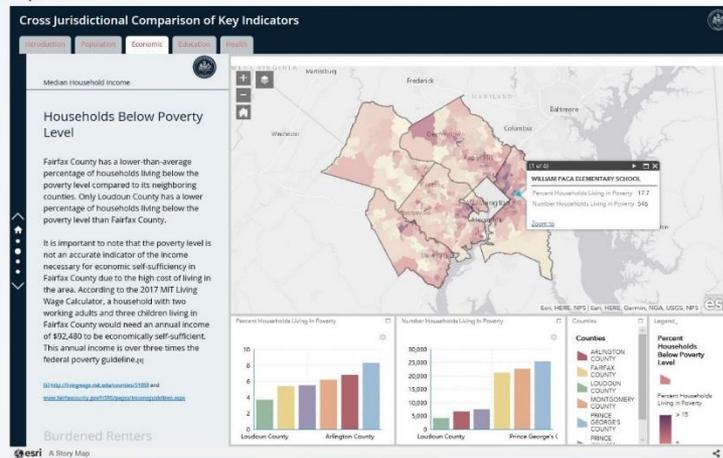


# Cross Jurisdictional Comparison of Key Indicators

The cross jurisdictional web mapping application, shown below, highlights the similarities and differences in various population-level indicators between Fairfax County and neighboring counties in Northern Virginia and Maryland. These neighboring counties include Montgomery County (MD), Arlington County, Loudoun County, Prince William County, and Prince George's County.

The information contained in this story map can be used by a variety of audiences, including the Board of Supervisors, county agency leadership, Planning & Zoning, and county residents as well as non-profits and businesses that may wish to open offices or start programs in certain areas. This application is important as a way to understand how Fairfax county is doing in comparison to other counties in the Washington metropolitan region.

Indicators were organized into four categories shown in the tabs below: population, economic, education and health. Population indicators include total population, number of households, population change rate, household change rate, population by race and age, median age, and population that speaks English "not well" or "not at all." Economic indicators include median household income, income distribution, households below poverty level (shown below), burdened renters, and employment. Education indicators include no high school diploma, high school graduate/equivalency, some college or associates degree, and bachelor's degree or higher. Health indicators include residents with health insurance and households with 1+ persons with a disability.



The data contained in the application was created using Esri's Business Analyst Desktop. The data comes from Esri's Updated Demographics and the American Community Survey (ACS) 5-year estimates. Esri's Business Analyst software was also used to aggregate the data to a custom sub-county geography - elementary school attendance areas (shown in the map above).

The application contains several customized tools and features created using various Esri ArcGIS Online applications. At its core, the application is a story map, which brings together text, maps and charts to bring additional meaning and context to the data obtained. A tabbed story map was combined with a journal story map to streamline the look of the text and organization of the application, while allowing increased functionality. Web mapping applications were created and embedded in the story maps to visually illustrate the data in the narrative geographically for all six counties by elementary school attendance areas. As another way to visualize the data, infographic charts of the overall county data were also embedded into the web mapping applications.

Interactive mapping application

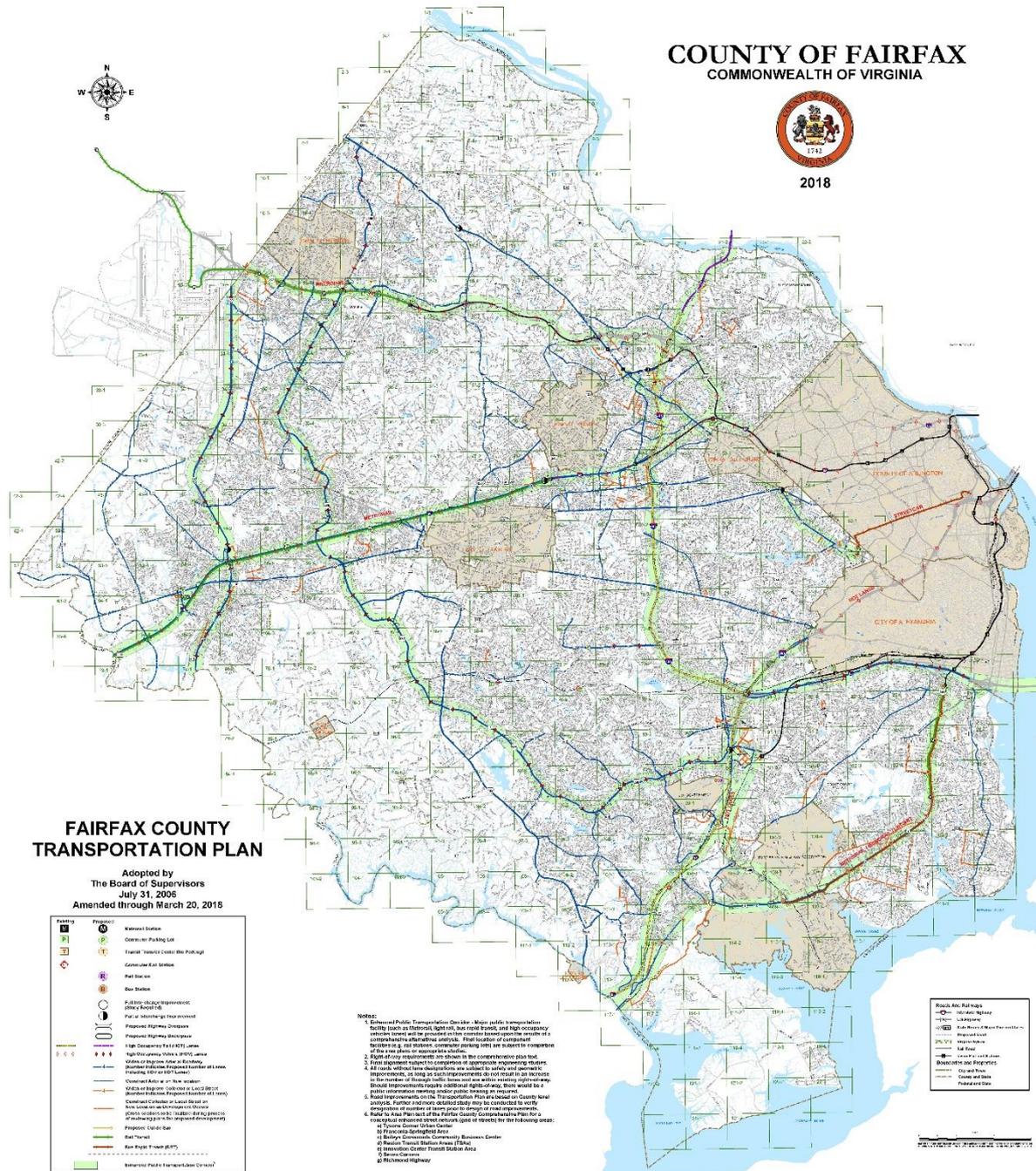
<https://bit.ly/2pVXIoz>

<http://fairfaxcountygis.maps.arcgis.com/apps/MapSeries/index.html?appid=75ae162ab6144b20bc3971cf92755a88>

**Transportation Plan Data**  
**Thomas A. Wampler, Dahae Hwang,**  
**Arpita Chatterjee**  
**Department of Transportation**

The Transportation Plan (TransPlan) is an element of the Fairfax County Comprehensive Plan and serves as a guide for long-range transportation development in the County. The Transportation Plan Map (TPM), adopted in 2006, illustrated the existing and planned elements of our multi-modal transportation system. Updates to the TPM followed a two-year schedule and required researching individual amendments to the Comprehensive Plan to determine how they should be displayed. The original GIS data consisted of little more than a classification type and a field to track if a feature had been removed from the plan; removal would not specify if the feature had been implemented and built or removed from consideration. The current dataset now contains over 1300 features under a standardized attribute schema that includes the name of the feature, To/From information for streets, planning district(s) and if the feature is part of a special planning area with additional requirements as outlined in the Comprehensive Plan, amendment & date tracking for when features are modified, and expanded status information to reflect phases of completion.

By standardizing the attribute information that constitute the Transportation Plan, seven 'Grid Streets' located in several special areas of the TPM (Tysons, Franconia-Springfield, Baileys Crossroads, Reston, Innovation Center, Seven Corners, Richmond Highway) were able to be brought into the TPM reducing the number of separate feature classes from fourteen to six and reducing separate geodatabases to the single Enterprise Geodatabase. This centralized location allows for users of the TPM data to easily retrieve the latest information as amendments to the Comprehensive Plan are made and implemented. Using the new TPM dataset as a template, other Comprehensive Plan components such as the Bike Master Plan and Trails Plan, are being updated to meet similar standards as the TPM dataset.



# Reston Safe December DWI(D) Enforcement and Education Initiative

**Brandi T. Horita**  
Police Department

The purpose of this project was to supplement the Reston District Police Station's "High Impact," driving while under the influence of alcohol or drugs DWI(D) enforcement plan. These plans targeted strategic date ranges and times surrounding the end-of-year and New Year holidays and festivities. These high impact efforts included Reston patrol officers completing proactive patrol during their assigned shift and looking for motorists exhibiting signs of driving while impaired.

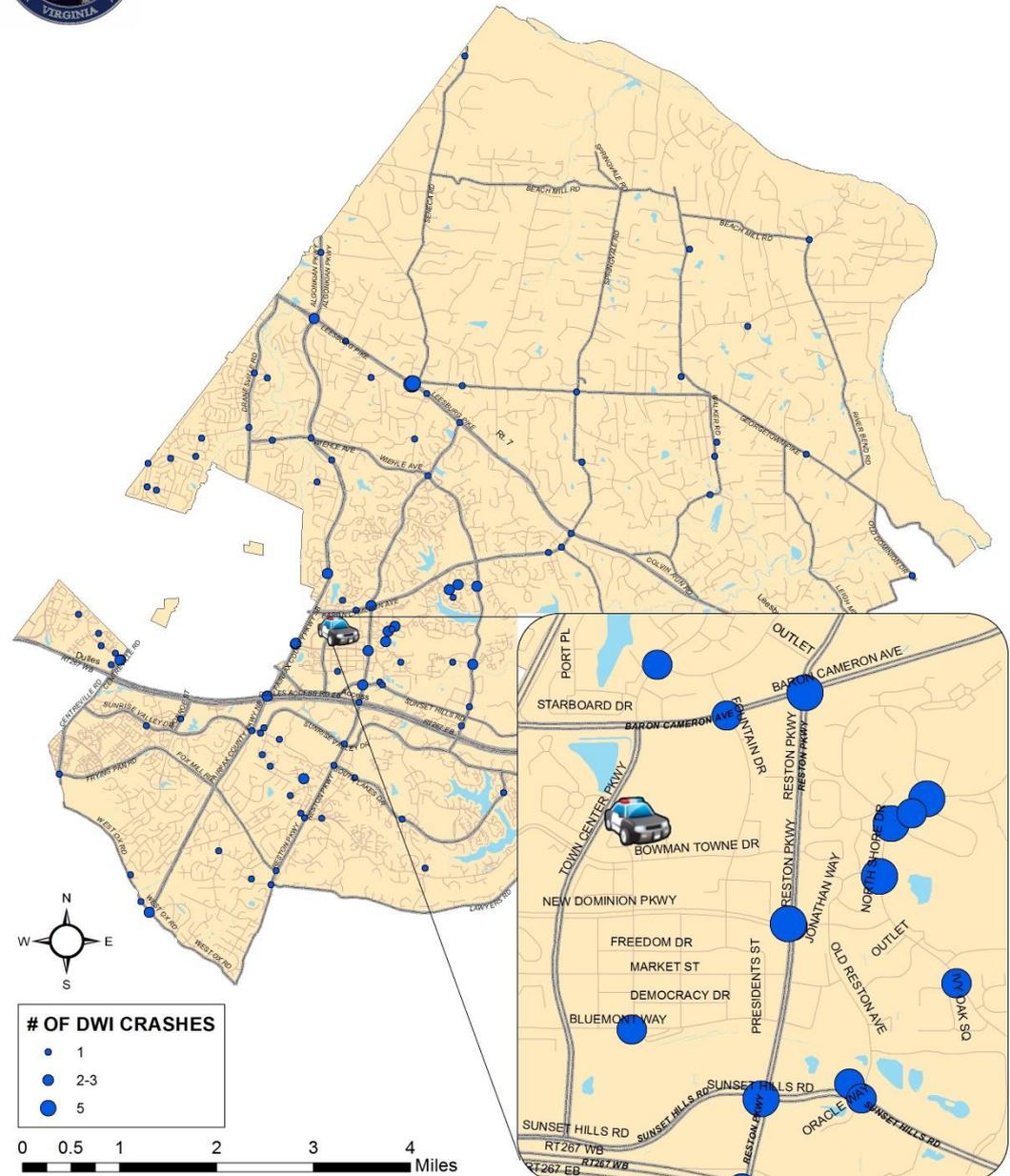
Clusters of crash incidents may be indicative of roadways in which drunk or drugged drivers are frequently traveling; either because the roadway is a major thoroughfare and/or because of proximity to locations providing alcoholic beverages. Plotting these locations in our local district allows us to visualize roadways where intoxicated drivers are frequenting. Alcohol and drug related crashes are included on this map so that we may decide where to concentrate resources to provide the maximum reduction in the number of impaired motorists on the roadways and subsequently, potentially *prevent injury and death*. The most accurate and recently available alcohol and drug crash data from the Virginia, Traffic Records Electronic Data System (TREDS) was used to plot the map incidents

The overall scheme of the map elements, colors, simple shapes, legend and the "blow-out" portion was created for ease of use and quick recall. It was displayed in large poster size in the roll-call room where it could be widely viewed and discussed pre-shift or used for operational awareness in patrol's everyday traffic safety efforts. The map was segmented to the Reston District police service area with the blown-out portion including the Reston Town Center, an area where many drinking establishments and restaurants are concentrated within the district. Major streets are labeled for reference purposes. The map project was provided to patrol and Reston Station Commanders as part of a complete package including a strategic schedule and locations for proactive patrol, education for officers (training), education for our community and businesses, resources available, SoberRide initiatives, and finally our community partnerships and outreach.

The results of the use of the enforcement and education planning package by the Reston District Police Station may be measured by the number of DWI(D) arrests made on our roadways during these special enforcement campaigns.



## DWI(D) CRASH HOTSPOTS RESTON DISTRICT



## Aerial Imagery and Computer Assisted Mass Appraisal

### Yorka Crespo, Peggy Kitzmiller

#### Department of Tax Administration

The Virtual Neighborhood Walk (VNW) Program was initiated to reduce cost, leverage our integrated CAMA system and assist in meeting the International Association of Assessing Officers' standards for data collection and data quality. Changes in the county budget and to county practices have required the Department of Tax Administration (DTA) Real Estate Division (RED) to become more resourceful to meet our goals. At one time the county had a team of data collectors, going door to door, inspecting the exterior of residential properties to update records. With budget cutbacks, we no longer have a Data Collector team and appraisers have now taken on this role.

In 2015 DTA RED contracted Pictometry/Eagleview to analyze our 2011 and 2013 aerial imagery. Their analysis identified changes to residential structures by outlining all structures from 2011 and overlaying those images over 2013. They then identified a percent change of the structure based on the original and new areas. This project was repeated for the 2015 fly over images. To maximize the effectiveness, appraisers focused on reviewing parcels with major changes. The project proved effective but, it came with a cost. When the 2017 flyover images became available, DTA RED decided to wait and see if they could develop their own project for systematically reviewing aerial images. The division already had all the necessary components in place, as an aerial platform had already been fully integrated into the appraisal software (Tyler Technologies iasWorld). Analysts simply had to create the framework to identify, track and report parcels reviewed via aerial imagery and appraisers had to be able to review properties easily and systematically while tracking their progress.

Fortunately, iasWorld has the flexibility to allow the analysts to create new project codes and new reporting tools to make it possible to work VNW from completely within the iasWorld system. The entire residential team had to work together to make it happen.

Using reporting tools provided by analysts, the residential supervising appraisers had to identify neighborhoods that required a complete review. Analysts then created 5 new codes in iasWorld to identify stages of completion of the VNW project. These stages were used to track the project at a parcel level. The list of neighborhoods requiring review were provided to the analyst, and parcel records were updated in batch. Appraisers received training on how to identify, research and update property records in iasWorld.

The project was very successful. Appraisers saved time by having all the necessary applications within one system. They could compare aerial images to our sketches, review permits and sales data, and review notes from other appraisers etc. The project provided an efficient means to verify the uniformity and accuracy of data for an entire neighborhood at one time.

# Aerial Imagery and Computer Assisted Mass Appraisal

*Leveraging Our Integrated Systems to Save Tax Dollars*



## Maintaining Standards of Excellence

The Department of Tax Administration is an award winning, high performing organization dedicated to maintaining the highest standards of data quality. Routine periodic inspections of real property are necessary in order to identify physical changes and ensure data accuracy.



## Outsourcing Data Analysis

One way to maintain up to date property records is to hire an outside source to analyze imagery and identify changes to properties. To do this, analysts take prior year imagery, outline existing structures and then overlay those outlines onto current imagery, identifying changes to properties. Appraisers are given a list of properties with changes for review. The analysis is done immediately after the images are captured (every two years).

## Outsourcing Issues

1. Meeting the Standard: By focussing only on changes, not all properties within a particular neighborhood get a review. Industry standards dictate that all properties within a jurisdiction must be inspected periodically.
2. Overlapping efforts: Physical changes to properties are, for the most part captured when there is a good system in place for tracking permits. Fairfax County's Department of Public Works and Environment Services has an excellent permit tracking system.
3. Cost: The cost of hiring an outside source to complete the analysis.

## In-house Analysis

The department already had all of the components to complete an aerial inspection project completely in-house. But to conduct a review of this magnitude, preparations had to be made. Analysts had to create the framework to identify, track and report parcels reviewed via aerial imagery and appraisers had to be able to review properties easily and systematically while tracking their progress.

## Virtual Neighborhood Walk (VNW)

**Analyst Steps**

- Provide reports to ID properties requiring review
- Create and insert new set of VNW codes into database
- Update records in batch with new VNW code

**Appraiser Steps**

- Search for parcels with a V5 code in iasWorld
- Create a working list of parcels requiring review
- Select all parcels, open an editing window and the aerial imagery window and begin reviewing the first parcel on the list
- Verify data accuracy by viewing structure from all angles (north, south, east and west), using the measuring tools to measure objects, and viewing current and prior year aerial imagery
- Update the property record with any changes
- Verify significant changes to living area in the field
- Change the status from "Not Reviewed" to "Reviewed"

**Annotations:**

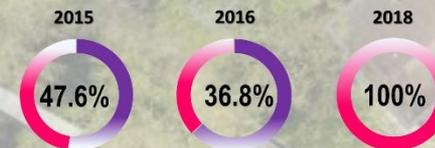
- This V5 Code identifies properties needing review.
- Querying the V5 code will create a working list which makes it easy for appraisers to navigate from parcel to parcel.
- Use the dual pane mode and drop down option to view images with different image capture dates.

## Results

### Percent of Total Residential Parcels Reviewed



### Revenue Generated as a Percentage of Cost



# Fairfax County Health Department: STAMP Program Web Application

## Division of Environmental Health, Consumer Protection Program

Lauren Lochstampf and Shannon McKeon

The STAMP Program web application was designed to promote awareness of the Health Department's STAMP (*Safety Through Actively Managing Practices*) program and to highlight program participants. STAMP is a voluntary enrollment program aimed at assessing and promoting proactive food safety practices and recognizing food service establishments for their food safety management systems. Proactive use of Active Managerial Control (AMC) helps establishments provide safe food to the community.

A food service operation that is successfully enrolled in the program has a marker placed on the web application, which is available to the public on the Health Department's website. Site users can use the Near Me tool to search for STAMP participants that are located within a certain distance of a specified address. Users can also search for a specific STAMP program participant by typing in the name of the facility.

The web application allows for easy identification and location of STAMP program participants. Enrollees have passed a rigorous evaluation of their food handling practices, so citizens may dine at these facilities with the confidence that foodborne illness risk factors are being controlled through proactive food safety management practices. It is a goal of the program to empower citizens to make informed decisions about where they eat. The web application provides an easy mechanism by which they can identify restaurants that demonstrate best practices in food safety. It is also a goal of the program that the positive recognition associated with enrollment and identification on the web application will encourage food service operators to strive for participation by beginning or improving the use of AMC in their operations.

### County web page – STAMP Program

<https://bit.ly/2HSww2y>

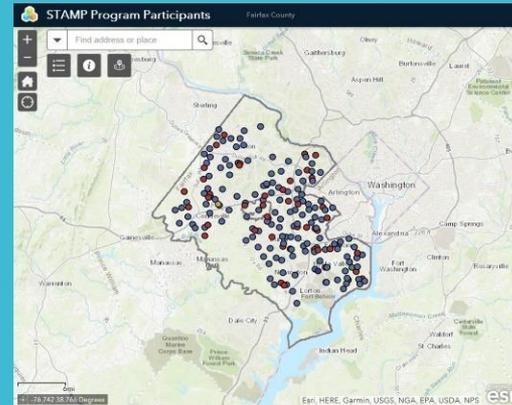
### County web page – STAMP Participants

<https://bit.ly/2AfkPAI>

### Interactive mapping application

<https://bit.ly/2q02qlv>

A Web App was created to showcase which food service establishments in Fairfax County are recognized as STAMP program participants. This Web App is available to the public on the Health Department's Website.

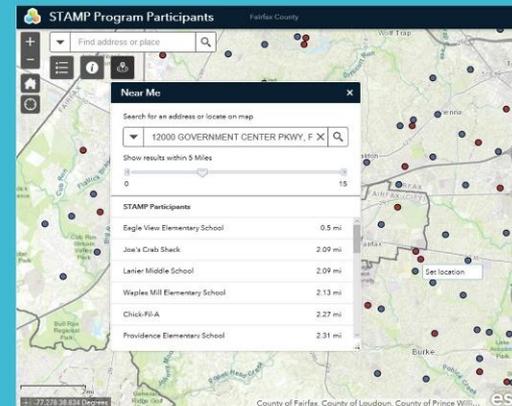


The Web App opens with an About Splash screen that links back to the public website for the STAMP program. The website lists all STAMP program participants.

Each colored dot on the map represents a different facility type. When you click on a dot, the pop-up shows the facility name, street address, city, date of enrollment in the STAMP program, and type of facility.



Site users can use the Near Me tool to search for STAMP participants that are located within a certain distance of a specified address. Users can also search for a specific STAMP program participant by typing in the name of the facility.



Fairfax County Health Department is proud to present STAMP [Safety Through Actively Managing Practices] — a voluntary enrollment program aimed at assessing and promoting proactive food safety practices and recognizing food service establishments for their food safety management systems. By being proactive through the use of Active Managerial Control (AMC), establishments are able to provide safe food to the community. Through partnership with the Health Department, STAMP enrollees demonstrate that they have strong policies, robust food safety training, active monitoring procedures and corrective actions that allow the operators to establish control over foodborne illness risk factors.



# Integrating GIS into Land Development Services

## BACKGROUND

Land Development Services (LDS) is responsible for facilitating the safe and sustainable development of communities in Fairfax County, which is best achieved through excellent and efficient customer service. Our agency is constantly evolving to meet the changing needs of our customers and utilize the latest technology to find better ways to deliver our services. During the past two years, LDS has invested considerable time and resources in developing our agency's GIS program, recognizing that GIS offers a wealth of opportunities to better serve our customers and help us streamline our business.

In 2016, LDS leadership solicited input from the Department of Information Technology (DIT) GIS team to better leverage GIS technology in LDS. At the time, GIS was used sporadically in LDS. A working group, consisting of staff from both LDS and DIT GIS, developed a vision for better integrating GIS into LDS and created a work plan to lay the foundation for greater GIS use in the agency. This included staff interviews, surveys and training, which led to an assessment report created by DIT GIS staff summarizing the state of GIS in LDS, with recommendations for next steps. GIS momentum was building in LDS, the need for an in-house expert was evident.

In April 2018, Brett Martin was hired as LDS's first GIS analyst, charged with officially kicking off LDS's GIS program. Brett arrived with a wealth of experience and knowledge from his years working in Stormwater Planning, and was brimming with energy and ideas. Brett immediately immersed himself into the LDS lines of business. He met with staff at all levels, showcasing plan reviews, following the routine of county staff and sitting along with inspectors to understand their day-to-day activities. He launched a Steering Committee, consisting of staff from all divisions in LDS, which updated the LDS GIS work plan and meets monthly to provide feedback and guidance.

Within the first six months, Brett has launched numerous tools and applications, bringing GIS to the fingertips of agency staff, closing process gaps and streamlining processes. Some of the recent accomplishments have included:

- ✓ Type of Construction Application (public-facing)
- ✓ Soil Viewer Application (public-facing)
- ✓ Floodplain Viewer Application (public-facing)
- ✓ Mobile LDS Field Map Application for site inspectors (internal)
- ✓ Curve Number Calculation Tool for SDD reviewers (internal)

Developed LDS Authoritative GIS data, including:

- ✓ Type of Construction Layer
- ✓ Site Construction History Layer
- ✓ Citizen Technical Assistance Layer
- ✓ Countywide Reclassification of 2015 Landcover
- ✓ Future Construction Escrow Layer
- ✓ LDS Inspection Areas

## TYPE OF CONSTRUCTION VIEWER

When constructing a new building, the Virginia Uniform Statewide Building Code requires the structure to be assigned a Type of Construction based on its combustibility and level of protection against fire. In addition, the building code assigns a fire Group that identifies the occupancy based on how the building is used. This information is extremely valuable for designers who are charged with interior alterations or the rehab of an entire building. The Type of Construction Viewer is the result of records of data gathering - from yellow cards in a filing cabinet dating back to the 1980s, to an Access database maintained by staff, to the Fairfax Inspection Database (FID). To gain access to the historic information, customers had to call Building Plan Review and send staff to look up the address in the Yellow Card Database. Now this information is all publicly available via GIS.

This was a perfect opportunity to utilize GIS to not only increase efficiency of an internal process, but also provide this much-needed information to the public in interactive mapping application. The first step in this process was geocoding the 14,000 records that existed in the database. This was a time-consuming process due to the age of some of the addresses. We wanted to make this an application for not only the historic data from the Yellow Card Database, but a one-stop shop for all type of construction data. This meant we would also need to extract building data from FIDO from 2006-Present and set up a process going forward to update the Type of Construction Layer monthly with FIDO data. Once we had the data model finalized we moved it to the Enterprise Geodatabase, published the Type of Construction and added it to an ArcGIS Online Web Application.

This application has been very well received by LDS Building Division as well as the public. The application has been public for four months and is averaging 300+ views per month.

## FLOODPLAIN VIEWER

The Floodplain Viewer is an effort to centralize all Fairfax County Floodplain data and related information into one application. There are multiple county Floodplain layers that each have their own history and uses. However, they are all referred to as floodplain and are used in the county's plan review process to flag potential construction in these areas. There are four primary floodplain layers in this app:

- ✓ FEMA Flood Hazard Areas
- ✓ County Recorded Floodplain
- ✓ Watershed Management Plan 100yr Floodplain
- ✓ 70ac Stream Network

The Floodplain Viewer provides detailed meta data on all the floodplain layers and the contact information for the county agency responsible for fielding questions about that data. The app also links to the county's geospatial open data site for downloading the floodplain layers. This is also the first time that public has had access to the Watershed Management Plan 100yr Floodplain and 70ac Stream Network. Having this information readily available in one location educates both county staff and the public, which leads to more informed decision making.

## SOILS VIEWER

The Soils Viewer is very similar to the Floodplain Viewer. There was a need to centralize all soils and soils-related data into one location. All construction plans submitted to the County for permits that require the inclusion of soils mapping should reference the 2018 soils map. This app also provides a link to the county's geospatial open data site to download the current Soils Map data to be used in an applicant's plan submission. The Soils Viewer contains the problem soils layers as well as the historic information. It also provides meta data on all the soils data as well as links to the problem soils such as the Health Department's material on problem soils like Potential Adhesives Containing Soils or Radon Potential Areas. This app, much like the Floodplain Viewer, puts important GIS data at the public's fingertips.

**Type of Construction Viewer**

This screenshot shows a web-based application interface for the Type of Construction Viewer. It features a map with various colored overlays representing different construction types. A sidebar on the right contains a legend and search filters. A text box on the map provides details for a selected location, including the address, type of construction, and fire group.

*"Brett has had a huge impact on our business. Customers can now see historic data for most buildings in the county. This has been well received by the design community and has made the task of reviewing building plans much easier for staff!"*

*Brian Foley, Fairfax County Building Official*

## LDS FIELD APP

LDS Site Development and Inspections Division (SDD) performed 58,461 site inspections in FY2017. During the GIS assessment performed by DIT GIS, the SDD inspectors requested a mobile application for viewing GIS in the field. Having instant access in the field to detailed information on wastewater infrastructure, stormwater infrastructure, easements, floodplains and complaints data increases efficiency in their daily workflow. Before the LDS Field App, the data would have been accessed once they got back to the office or by sending out the county network and accessing GEM.

The decision was made to publish this application through Portal for ArcGIS and the users would use Explorer for ArcGIS to view the map. Having the app in the Portal allows us to restrict access to county employees while still providing any associated cost. This also allows us to include any sensitive data that is not intended for use by the public. The first step was getting up level 1 Portal accounts for all the inspectors. We then used the Where banner app to set up a VPN and safely access the Explorer for ArcGIS App through the ITR Apps store. This allowed the inspectors to have access to the app in their County Phone. Then we scheduled a training session on installation of the VMware Tunnel App, Explorer for ArcGIS and performed a demonstration on how to use the Explorer for ArcGIS App. We received great feedback on the app and have given the user base to include all LDS employees who have County Phones.

**LDS Field App**

This screenshot shows the LDS Field App interface on a mobile device. It displays a map with various colored overlays representing stormwater facilities. A sidebar on the right contains a legend and search filters. A text box on the map provides details for a selected location, including the address, facility ID, and stormwater facility type.

*"The new application to unify stormwater complaints from LDS and our partner agencies and to give all of their knowledge in an app readily accessible in the field provides an incredible amount of time right in the hands of our inspectors when they are working with contractors and neighbors!"*

*Bill Hicks, Director, Land Development Services*

## FUTURE CONSTRUCTION ESCROWS EDITOR APP

Escrows may be posted by developers for future infrastructure improvements such as roads, sidewalks and stormwater improvements, that are required by state or local regulation but are waived or modified during the plan review process. These are referred to as "future construction escrows." The County maintains these escrows sometimes for a number of years. LDS staff often needs to research whether past future construction escrows have been posted in the vicinity of proposed projects, so they can be utilized when applicable.

LDS has been tracking these escrows on a spreadsheet, but this has been a cumbersome way to manage this data. It is difficult to search, and requires manual effort to proactively identify available funds that could be used to support current development. To better manage this data, a GIS layer was created which contains the pertinent information on each escrow, and a graphic representation (polygon or line) of the general scope of the improvements to which the escrow is committed. This is also a polygon feature for all parcels that are related to each escrow improvement. This dataset provides an efficient means of assessing whether future construction escrows are on file, to help fund infrastructure improvements when proposed, and ensures that the County does not miss the opportunity to apply escrow funds to upcoming infrastructure improvements.

**Future Construction Escrows Editor**

This screenshot shows the Future Construction Escrows Editor application interface. It features a map with various colored overlays representing future construction escrows. A sidebar on the right contains a legend and search filters. A text box on the map provides details for a selected location, including the address, escrow ID, and escrow type.

*"Mapping the escrows to points in GIS to create a user-friendly layer has allowed staff to view available escrowed funds in a whole new way and will aide LDS in effectively identifying and applying funds to the appropriate projects."*

*Lari Ramsey, Chief, Site Technical Services*

## NEXT UP...

We continue to work on the GIS tasks requested by staff from all facets of LDS, seeking input from the Steering Committee at monthly meetings. Some of the projects currently in development include:

- ✓ Internal Citizens Information Center (CIC) Application
- ✓ LDS Complaints Layers and Internal Application
- ✓ Site Applications Center Intake Application
- ✓ RPA Approved Plans Layer
- ✓ Coprocessing Service for Curve Number Tool
- ✓ Support of the PLUS effort to ensure the new permitting system for LDS is GIS-centric

LDS is immensely proud of the improvements made since the launch of LDS's first-ever GIS program. We are off to a great start and look forward to the exciting, innovative changes it will bring to our business in the years to come.

Land Development Services

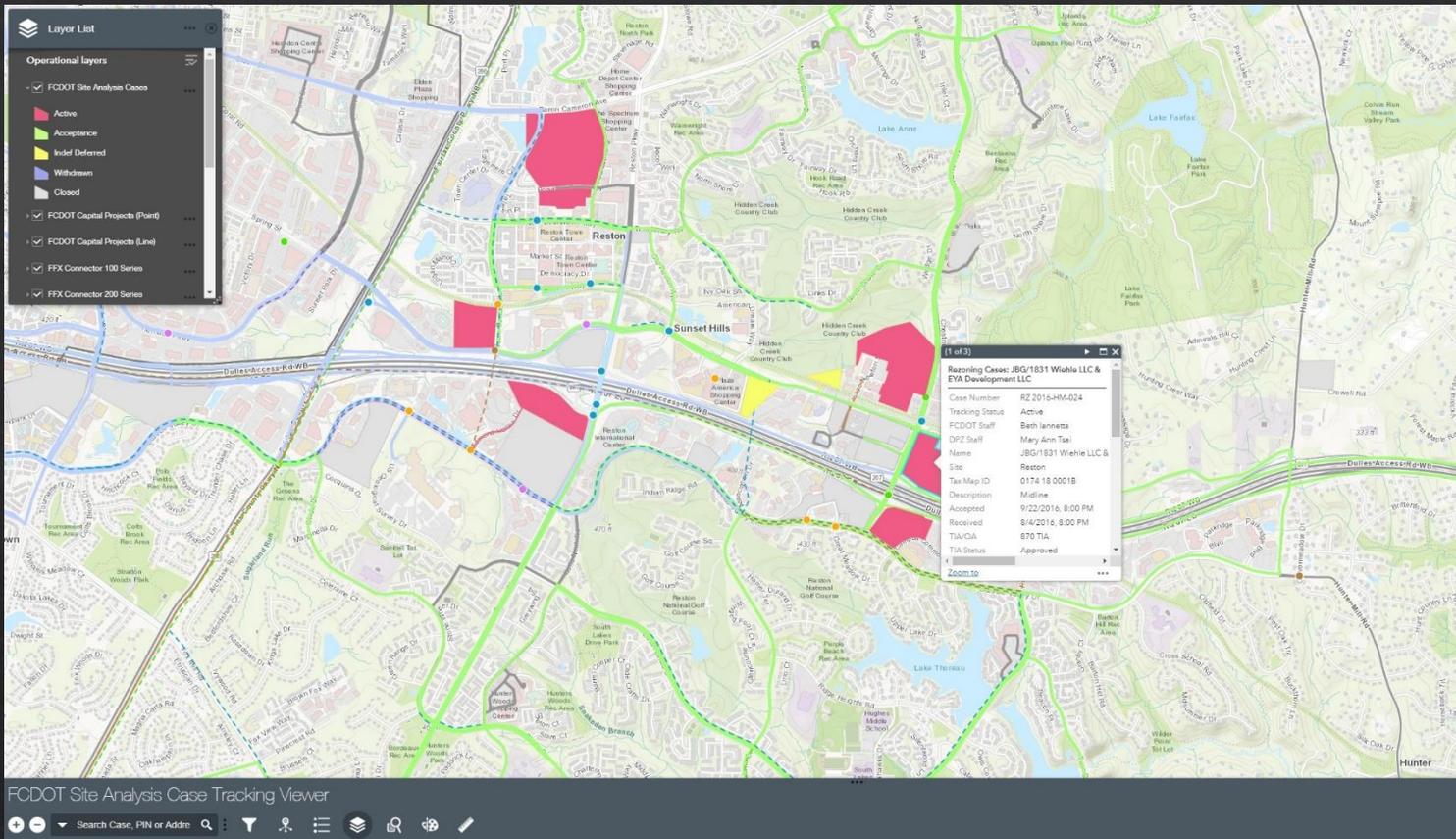


Land Development Services exists to ensure development in Fairfax County occurs in a safe and sustainable manner. The plans reviewed, permits issued and inspections completed touch thousands of parcels each year. This line of business is a natural fit for the technology of GIS. The process to initiate a GIS program in LDS has evolved over the past two years from a vague idea to a well-articulated program.

A massive assessment effort was completed in 2017 to study the level of familiarity and extensiveness of GIS use by LDS staff. As a first step in providing base-line training to LDS staff, mandatory GEM training was conducted. A full-time GIS analyst was hired in April of 2018 and he began working with a Steering Committee, comprised of LDS staff, to establish the following vision for the integration of GIS in LDS:

The GIS program will promote and maintain a vision of a land development process where GIS is intrinsic in nature, and establish the milestones to get there. A well-trained staff utilizing the most current GIS technology in their daily work flow is what will bring this vision to life. This GIS program will seek to improve the effectiveness and efficiency of LDS services by capitalizing on GIS resources available, identifying unmet needs that additional GIS customization or applications could meet, and increasing its use agency-wide. The success of this program will ultimately lead to improved productivity and overall time to market for our customers.

Within the past six months, LDS has pursued many tasks and initiatives aimed to bring LDS closer to realizing this vision. The GIS analyst has developed processes for collecting and maintaining new GIS data layers; met with dozens of LDS staff to understand lines of business and find opportunities to leverage GIS to improve efficiencies; developed online public-facing GIS applications to improve the customer experience; and served as a GIS technical advisor in the massive LDS effort to develop a new permitting database (PLUS). Whereas two years ago, most LDS staff were skeptical about the applicability of GIS to their day-to-day work, we are now seeing a rapid increase in use and understanding of the technology; many are now coming up with their own ideas for new tools and applications. These efforts to integrate GIS into the existing LDS processes have been warmly received by LDS staff and are improving our service to customers each day.



## Interactive mapping application

<https://bit.ly/2Pc3b9G>

### *Site Analysis Case Tracking Application* **Jeffrey Hermann, Thomas Wampler, Amy Muir, Dahae Hwang** **Department of Transportation**

Site Analysis Staff were independently tracking zoning applications in Microsoft Excel, with duplicative info. We programmed an application, and associated web interface to see/input all the info we needed to track. We also added functionality to the mapping interface by overlaying other DOT data to reference Fairfax Connector routes and Capital Projects. Staff routinely update the case info in the application/database (at least once a week), and other sections in the department can reference the web mapping interface without risk of changing any of the data, to ensure we are coordinating zoning case review with hundreds of Fairfax Connector routes and capital projects. This has significantly streamlined the Site Analysis tracking and case review operation, and enabled us to collect several key metrics about how we process applications, staff needs and workload, and helps further refine and expedite our daily work.

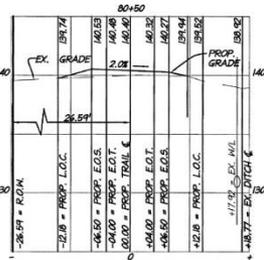
As far as aesthetics and ease of use, both the mapping interface as well as the data input application are simple, and well thought-out. We produced a simple user guide to assist users to learn how to use and navigate the application as well as enter data and create database entry relations (cases that are related to each other can be related so the user only needs to enter data once for multiple entries).

The web GIS interface is simple, well thought out, and cartographically simple. Certain layers like schools, parks, certain connector routes are left off when you first view the webpage, but available to turn on should you need to reference them. This is intentional to not confuse the user.

Holistically, this application has changed Site Analysis' arcane and outdated methods for tracking thousands of records. It has enabled other areas of the department to gather data quickly so they can stay in the loop as case review progresses.

# Use of ArcGIS 3D Analyst and the Fairfax County 2009 Digital Elevation Model for Walkway Preliminary Engineering Design

Civil engineers use diagrams called cross sections to convey existing topography and proposed grading designs. These require land surveys that can be expensive.



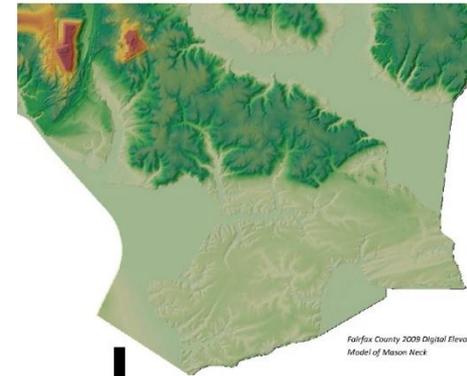
Source: Mason Neck Trail Section 2B

At the preliminary engineering design phase of a walkway project, existing conditions and proposed grading designs are only feasible using contour maps, field visits, and verbal descriptions.

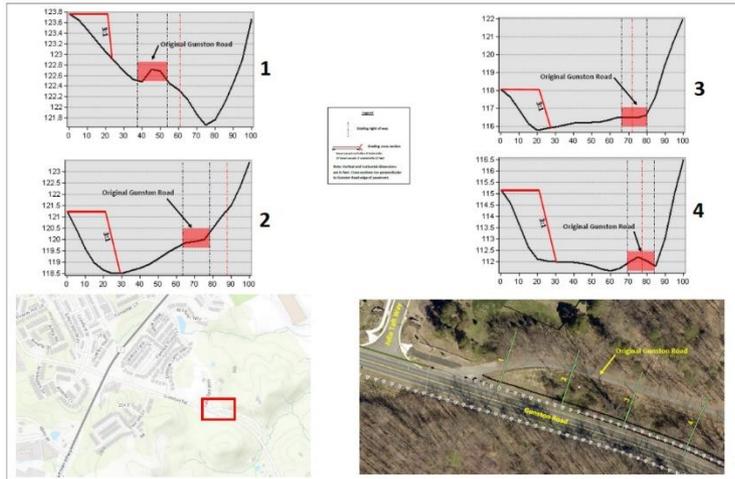


Vertical alignment challenges at eastern end of project

One way to get more detailed grading designs at the preliminary engineering design stage is to use ArcGIS 3D Analyst and the Fairfax County 2009 Digital Elevation Model.



Fairfax County 2009 Digital Elevation Model of Mason Neck



Cross sections can be created using the "Profile Graph" tool. Profile graphs can be imported into Microsoft Publisher and edited to show proposed cut and fill profiles.

The Fairfax County Department of Transportation is currently working on several walkway projects throughout Fairfax County. The first stage of a walkway project is called preliminary engineering design. A walkway project at this stage must address existing topographic conditions. The construction of a walkway typically can require regrading which involves either cutting into an existing slope (a cut slope), or filling in an area (a fill section). This kind of construction is typically referred to as "cut and fill". Cut and fill can help with the alignment of a walkway that allows for easier use by pedestrians, cyclists, and people with disabilities, as well as fulfill other walkway design requirements. Cut and fill is typically conveyed graphically using diagrams called "cross sections". A great definition of a cross section comes from the book titled *Cartographic Grounds: Projecting the Landscape Imaginary* (Desimini, Waldheim, and Mostafavi) that defines it as being: "A drawing cut along a predetermined line perpendicular to the plan view to reveal elevation, depth, and structural and material composition." Cross sections are often created at the final engineering design stage for a walkway project, but these require extensive data that come in the way of land surveying. Land surveys can be very expensive and are not typically done at the preliminary engineering design stage of a project. One way to create cross sections is to use ArcGIS 3D Analyst. Using 3D Analyst and the Fairfax County 2009 Digital Elevation Model, cross sections can be created using the "Profile Graph" tool. Profile graphs can be imported into Microsoft Publisher and edited to show proposed cut and fill profiles. These can show proposed cross sectional slopes (grades) and grading construction limits. These figures can show elevation and horizontal data that are typically given in feet. This method is significantly different than what has typically been done where assessments of existing topographic conditions and proposed improvements could only be done using contour maps, field visits, and verbal descriptions. While the proposed methodology is limited in accuracy compared to an actual land survey, it does give more dimensional information than what is currently provided in a walkway preliminary engineering design study. This could potentially be of value at the final engineering design phase of a walkway project.





# Creating Data Driven Mapping Applications to Communicate Economic Success in Fairfax County

## Office of the County Executive

GIS Award Category: Use of GIS for Public Outreach

### Background

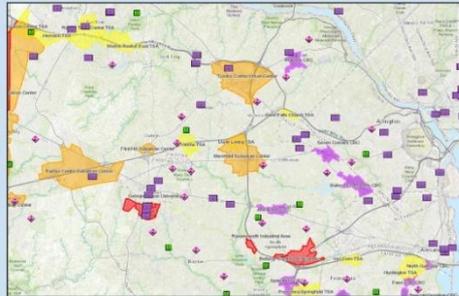
In 2015, Fairfax County Board of Supervisors adopted the [Strategic Plan to Facilitate the Economic Success of Fairfax County](#). This wide-ranging strategic plan was designed to conceive economic success from a broad perspective that encompasses not only aspects of business, innovation, and entrepreneurial activity, but also incorporates the creation of place as an economic driver, as well as natural and physical infrastructure, equity, education, and transportation.

### Community Outreach and Education Using GIS

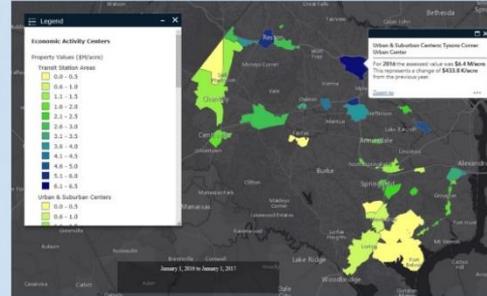
Several interactive mapping applications were developed to assist county staff and the public in understanding the geographic data being used to address the economic success indicators. In addition to standard interactive map functionality of turning layers on and off and clicking features on a map to see more information about them, configurable tools have been deployed in these apps to add more complex analysis capabilities that, in the past, were confined to desktop mapping applications. For example, advanced searching and filtering tools allow for focused browsing of the apps to find and view information for adjustable subsets of the data. Other tools give the user the functionality to select a feature in one layer and use it to quickly select and summarize the coincident features of another layer in the map. Lastly, the addition of time-enabled layers and tools adds the ability to view and analyze data temporally as well as spatially. These advanced tools assist the users of these apps to more effectively interact with the maps and better understand the underlying data.

In addition to the interactive mapping applications, static maps were developed to provide a high level overview of economic success indicators in an effort to inform and educate stakeholders and the community.

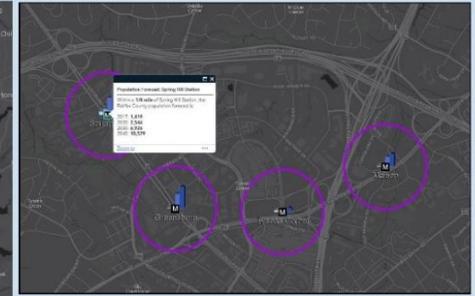
### Interactive Mapping Applications



**Art Venues**—Search for and view detailed information about arts venues in and near Fairfax County Economic Activity Centers in the Performing and Visual Arts Venues viewer. The venues may also be filtered by type.



**Assessed Value of Activity Centers**—When the time-enabled layers of the Economic Activity Centers application are active, the map automatically changes to display property values and the change in property values for each year from 2005 to 2017.

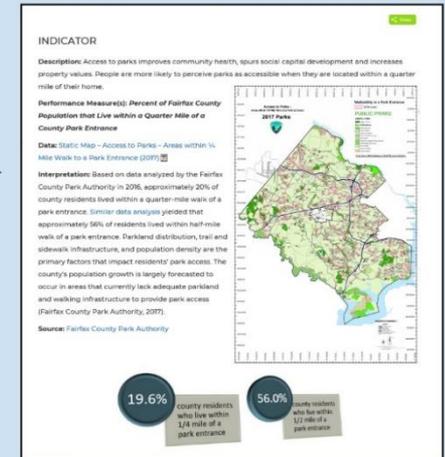


**Density in Transit Station Areas**—In addition to viewing detailed maps of the areas surrounding Metro and VRE stations in Fairfax County, users of the Rail Station Area Population viewer may click on a station to view the current and forecast population estimates within ¼ and ½ mile buffers of each station.



### Public Website

The ESSP success indicators can be found on the Fairfax County public website (<https://www.fairfaxcounty.gov/economic-success/indicators-performance-measures>). All mapping resources are available for the community to view and learn about economic success in the county. Static data-driven maps such as hotel revenue in activity centers (left image) and parks access (right image) provide a visual representation of economic information.



County web page – Economic Success Plan

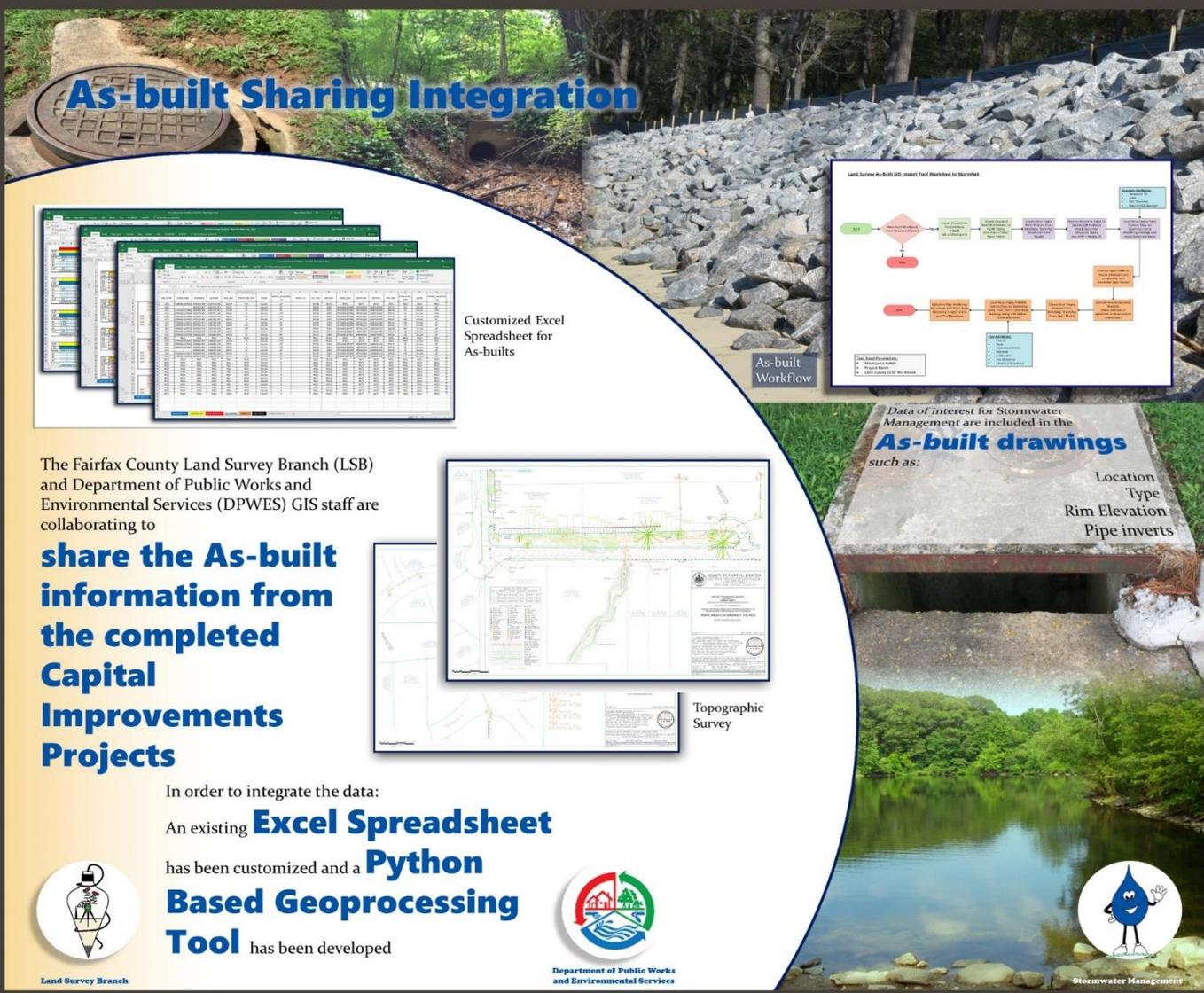
<https://bit.ly/2yqmzpB>

County web page – Indicators & Performance Measures

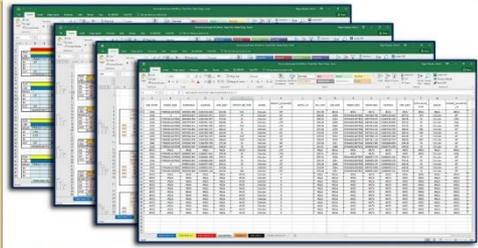
<https://bit.ly/2yUVaf9>

County web page - Board Economic Advisory Commission Meeting: Jan. 16, 2018

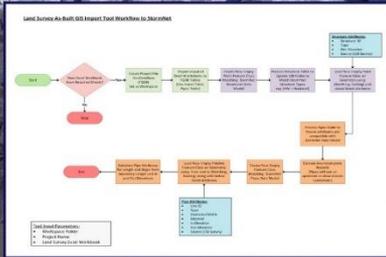
<https://bit.ly/2Ove8nc>



# As-built Sharing Integration



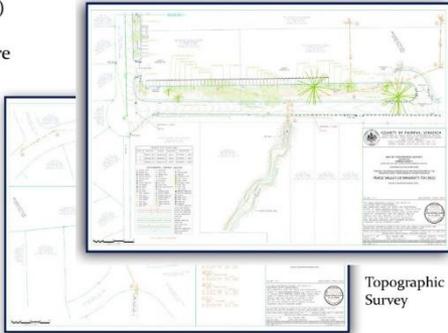
Customized Excel Spreadsheet for As-builts



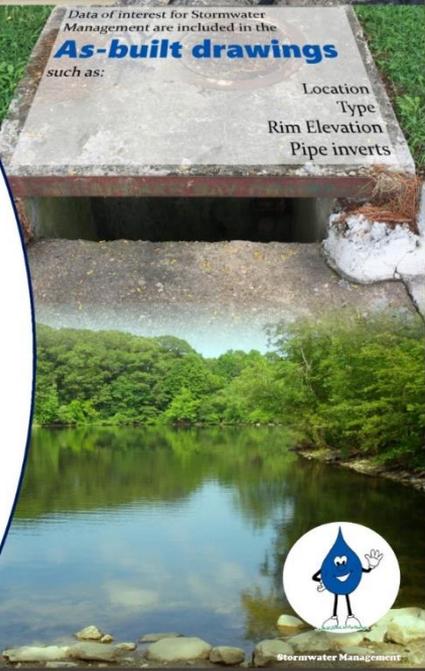
As-built Workflow

The Fairfax County Land Survey Branch (LSB) and Department of Public Works and Environmental Services (DPWES) GIS staff are collaborating to

## share the As-built information from the completed Capital Improvements Projects



Topographic Survey



In order to integrate the data:  
An existing **Excel Spreadsheet** has been customized and a **Python Based Geoprocessing Tool** has been developed



Land Survey Branch



Department of Public Works and Environmental Services



Stormwater Management

The Fairfax County Land Survey Branch (LSB) performs countless as-built field surveys of new and existing infrastructure for various capital projects throughout the year. Much of their survey work includes data of interest for stormwater infrastructure such as structure location (X, Y), type, rim elevation and in and out elevations for upstream and downstream pipes. It was recognized by LSB staff that this survey grade data was not being utilized to its full potential and should be incorporated into the county's GIS stormwater infrastructure network (StormNet). Department of Public Works and Environmental Services (DPWES) GIS staff began collaborating with the Land Survey Branch to begin working towards a feasible update process.

LSB staff were already capturing and logging survey data in the field and then post processing that data in customized Excel workbooks. Traditionally all Land Survey Branch (LSB) as-built data was kept in handwritten formats in paper fieldbooks. This process was lengthy and required additional steps to transfer from paper to the digital realm where all of today's actual work takes place. This Excel custom spreadsheet was developed to meet the needs of our changing industry and allow for seamless integration with our AUTOCAD systems and digital field data collection. This has yielded many time-saving, and accuracy-increasing benefits within LSB, by reducing the number of hands the work must pass through before reaching its client.

Though the survey workbook included all the necessary data to import and update StormNet, it was not in a compatible format for ArcGIS geoprocessing tools to create the necessary GIS features like pipes which require a from point (X, Y) and to point (X, Y) to be identified. It was determined that augmenting the custom workbook to add an additional calculated worksheet for the translation of the pipe attributes to GIS features was essential.

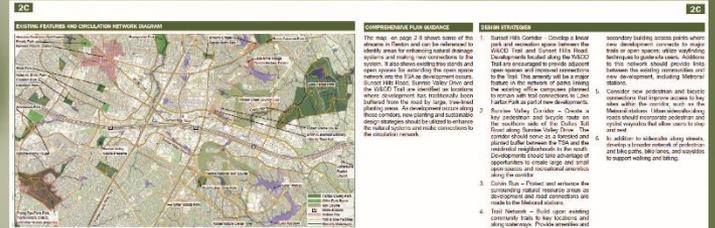
A Python-based geoprocessing tool was then developed to convert the required custom Excel worksheets to geodatabase tables to then process and translate them into GIS features within the StormNet data model. Over time this effort will improve the accuracy of the GIS stormwater infrastructure network and lead to improved utilization of the survey data that is continuously being collected by LSB staff. There are more opportunities to incorporate survey data into GIS infrastructure layers at the county and this tool is a template that can be modified to work towards that.

# Guidelines For Development: Reston Transit Station Areas

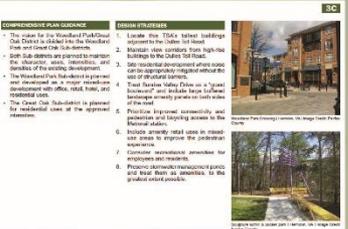
The Maps in the Guidelines are a key resource explaining location of specific design elements. The Guidelines begin with location and the Existing Features and Circulation Network maps to familiarize users with the Reston Area and the TSA's impartment. A variety of subject specific maps follow such as the Land Use Guidance series (12 total), Primary Pedestrian and Bicycle Modal Emphasis Corridors (1), TSA Street Network And Classification series (3), and Reston Specific Streetscape Locations map (1). A key feature of all the maps is how the language in the Guidelines is tied to the maps themselves. Placing the maps side by side with the Guideline text allows the user to visually comprehend the extent, location, and the spatial relationship of the Guideline text. Use of buffering, and overlays enhance and bring context to the maps as well.

The Guidelines for Development in the Reston Transit Station Areas (Guidelines); currently still in Draft form, are intended to assist in implementing the Comprehensive Plan's Transit Station Area recommendations. It assists by providing ideas and strategies for meeting best practices in planning, site design and development. The Guidelines were written collaboratively with input from property owners, residents, interest groups, and public agencies. Once endorsed by the Board of Supervisors, the Guidelines will be used by County staff and the Reston Community for both framing the discussion with developers and in evaluating proposed development applications. They will be revised and updated as necessary. The Comprehensive Plan includes Urban Design Principles that provide recommendations for development in the Reston TSAs. The Guidelines build upon the Plan's Urban Design Principles, with strategies for implementation; they are intended to provide direction for applicants and designers who are developing proposals in the Reston TSAs, and guidance for those reviewing such proposals. The Guidelines do not regulate or dictate a particular architectural style for Reston. Rather, it articulates Intent Statements and describes a series of desired objectives referred to as Strategies for each design element while allowing for flexibility in the means to achieve those objectives. This flexibility allows for a distinct character in each district and neighborhood. The Guidelines are intended to provide flexibility in their implementation. Alternative, but comparable, design strategies may be considered in light of the unique circumstances of a particular site. The Guidelines support flexibility, so long as the outcome furthers the implementation of the vision set forth in the Comprehensive Plan.

## Location and Existing Features Maps



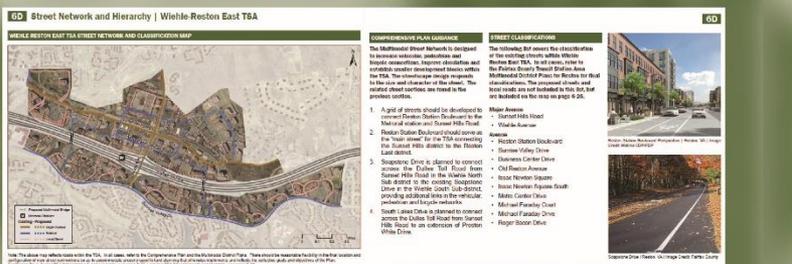
## Land Use Guidance



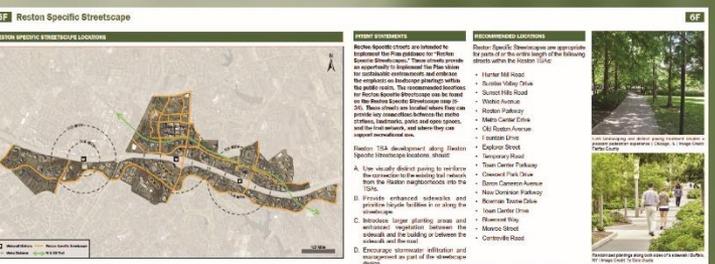
## Primary Pedestrian Corridors & Bicycle Modal Emphasis



## TSA Street Network And Classification

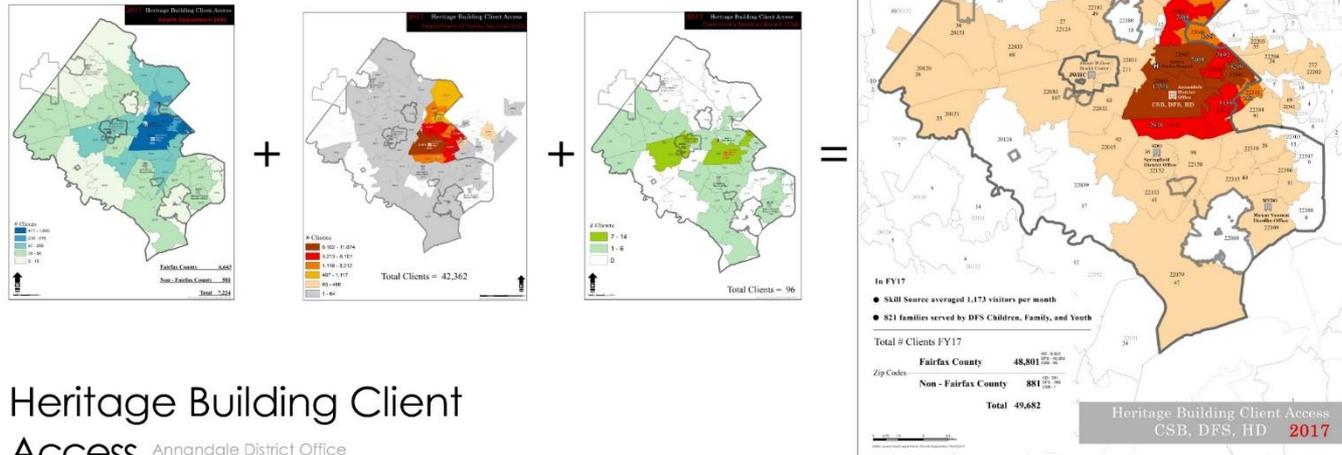


## Reston Specific Streetscape



The following set of maps  
 Heritage Building Client Access Community Service Board (CSB)  
 Heritage Building Client Access Department of Family Services (DSF)  
 Heritage Building Client Access Health Department (HD)  
 Heritage Building Client Access CSB, DFS, HD (combine)

were part of the **Delivery of Human Services in East County** report that was presented to the **County Executive Office** in October of 2017. Those maps were developed when the county was looking for a location for the new East County Government Facility to visually show where the clients who visit the Heritage location are coming from.



## Heritage Building Client Access for 2017 Fiscal Year

The county currently occupies most of the space at the Heritage Building in Annandale. That lease will expire in 2019 and the county is considering relocating to the East County Human Services. A multi-agency committee was formed to conduct a needs assessment in Human Service Region 2, and determine how many clients are traveling to the Heritage Site. Based on the information from CSB, DFS, and Health, we built four thematic maps that showed the ZIP codes across Fairfax County and non-Fairfax County associated with the number of clients who visited the current location to access various services during the 2017 fiscal year.

The maps were composed of the county border, political jurisdictions, and ZIP code layers, all accessed via the FFX DataLoader. We used the Health Department district office point layer, displayed with a building outline symbol, and shaded the Annandale District Office located at the Heritage building with either red or white to signify the focus site. Each ZIP code was labeled and color coded to identify client density. The total number of clients per ZIP code was also displayed on the DFS and combined agency map.

Maplex label engine was used for all the label features displayed on the maps and the tabular presentation on each map was created using the draw tool with text box insert.

The Region 2 Manager of the Department of Neighborhood and Community presented the maps to the County Executive Office and later wrote "...maps which very clearly and masterfully show those ZIP codes across Region 2..."

# DCCS Inspection Enforcement Branch – Implementation of Expanded Inspection Program



## Background

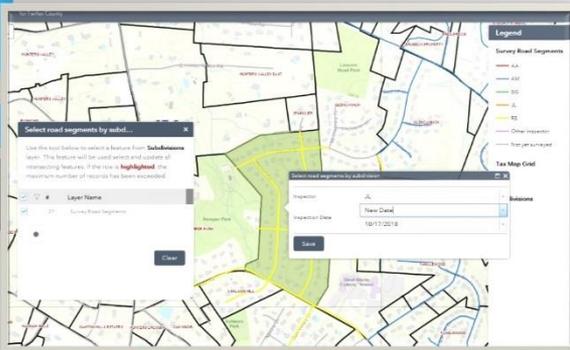
The Department of Cable and Consumer Services (DCCS) Inspection and Enforcement Branch (IEB) is charged with tracking and reporting cable equipment issues. IEB has always responded to cable service and equipment complaints from community members. In December of 2017, IEB implemented an expanded inspection program to more proactively identify issues. In addition to responding to complaints, inspectors systematically examine inspection service areas throughout the County to ensure compliance with federal, state, and County codes and standards. By proactively inspecting areas of existing cable plant to identify and resolve violations not previously reported by homeowners and other concerned citizens, problems can be addressed in a more thorough and timely manner. This expanded inspection program was initially tracked by marking up paper maps in the field, then summarizing the progress by hand. It was quickly apparent that this was not an ideal method. To thoroughly monitor the entire county in an efficient manner, DCCS turned to GIS technology.



## Methodology

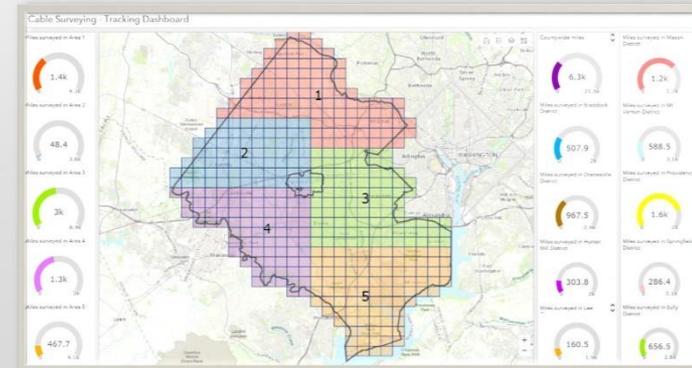
Two mapping applications have been developed to support IEB's expanded program. The **Cable Surveying app** was built using the Esri ArcGIS Online Web App Builder, a customizable online mapping application. Inspectors launch the application from any Fairfax County intranet-enabled device. They can then zoom to their current location or search by address, subdivision, tax map grid or ZIP code. Within the area of interest, the street centerline layer becomes visible. Street segments were chosen as the surveying units because the inspectors walk and/or drive the roads to look for issues with the cable network. When a street segment (or group of segments) has been , it is marked complete in the app. This is done via the "Batch Attribute Editor" widget, which allows the user to select features—either related features, based on another layer, or by sketching in a shape—and update common attributes at the same time. In the Cable Surveying app there are 3 versions of this widget: select by drawing (a point, line or polygon), select by tax grid, and select by subdivision. Once selected, the street segments are all marked completed with the date and the initials of the inspector; it takes just a few mouse/screen clicks to update a selection of street segments. The various options for selection give the inspectors the flexibility to report at a frequency and in units that are consistent with their work, and provide a very efficient way to report their progress in surveying.

The **Cable Surveying – Tracking Dashboard** was developed so that managers could view the progress of the inspections. This app was built using the Esri ArcGIS Online Operation Dashboard application, which can utilize charts, gauges, maps, and other visual elements to reflect the status and performance of people, services, assets, and events in real time. For this project, managers were interested in viewing the survey progress summarized in each of the 5 survey areas, as well as in the 9 Supervisor Districts. The dashboard has a map of the County with these areas, as well as the street segment layer with the current surveying status. Gauges placed around the map summarize the data and display it as miles of street segments surveyed by inspection area or Supervisor District. A quick glance at these gauges reveals the progress occurring in each area and can assist managers in focusing the ongoing efforts.



## Conclusions

The integration of GIS into branch operations has brought improved efficiency and insights to the work of IEB. Staff are now able to quickly assess where to focus their inspection efforts, and then easily update the status in their assigned area. Managers can efficiently track this progress in real time, as well as gather statistics for reporting purposes.



# The Evolution of North Hill

1747



## The Northern Neck of Virginia and the Creation of Fairfax County

The Northern Neck of Virginia was also called the Northern Neck Land Grant or the Fairfax Grant. While in exile, English King Charles II in 1649 created the Virginia land grant of approximately 5 million acres of land bordered by the Rappahannock River, the Potomac River, the Chesapeake Bay and extended northwest. King Charles II granted the large area of land to seven of his most loyal supporters including Thomas Colepeper the colonial governor.

The land was passed on to Thomas Fairfax the 6th Lord Fairfax of Cameron in 1710 after the death of his parents (Catherine Culpeper and Thomas 5th Lord Fairfax). In 1747 Thomas 6th Lord Fairfax returned to Virginia from England and lived at Belvoir along the Potomac River.

By legislation in 1742 the County of Fairfax was created. In 1757 the Virginia House of Burgesses passed an act calling it off from the County of Loudoun. The General Assembly of Virginia in 1798 passed and act for a new dividing line which is the current boundary line between the two counties.

The red square on the map is the future location of North Hill.

1800s



## Map of Mount Vernon area - 1860s

The area that became North Hill was originally part of George Mason's estate. In 1800s, Thomas Mason divided the estate between his sons Dr. Richard Chichester Mason and Thomas Francis Mason. The lower portion of the property was wooded and used for hunting and more than 1,000 acres of it is now the nearby Huntley Meadows Park.

Source: Historical Society of Fairfax County, Va.

## The Residences at North Hill



The North Hill property will consist of approximately 33 unimproved acres off of Richmond Highway in the Mount Vernon District of Fairfax County. Through the Public Private Education Facilities and Infrastructure Act of 2002 (PPEA), the Fairfax County Redevelopment and Housing Authority is able to pursue a public-private partnership that will transform North Hill into a mixed income, affordable and market rate housing community comprised of multifamily rental apartments and for-sale townhomes. The redevelopment of North Hill will bring much needed affordable, work force, and market-rate housing to Richmond Highway and support the area's overall revitalization effort

- North Hill will consist of:
- 219 affordable and workforce apartments
  - 60 affordable independent living units for seniors
  - 175 market rate townhomes
  - 12 acre public park



## Present Day



1937



This map from the 1930s shows the area undeveloped.

1953



Woodley-Nightingale, a was built near the end of World War II to help ease the country's postwar housing shortage.

1980s



When the Fairfax Redevelopment and Housing Authority purchased Woodley-Nightingale in 1981, the park had more than 500 trailers and was badly overcrowded. County officials said they were forced to reduce the park's population through attrition to comply with federal and local health and housing standards. Much of the land, they discovered, was marine clay and was unsafe for trailers.

Source: Washington Post. Trailer Park's Residents Fear Fairfax Sale Plan, June 7, 1984

1990s



In the early 1990s, Phase I of the redevelopment containing approximately 15 acres, located south of the intersection of Lee Hwy and Dart Drive, were developed into the manufactured home community of Woodley Hills Estates. Phase II was put on hold due to the difficulty and costs of development associated with the balance of the property's marine clay soils and steep slopes.

The redevelopment of North Hill will transform it into a mixed income, affordable and market rate housing community comprised of multifamily rental apartments and for-sale townhomes. Extensive research shows how the area has changed. The data collected for this map project involved researching maps from the Library of Congress and the history of the area.

The data used for this map project is an example of the visual information the agency presents to our community and stakeholders concerning prospective or ongoing developments, presenting the positive transformations of the area. The use of mapping and GIS allows the agency to create a graphic story of the history and transformation of development projects like the Residences at North Hill. This display will be integral in furthering community involvement and interest in the project.