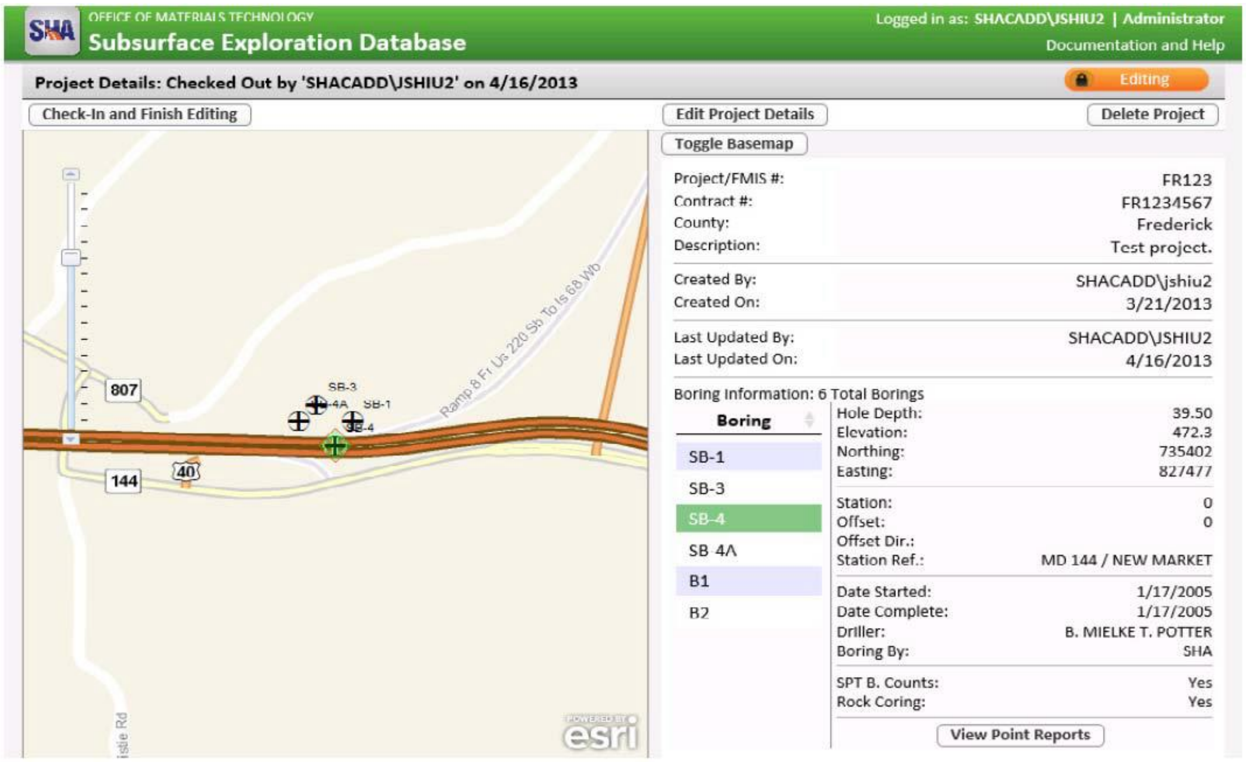
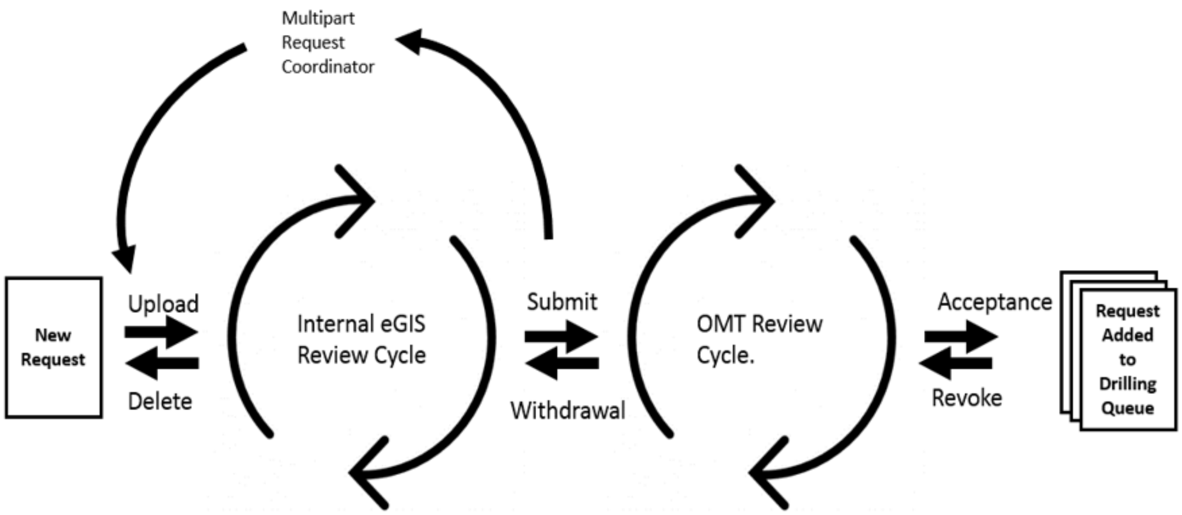
GIS-Based Subsurface Exploration System

In 2012 MDOT SHA set a goal to develop a Geographic Information System (GIS) based subsurface exploration database. This database allowed engineers to better track, record, evaluate, analyze, share, and visualize the geotechnical subsurface data. Prior to this project MDOT SHA's geotechnical data was managed by the Field Exploration Division (FED) via a paper process which resulted in significant efficiency loss due to transcription errors, data accessibility, data transport and other issues. The picture below shows the content layer developed as a part of this project. This application was the foundation that has led to further enhancements since the project ended in 2014. This program and the enhancements that followed have provided major cost savings to the administration as out lined below.



Electronic Data Requests

When an electronic boring request is received through the GIS-based interface, it is first validated by the Boring Request tool to identify if the boring locations are on a private property or wetlands. The tool also identifies all previous borings near the requested locations to avoid redundant drilling. After the automated review, the request is reviewed and validated by an engineer and a work order is added to the drilling queue. The system component saves substantial costs by reducing time spent preparing hand written forms, catching errors early on (out of state coordinates, private property, missing data, etc.), consolidating and tracking review correspondence, and spatially presenting the boring locations with reference to utilities, right-of-way, and other roadway asset locations.



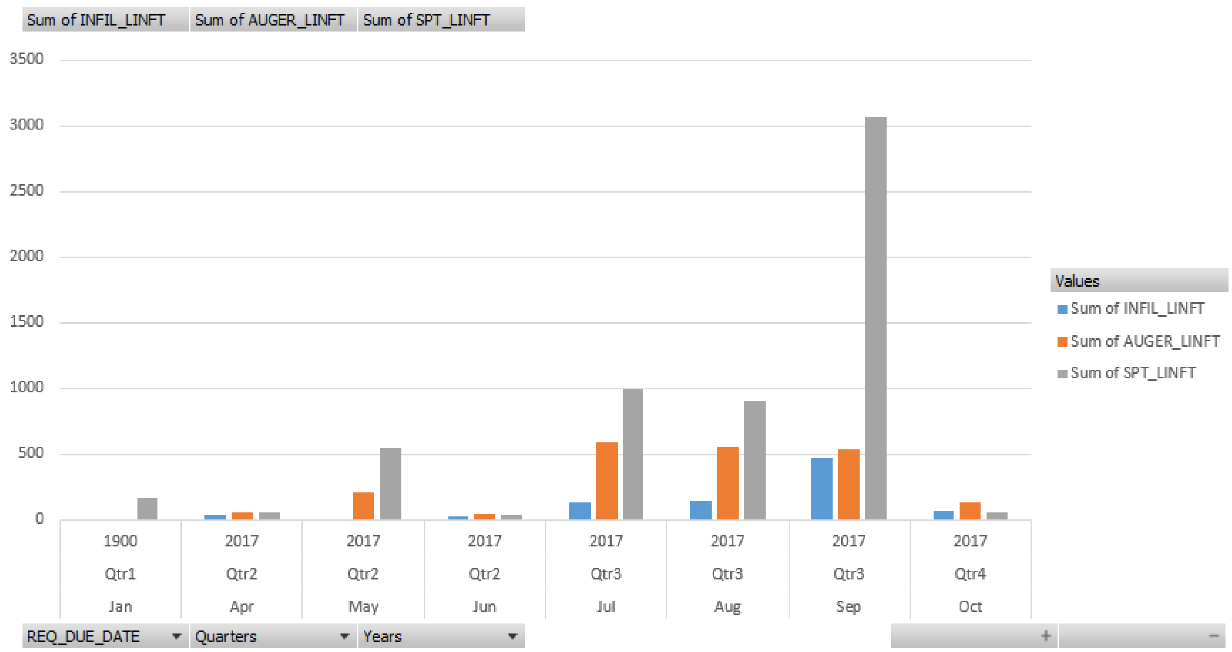
General data flow through the boring request process

Remote Field Data capture

All data is now electronically collected in the field on a mobile device. Data is captured and provided real-time to project engineers. This component eliminates the time preparing hand written forms and converting to electronic data, and provides immediate quality control.

Automated Project Tracking

Throughout the requesting, drilling, and data delivery, the flow of data is automatically tracked, allowing the program to provide all users a real-time look at the project queue. This includes the status of every project and the program as a whole. Automated project tracking eliminates the need to prepare weekly progress reports and project engineers no longer need to contact FED for status updates.



Monthly Drilling Quantities

Historic Boring Data

All Boring data is now saved and provided spatially in this program. Users can generate gINT files for any set of historic borings. Additionally, when a boring is requested near a location that was drilled in the past, this historic data is automatically provided to avoid duplication.

Display of Historic Boring Data

Quantified Cost Savings:

This project has resulted in an estimated MDOT SHA cost savings of almost $1M per year. The estimated savings for each component is listed below. The cost savings from catching errors (utilities, private property etc.) are not included in these conservative estimates. Such cost savings will increase as the quantity of archived data increases.

System Component	Average Time taken -before-	Average Time taken -after-	Cost Savings per project ($70/hr)	Average # of projects	Cost Savings per year
Electronic Data Requests	8 hours to prepare; 8 hours to enter lab data	4 hours to prepare; 0 hours to enter lab data	$840	200	$168,000
Remote field data capture	16 hours to convert paper data to digital	0 hours to convert paper data to digital	$1,120	200	$224,000
Automated Project Tracking	24 hours a week updating and tracking projects	0 hours	$1,680 per week (by 52 weeks)		$87,360
Historic Boring Data	Conservatively estimate: eliminate 2 borings on each project with easily-retrievable historic data. Assume a cost of $1,200 per boring, the component saves $2,400 per project.			200	$480,000
TOTAL					**$959,360**