

Creating a Corrected Surface Model: Borough of Whitehall Improves Drainage Design



The Problem

The Borough of Whitehall PA is a highly developed urban area characterized by mixed residential, commercial, and light industrial development. Covering an area of 3.3 mi² and located about 6 miles south of downtown Pittsburgh, Whitehall's infrastructure is aging and not adequately designed for today's runoff conditions.

Challenges

In recent years residents and business have been experiencing an increase in localized flooding due to inadequate drainage, causing damage to both private property and public roadways. Basements are flooding. Roads are washing out, eroding both pavement and concrete. The Borough hired Gateway Engineers to help alleviate runoff problems and improve drainage. Members of the GroundPoint Engineering team worked with Gateway to use publicly available high resolution topographic data to analyze current drainage conditions.

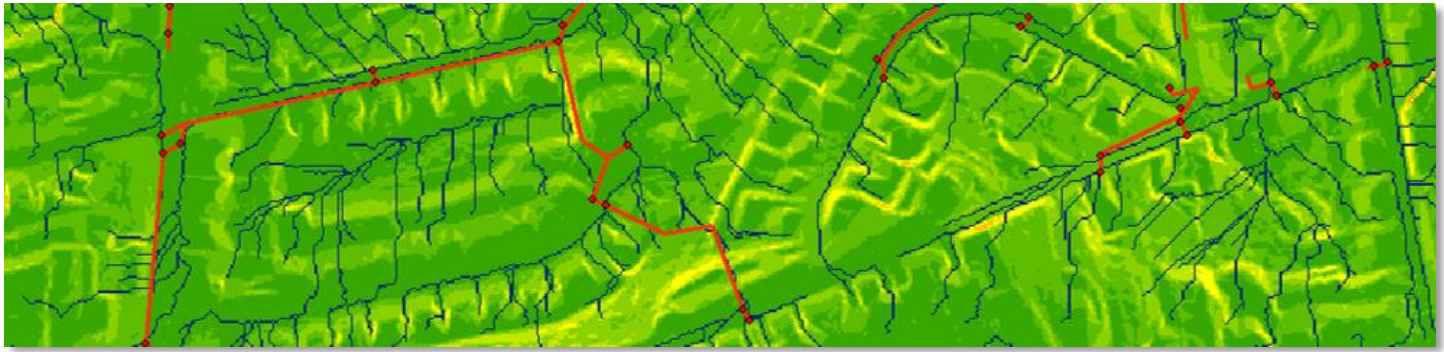
Solutions

Allegheny County had recently collected high density airborne LiDAR data meeting the USGS QL2 Standards for point density and topographic data development. Members of the GroundPoint Engineering Team were able to use the raw LiDAR data to create a hydrologically corrected surface model that allowed Gateway to evaluate detailed drainage patterns at any point within the Borough. Gateway provided over 1700 catch basin and storm water inlet locations to evaluate the contributing drainage to current infrastructure.

USGS QL2 LIDAR = 2 points/m²

Meets NMAS for 1ft contours





GroundPoint developed a surface model from the original LiDAR data and iteratively edited it to reflect actual field conditions such as curb and gutter flow, ponding in low lying areas, and surface flow in ditch lines, channels and streams. The surface model was used to generate runoff catchment areas contributing to each of the 1700 key points of interest. Additional information was incorporated to calculate individual drainage area characteristics such as total area, slope, time of concentration, and average runoff curve



The resulting drainage maps showed accurately where water flowed across the landscape at the level of detail necessary to assist with infrastructure assessment, all without the need for any field surveying.

number. The code was originally developed at the Cornell Water Resources Institute (WRI) to estimate peak flows based on the Soil Conservation Service TR55 Runoff Model and adapted to estimate volumes for a range of predicted rainfall events.

Results

The hydrologically corrected surface model and derived drainage layers were helpful in identifying where existing infrastructure was working well, and where it wasn't. The drainage area characteristics proved useful to the design engineers in adapting separate runoff and storm sewer models beyond the initial basic estimates provided by GroundPoint. Ultimately data for all 1700 catch basins was helpful for Gateway Engineers to evaluate design options for retrofits and upgrades.

In some instances, the surface model showed water being routed away from the intended catch basins while overflowing others.

About GroundPoint Engineering

GroundPoint Engineering is a professionally licensed engineering firm that specializes in high resolution topographic mapping and drainage analysis. Working with data from sources such as airborne LiDAR and UAVs, GroundPoint creates data that supports immediate analysis and provides the input to more complex runoff and water quality modeling packages.

For more information about how GroundPoint Engineering can help with your drainage challenges, visit drainagemapping.com or contact us at 845.224-7780

