

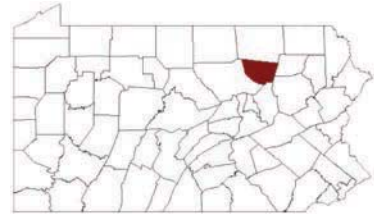


# M a r c e l l u s X D e s i g n

The Sullivan County Design Charette  
The Pennsylvania State University  
Landscape Architecture  
2013

## Land Changes & Water Quality

By: Amanda Jones



“ When the well’s dry, we know the worth of water.” - Benjamin Franklin

### Problem Statement:

The goal of this project is to compare the land changes over the past years of 1939, 1959, 1994, 2004, 2008, and 2013 in Dushore and Shunk, Pennsylvania to measure the runoff amounts and effects on water quality.

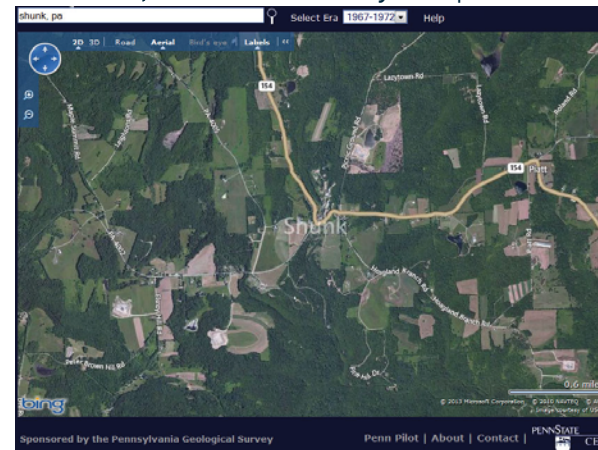
### Project Description:

Using US EPA (Environmental Protection Agency)’s **stormwater calculator** to determine the amount of runoff in Shunk and Dushore under natural conditions, proposed conditions, and gas development conditions.

### Benefits/Goals of Project:

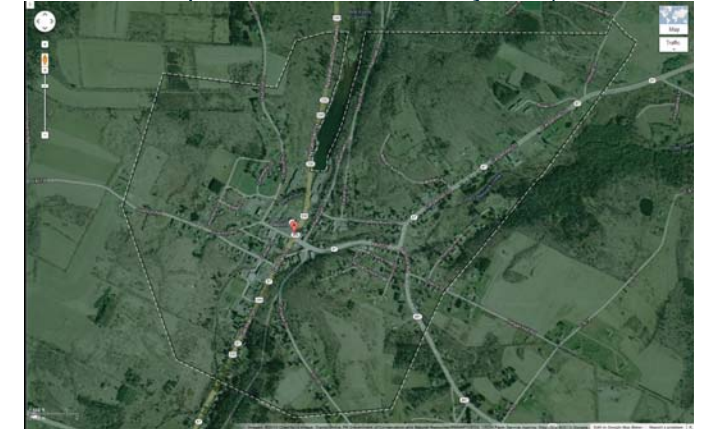
- To measure the **changes** in **permeable** and **impermeable** surfaces
- Calculate the different **runoff** amounts for the various years and towns
- Measure the **distance** of large impermeable surfaces to the nearest waterway
- Offer design solutions to filter the runoff and keep the **waters** **clean** for future generations

#### Shunk, PA: Primary Impacts

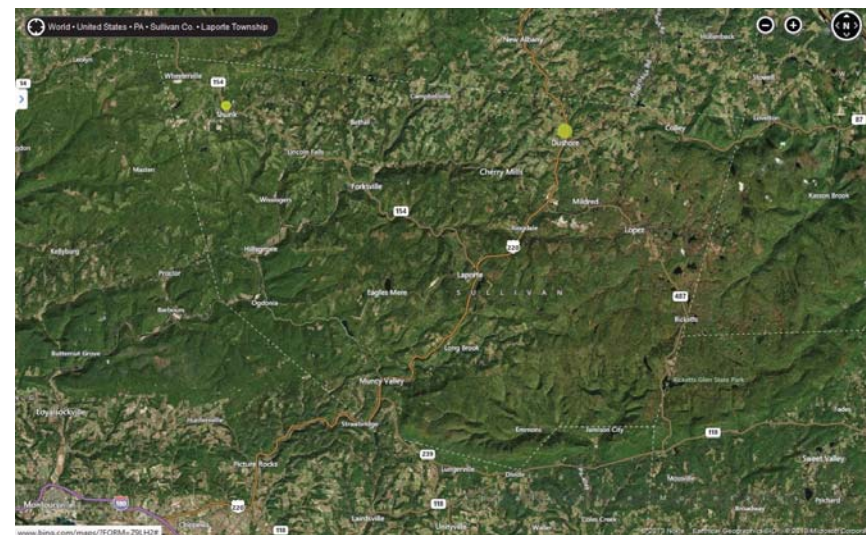


Source: Bing Maps

#### Dushore, PA: Secondary Impacts



Source: Google Maps



#### Locator Map within Sullivan County

- Shunk, PA
- Dushore, PA

Source: Bing Maps





## Shunk, 1939





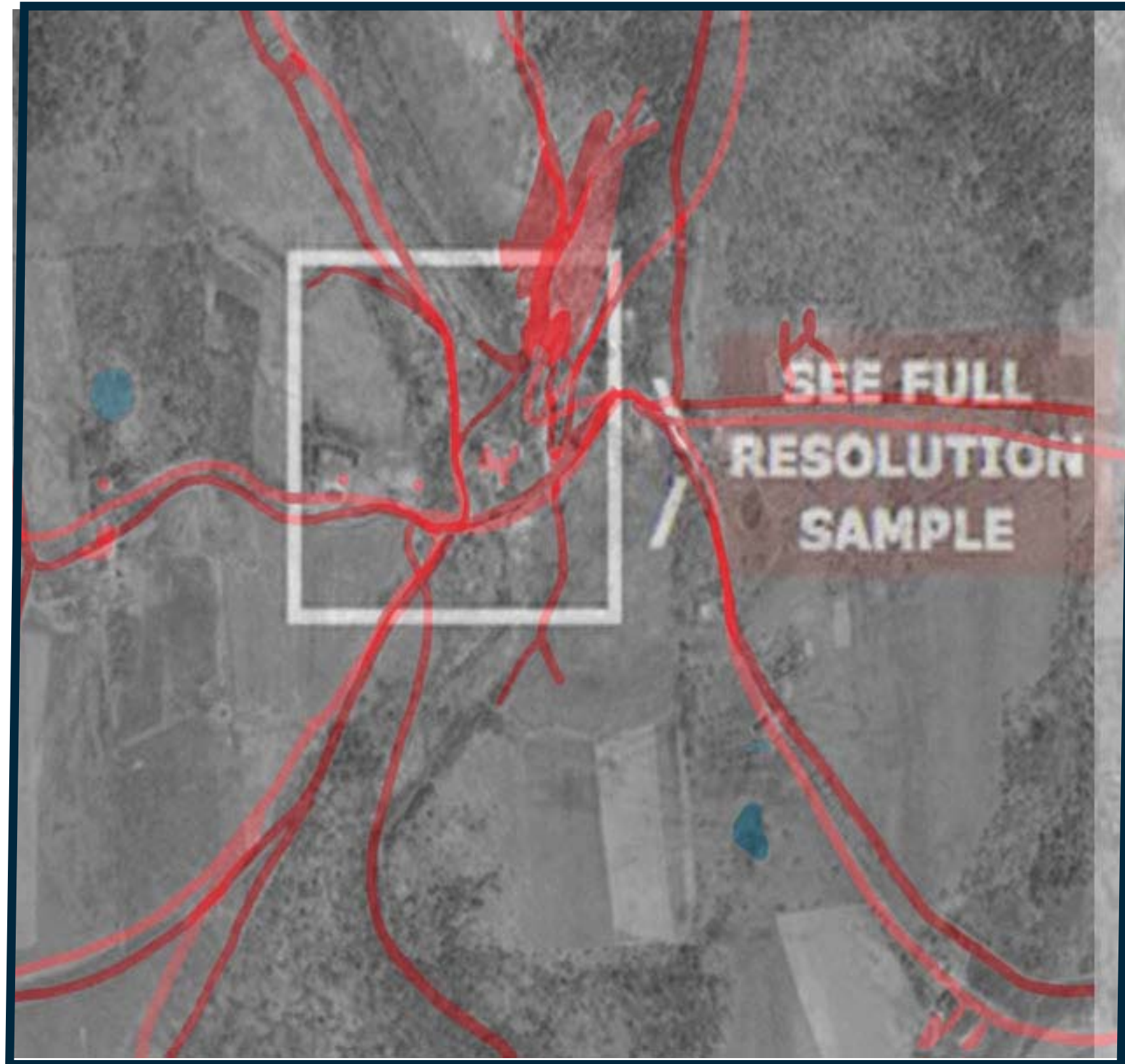


## Shunk, 1959



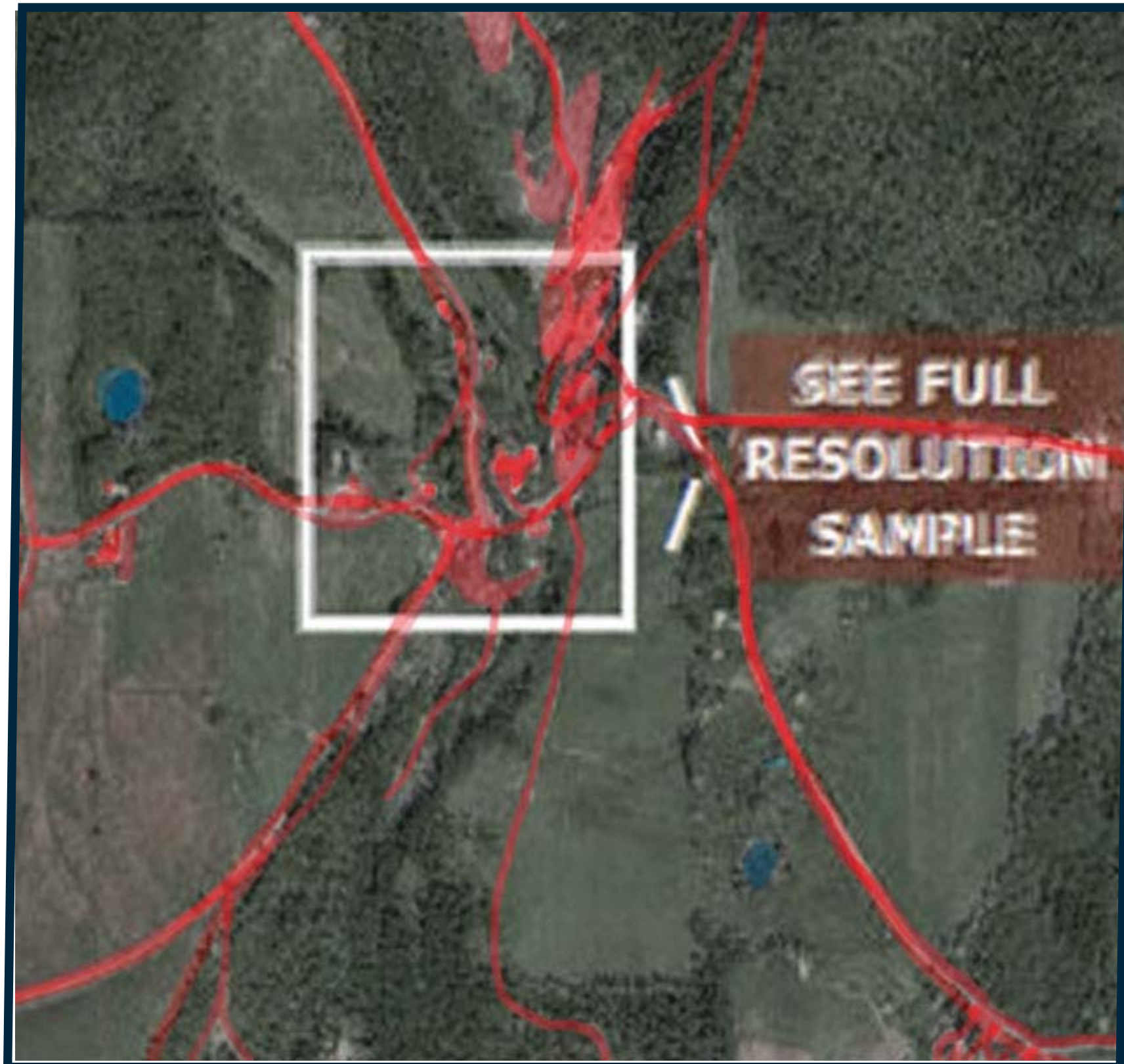


Shunk, 1994





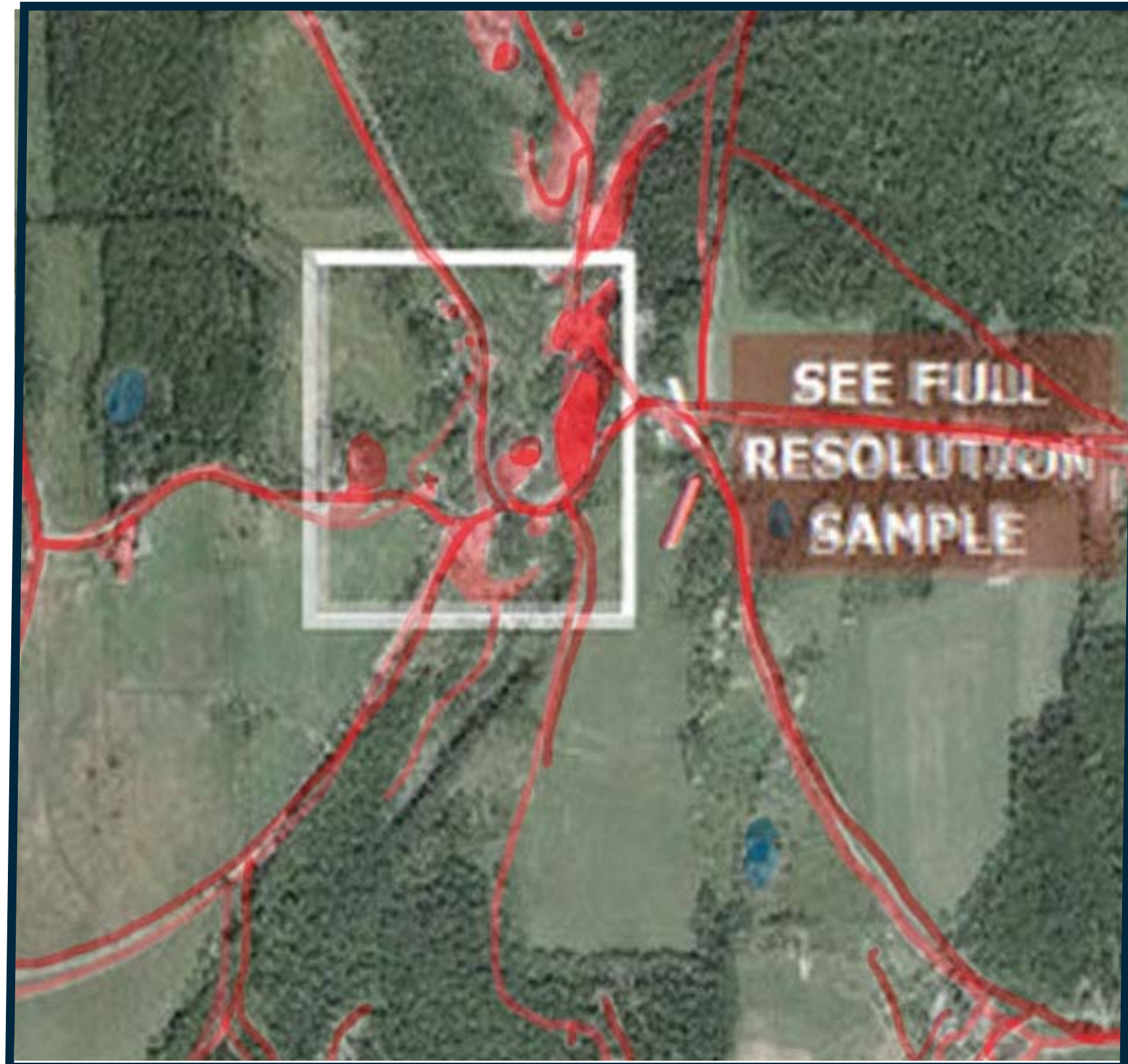
Shunk, 2004







Shunk, 2008







## Shunk, 2013





## Problem Statement:

**Shunk** is a town located within the Northwestern part of Sullivan County that has been primarily impacted due to the Marcellus Shale gas play. Due to these impacts, impermeable surfaces have increased since 1939 and the runoff amount that enters the local water bodies has also increased.

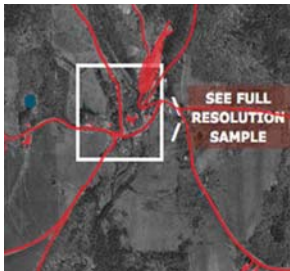
Shunk, 1939



Shunk, 1959



Shunk, 1994



Shunk, 2004



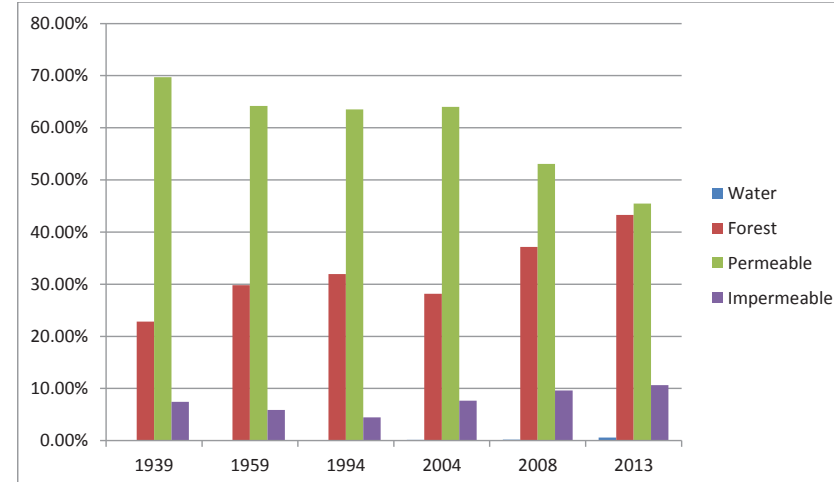
Shunk, 2008



Shunk, 2013



Shunk, 2013



Predicted, 2053

Soil Type  
Soil Drainage  
Topography  
Forest -- 39%  
Water -- 1%  
Permeable -- 49%  
Impermeable -- 11%

Predicted Percent of all  
Rainfall Retained: **89.11%**

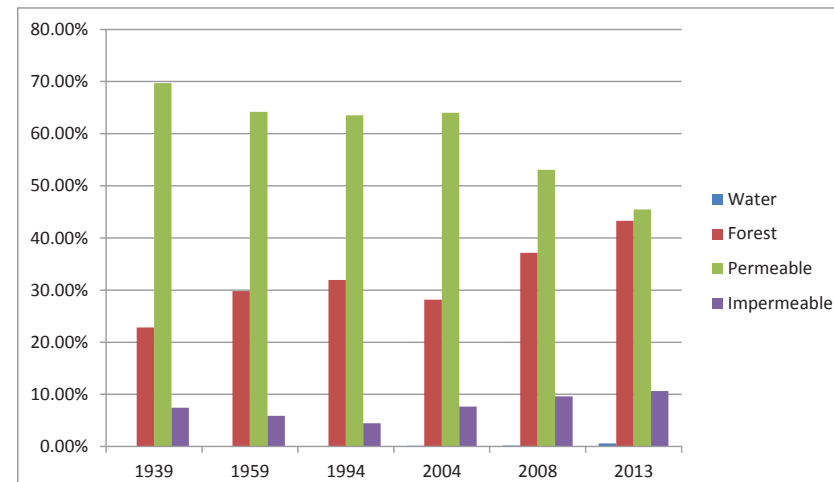
Proposed, 2053

Disconnection -- 10%  
Green Roofs -- 5%  
Street Planters -- 5%  
Permeable Pavement -- 5%  
Forest -- 39%  
Water -- 1%  
Permeable -- 49%  
Impermeable -- 11%

Predicted Percent of all  
Rainfall Retained: **91.03%**

## Natural Changes

Shunk, 2013



Predicted, 2053

Soil Type  
Soil Drainage  
Topography  
Forest -- 45%  
Water -- 0%  
Permeable -- 40%  
Impermeable -- 15%

Predicted Percent of all  
Rainfall Retained: **85.58%**

Proposed, 2053

Disconnection -- 10%  
Green Roofs -- 5%  
Street Planters -- 5%  
Permeable Pavement -- 5%  
Forest -- 39%  
Water -- 1%  
Permeable -- 49%  
Impermeable -- 11%

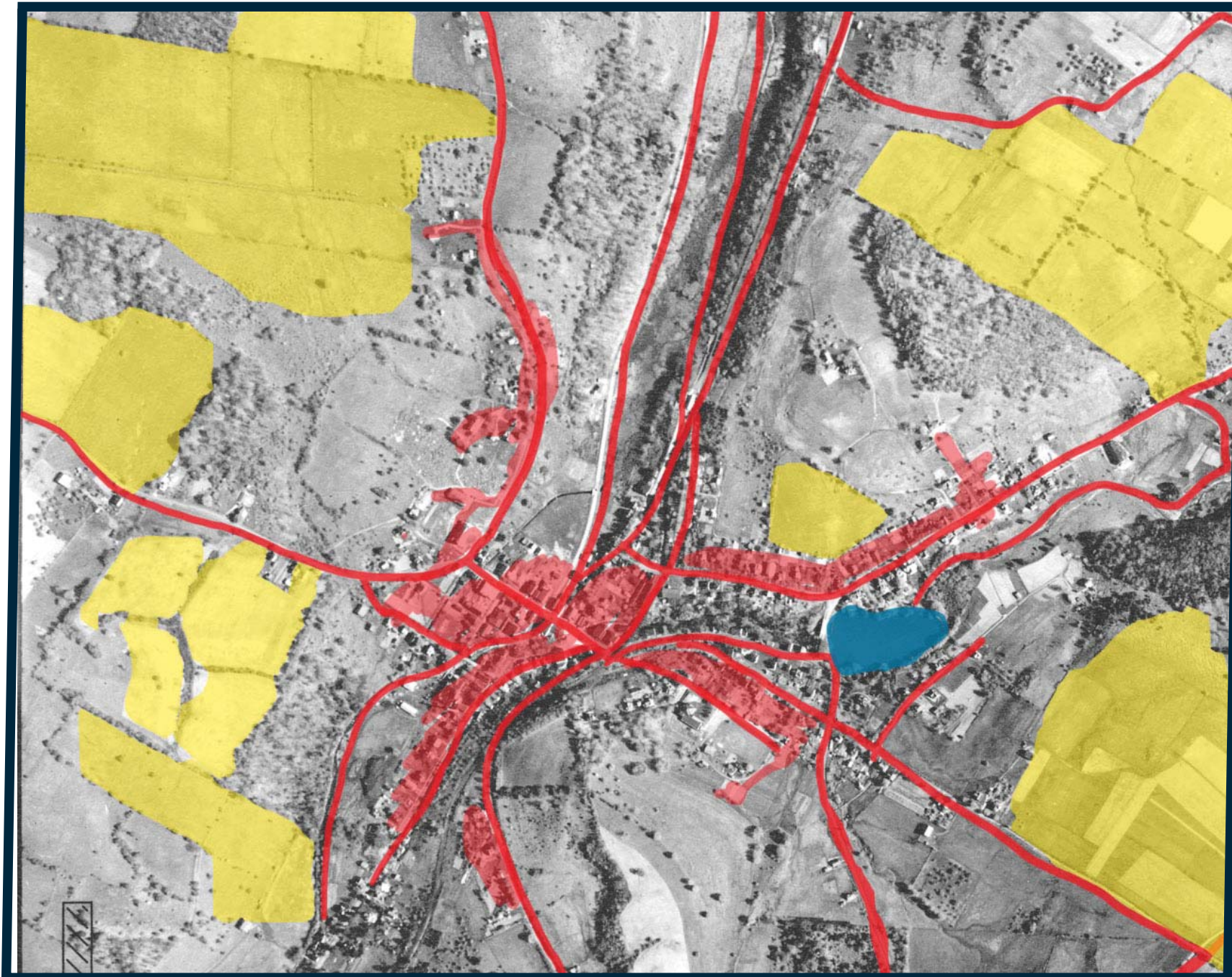
Predicted Percent of all  
Rainfall Retained: **91.03%**

## Gas Development-Related Changes





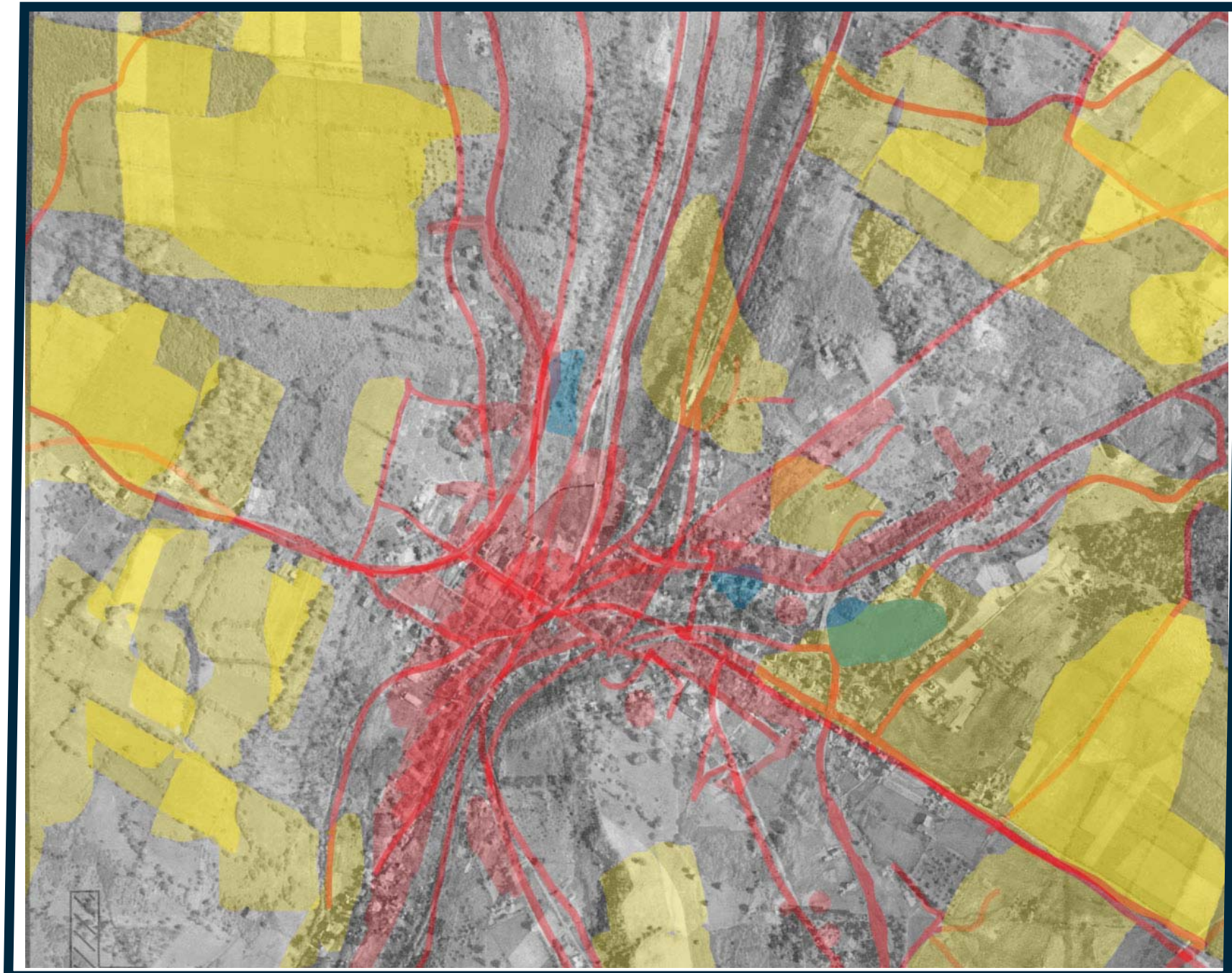
## Dushore, 1939







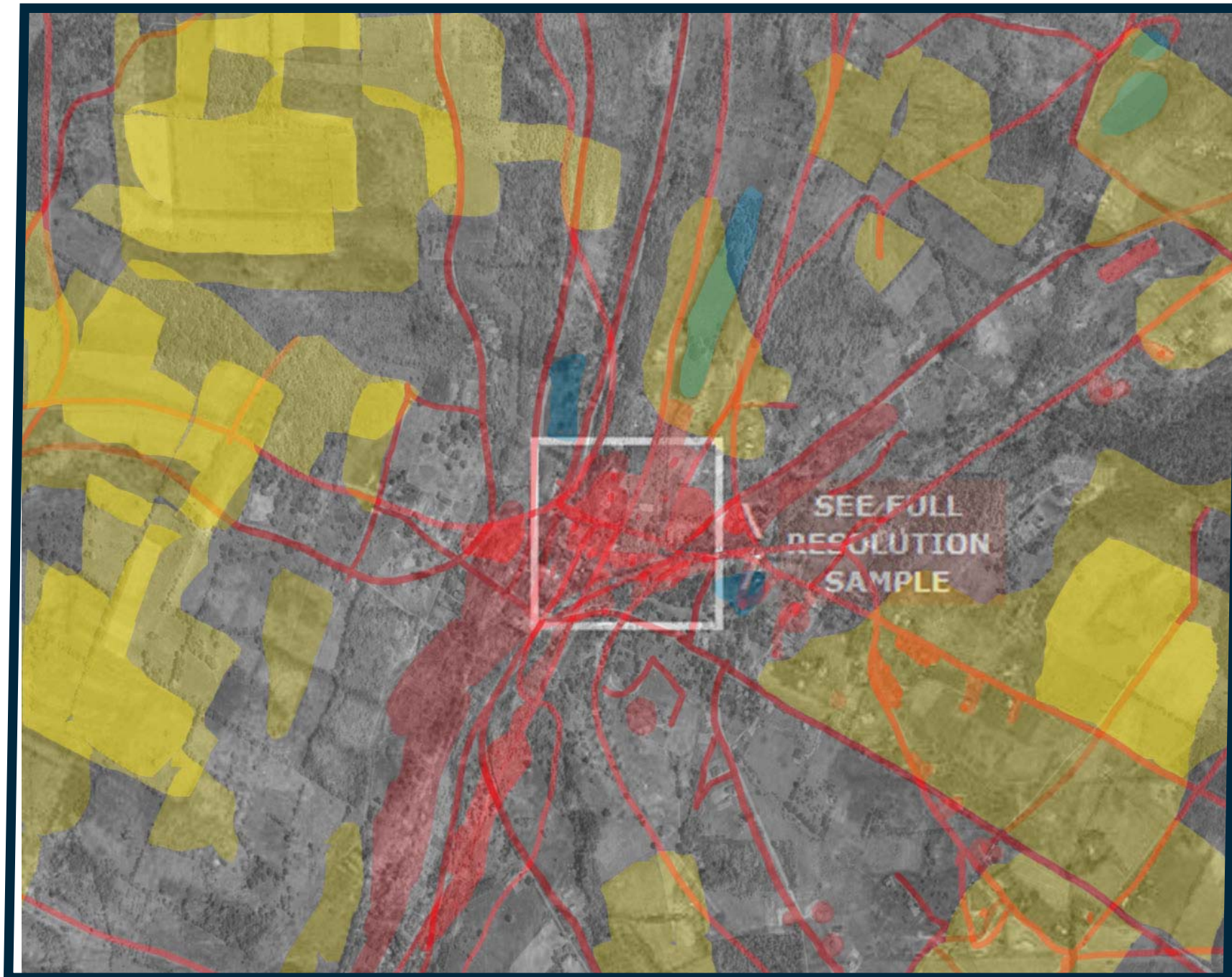
## Dushore, 1959







## Dushore, 1994







## Dushore, 2004







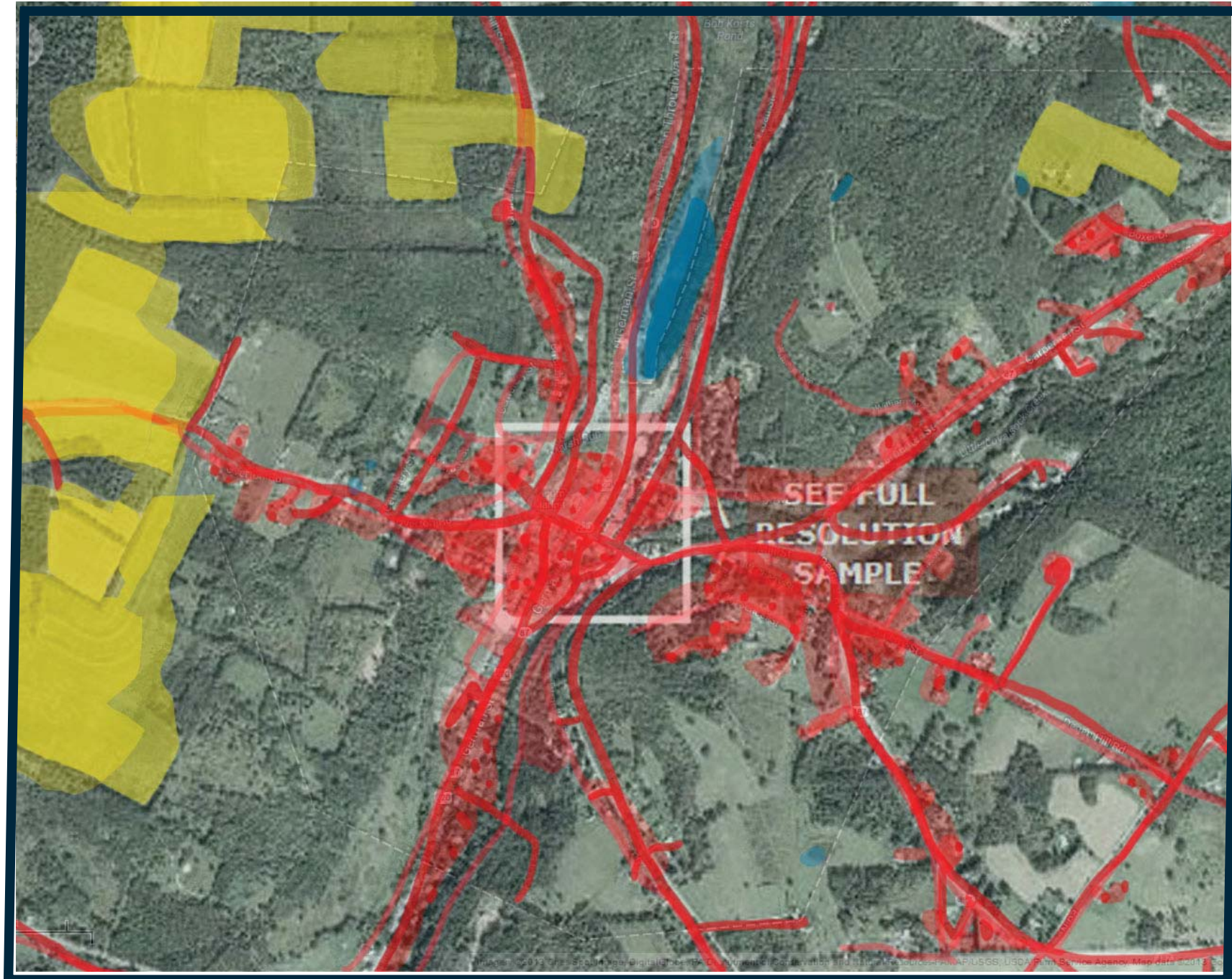
## Dushore, 2008







## Dushore, 2013







# Marcellus X Design

## Problem Statement:

**Dushore** is a town located within the Northeastern part of Sullivan County that has been secondarily impacted due to the Marcellus Shale gas play. Although gas development has not occurred within this town, impermeable surfaces have still increased due to the need to support gas development (i.e. streets, parking, storage).

Dushore, 1939



Dushore, 1959



Dushore, 1994



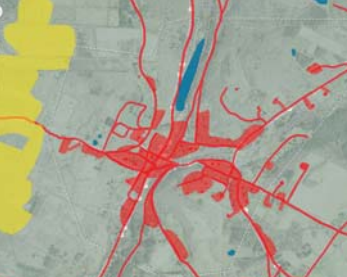
Dushore, 2004



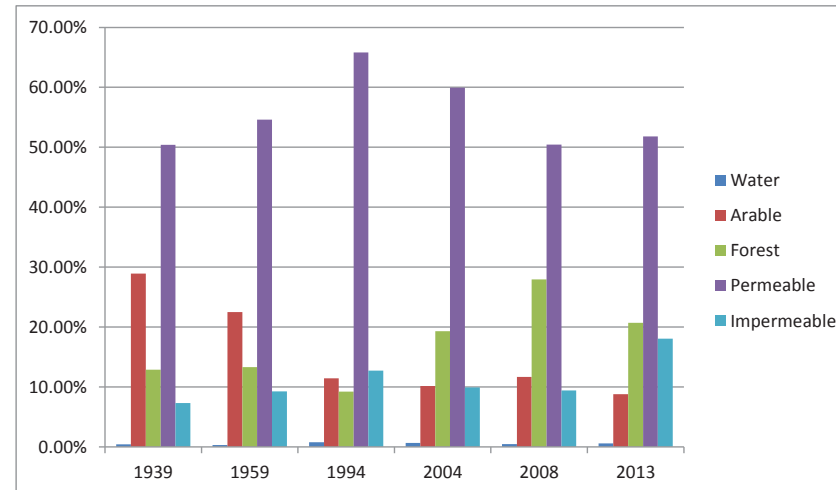
Dushore, 2008



Dushore, 2013



Dushore, 2013



Predicted, 2053

Soil Type

Soil Drainage

Topography

Forest -- 8.88%

Arable -- 8%

Water -- 1%

Permeable -- 74%

Impermeable -- 8.12%

Predicted Percent of all

Rainfall Retained: **91.54%**

Proposed, 2053

Disconnection -- 10%

Green Roofs -- 5%

Street Planters -- 5%

Permeable Pavement -- 5%

Forest -- 8.88%

Arable -- 8%

Water -- 1%

Permeable -- 74%

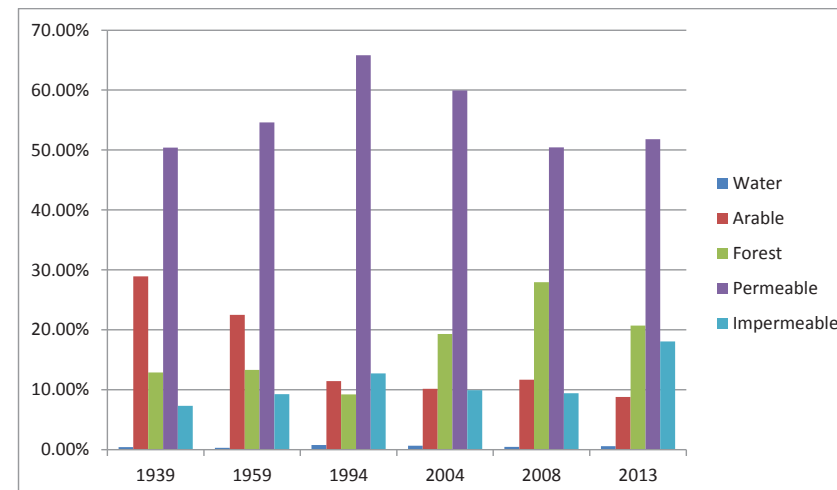
Impermeable -- 8.12%

Predicted Percent of all

Rainfall Retained: **92.95%**

## Natural Changes

Dushore, 2013



Predicted, 2053

Soil Type

Soil Drainage

Topography

Forest -- 5%

Arable -- 6%

Water -- 0%

Permeable -- 54%

Impermeable -- 35%

Predicted Percent of all

Rainfall Retained: **67.75%**

Proposed, 2053

Disconnection -- 10%

Green Roofs -- 5%

Street Planters -- 5%

Permeable Pavement -- 5%

Forest -- 8.88%

Arable -- 8%

Water -- 1%

Permeable -- 74%

Impermeable -- 8.12%

Predicted Percent of all

Rainfall Retained: **92.95%**

## Gas Development - Related Changes