The GreenPlan-IT tool kit:
A Watershed-Scale Planning Tool for Green Infrastructure in Bay Area Watersheds

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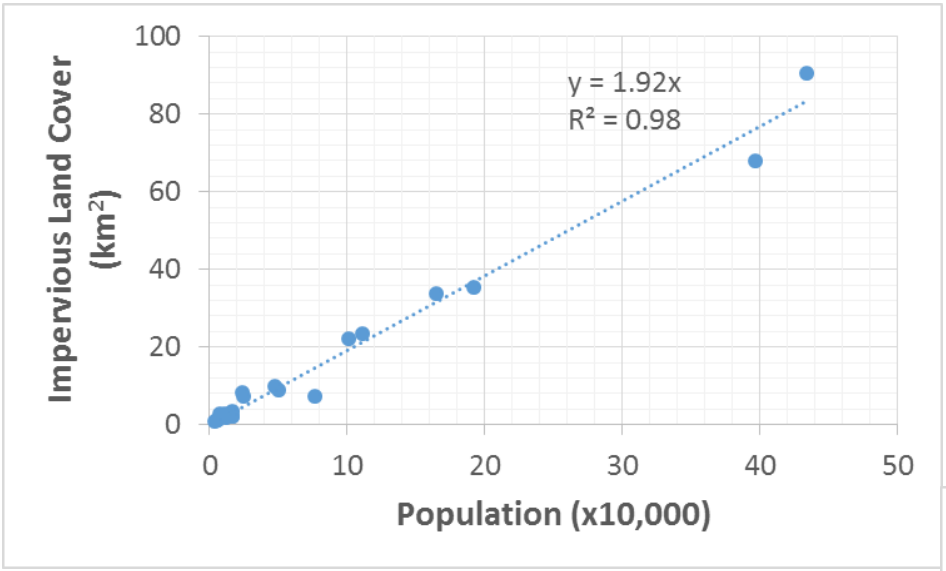
GreenPlan-IT Overview

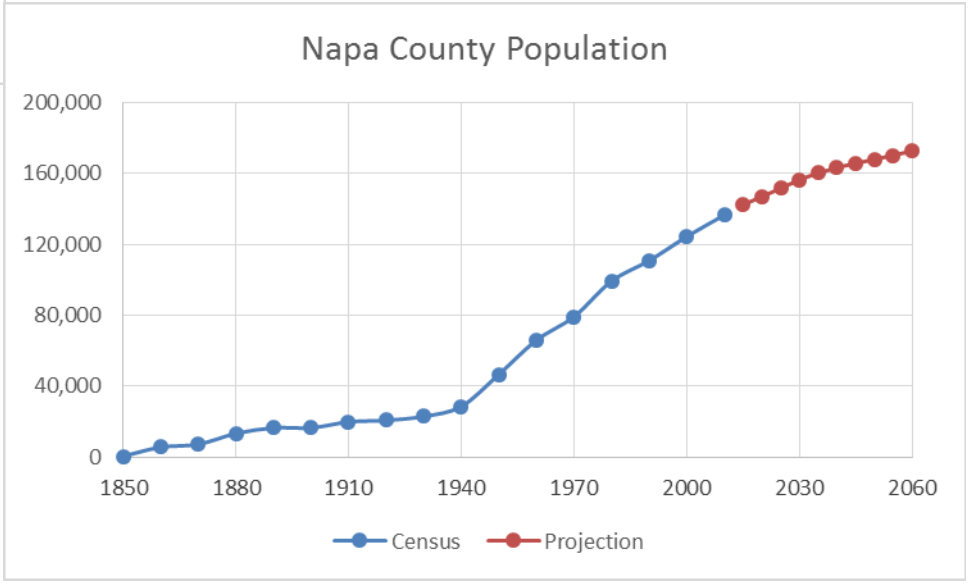
- Designed to identify optimal GI locations for stormwater management
- Developed with Partner Cities San Jose and San Mateo
- Primary design use: Managing surface runoff and pollutants
  - But can be enhanced for use on groundwater recharge and other hydrological issues
- Open source, free to be used or further enhanced

Napa area population challenge



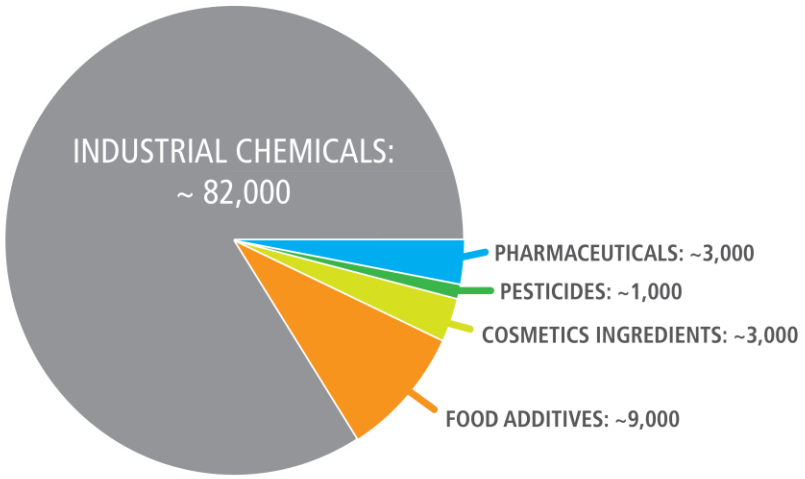
- Every 5,000 people
  - ~1 km² of impervious cover

- Over the past 4 decades
  - Added ~5,000 people every 3.5 years



Emerging Pollutants

- **Urban environments**
  - Import water, food, and materials from the near by rural areas
  - Export water, air pollutants, wastes and wastewater to nearby environments
  - In the past 30 years, 100,000 new chemicals have been invented
  - The 2055 pollutant list has not been invented yet!!



Source: Muir and Howard (2006)

Napa area climate change?

- Over the past decades annual average rainfall has increased

	Napa State Hospital (046074)	Calistoga (041312)
1961-1990:	25.1”	37.6”
1971-2000:	26.5”	38.5”
1981-2010:	27.7”	40.9”

Napa area rainfall-runoff challenge

- Each 1 km^2 of impervious surface added every 3.5 years for an annual average rainfall of 30” leads to:
  - ~750 Acre-foot less recharge occurs on average
  - ~1.2 cfs less base flow in our creeks occurs on average
  - Increased peak flow runoff capacity needed in stormwater infrastructure

RIDDLE ME THIS…

HOW WILL WE MAINTAIN OR ENHANCE ENVIRONMENTAL QUALITY IN NAPA COUNTY AGAINST SUCH SEEMINGLY FORMIDABLE ODDS?

Urban opportunity

How do we want our urban areas to be designed and function for 2055?

- Water supply and use?
- Stormwater runoff?
- Pollutant production and export?
- Habitat for birds and animals?

Habitat for people too!

Just like they were designed in the last 100 years or a new design?

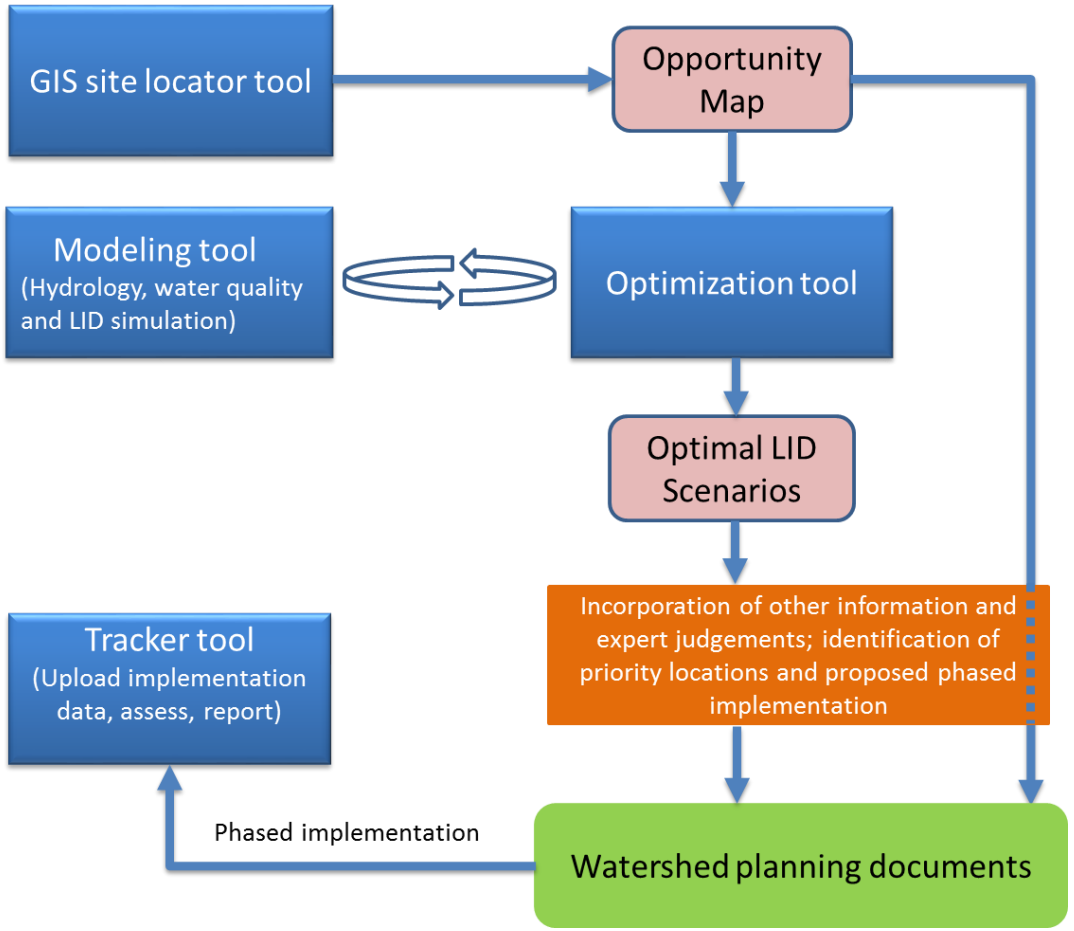
Green Infrastructure (GI) is a solution that can help us create that new design

but we need a shared vision and a shared strategy

A plan

Introducing GreenPlan-IT

- A watershed-scale planning tool for municipalities
- Locate and determine cost effective implementation scenarios



GreenPlan-IT: Answers Key Questions

- Where are possible locations for GI implementation?
- Where are effective locations for GI implementation and what quantitative flow and water quality improvements can be achieved?
- What are the most cost-effective GI combinations for achieving certain reduction goals?

What is Green Infrastructure?

- Rain gardens
- Bioswales
- Green roofs
- Tree well planters
- Pervious pavement
- Green walls
- Cisterns

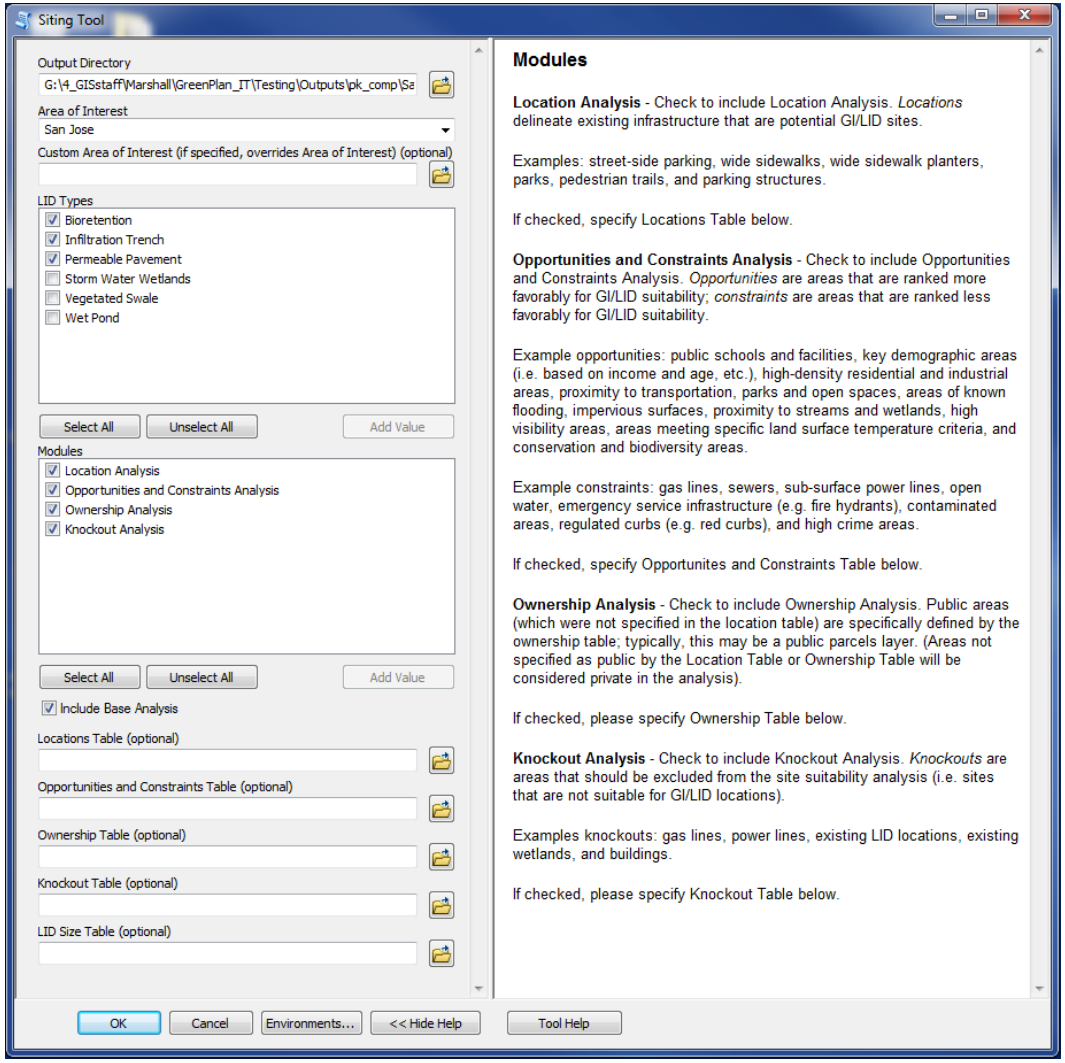
Locator tool

Value proposition:

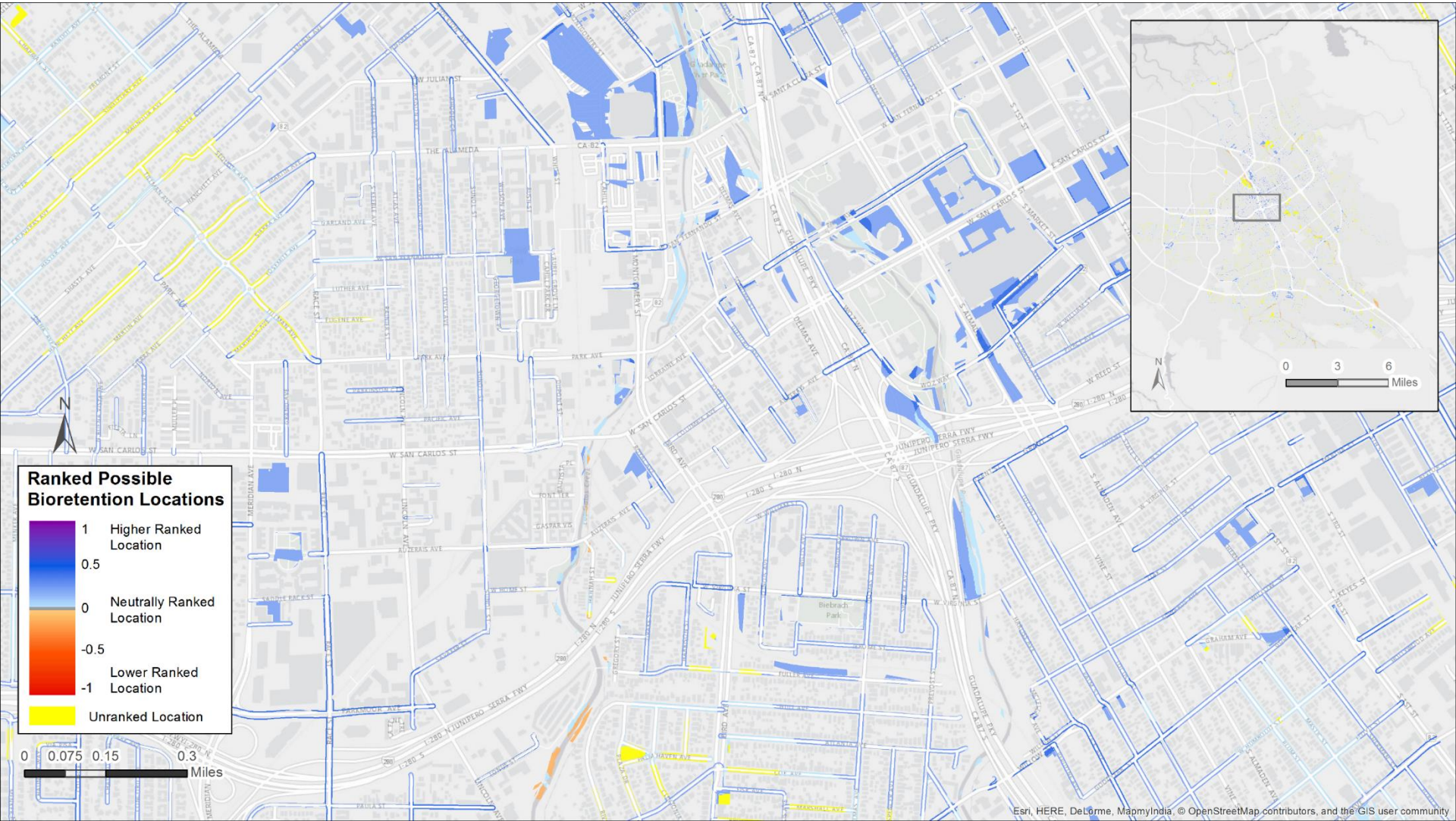
Takes the user from not knowing where to place GI among 10s to 100s thousands of locations to a few thousand feasible locations

An Easy Tool Interface

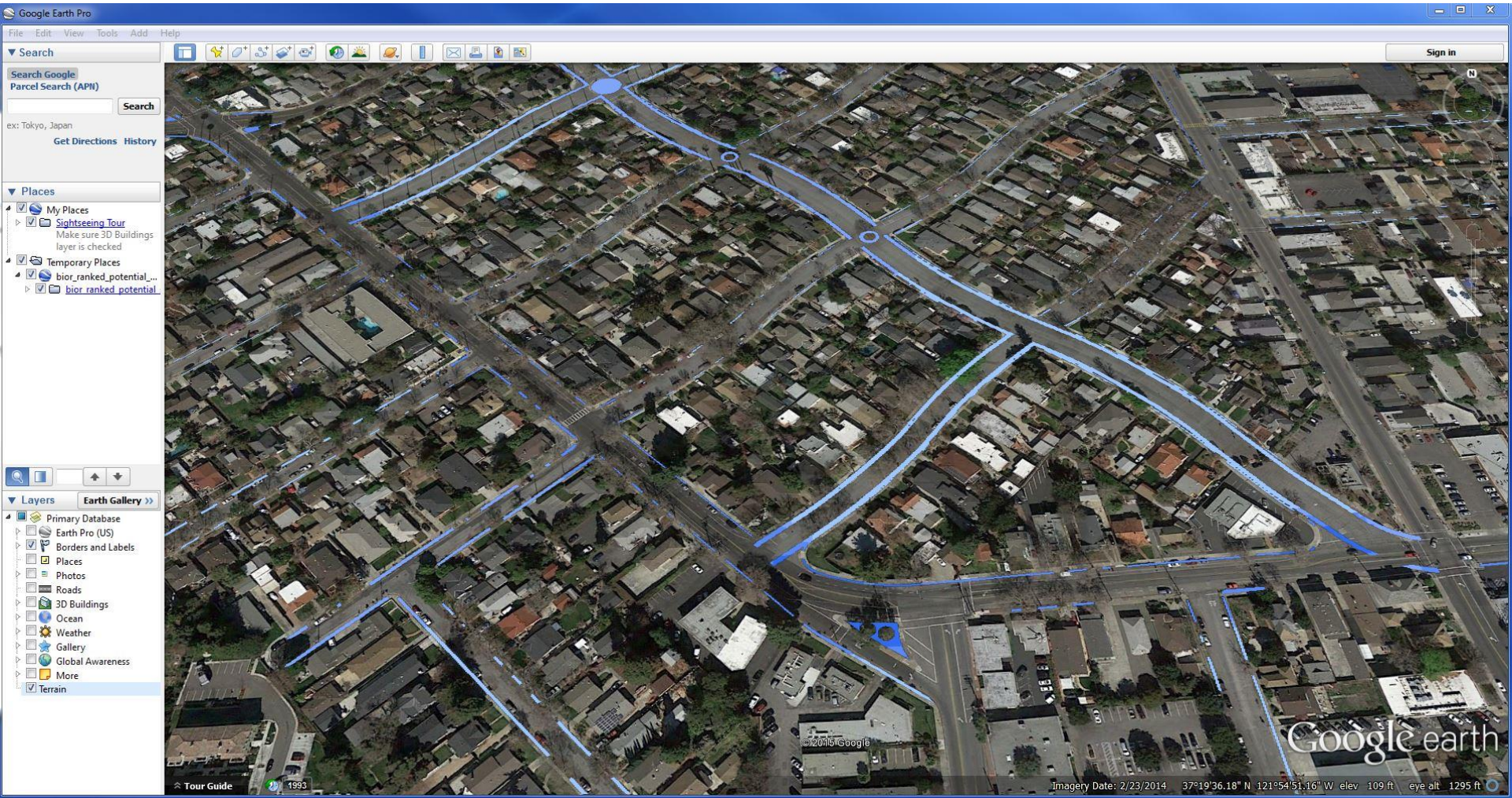
- Organizes local and regional GIS data
- Select only GI types, analysis modules you want to include
- Classifies, adds knockouts and constraints, and ranks the locations according environmental conditions, LID physics, and <u>your</u> priorities



Outputs - Maps and Tables



Viewable in Google Earth



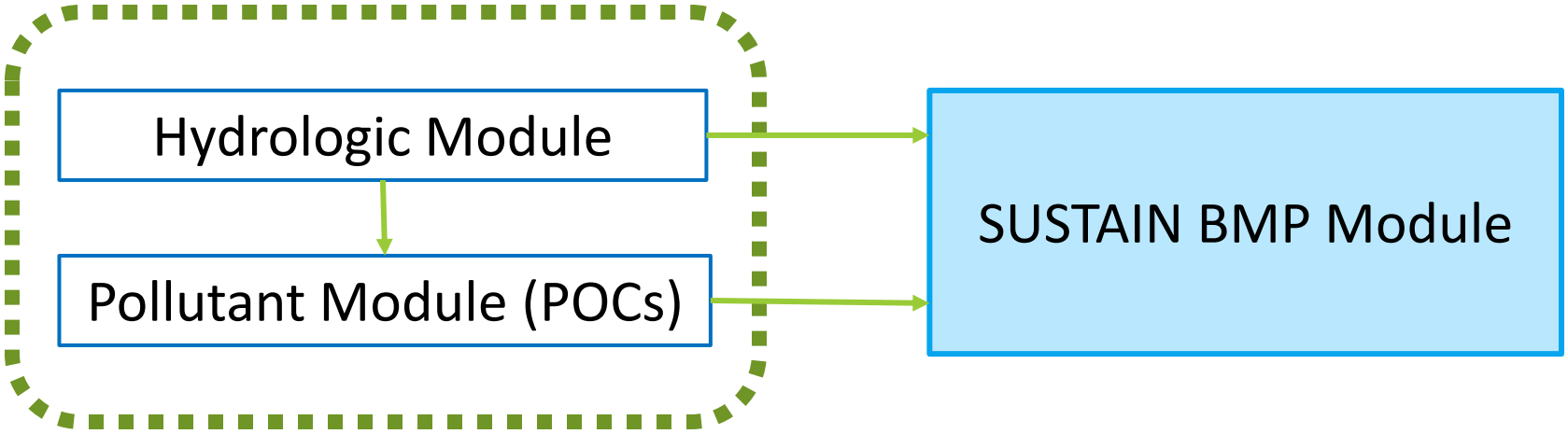
Modeling tool

Value proposition:

Provides the user with the ability to compare runoff and water quality conditions before and after GI buildout

The Modeling "Engine"

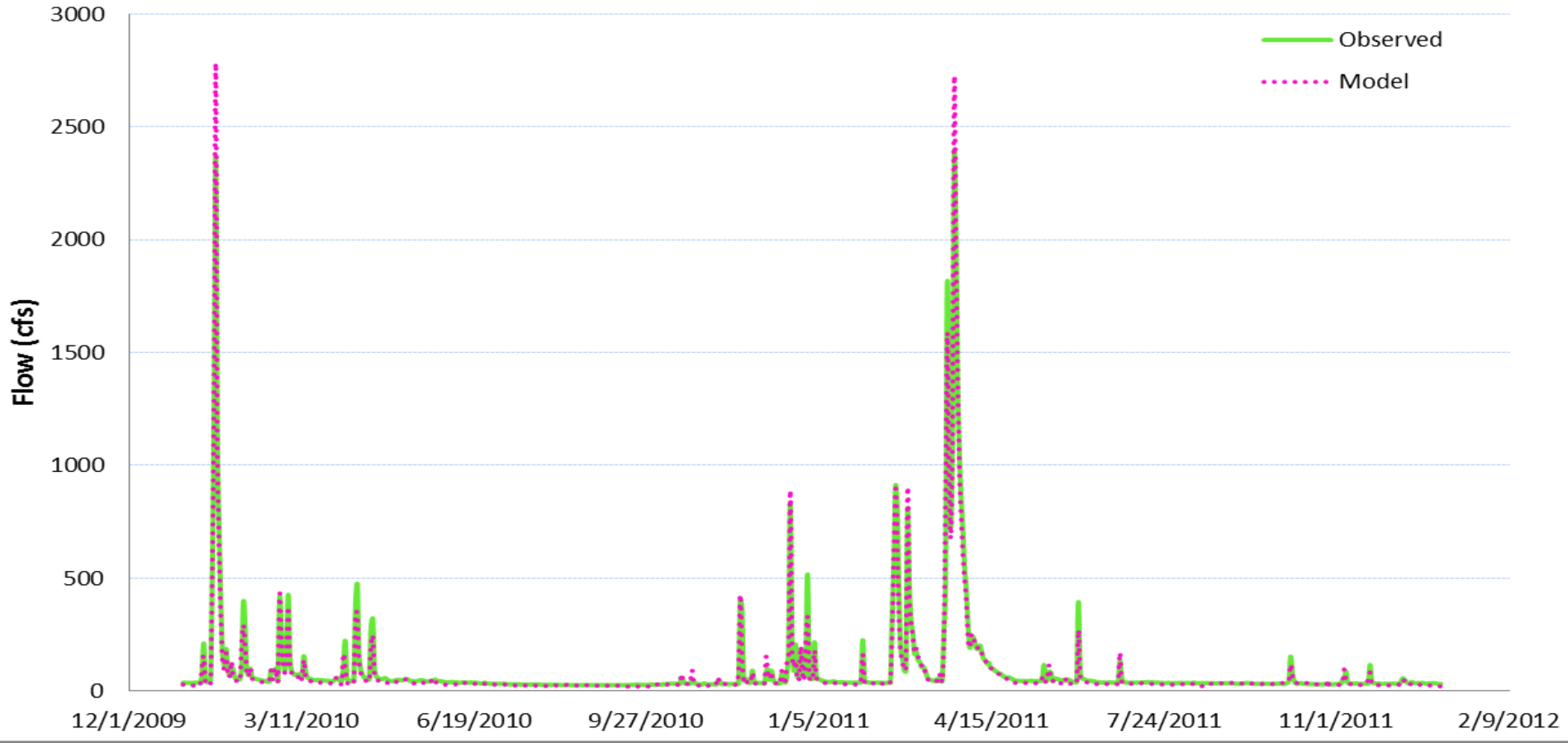
- EPA's SWMM model



- Establish baseline condition
- ID critical pollutant and runoff source areas
- Quantify flow and pollutant load reduction from various GI scenarios

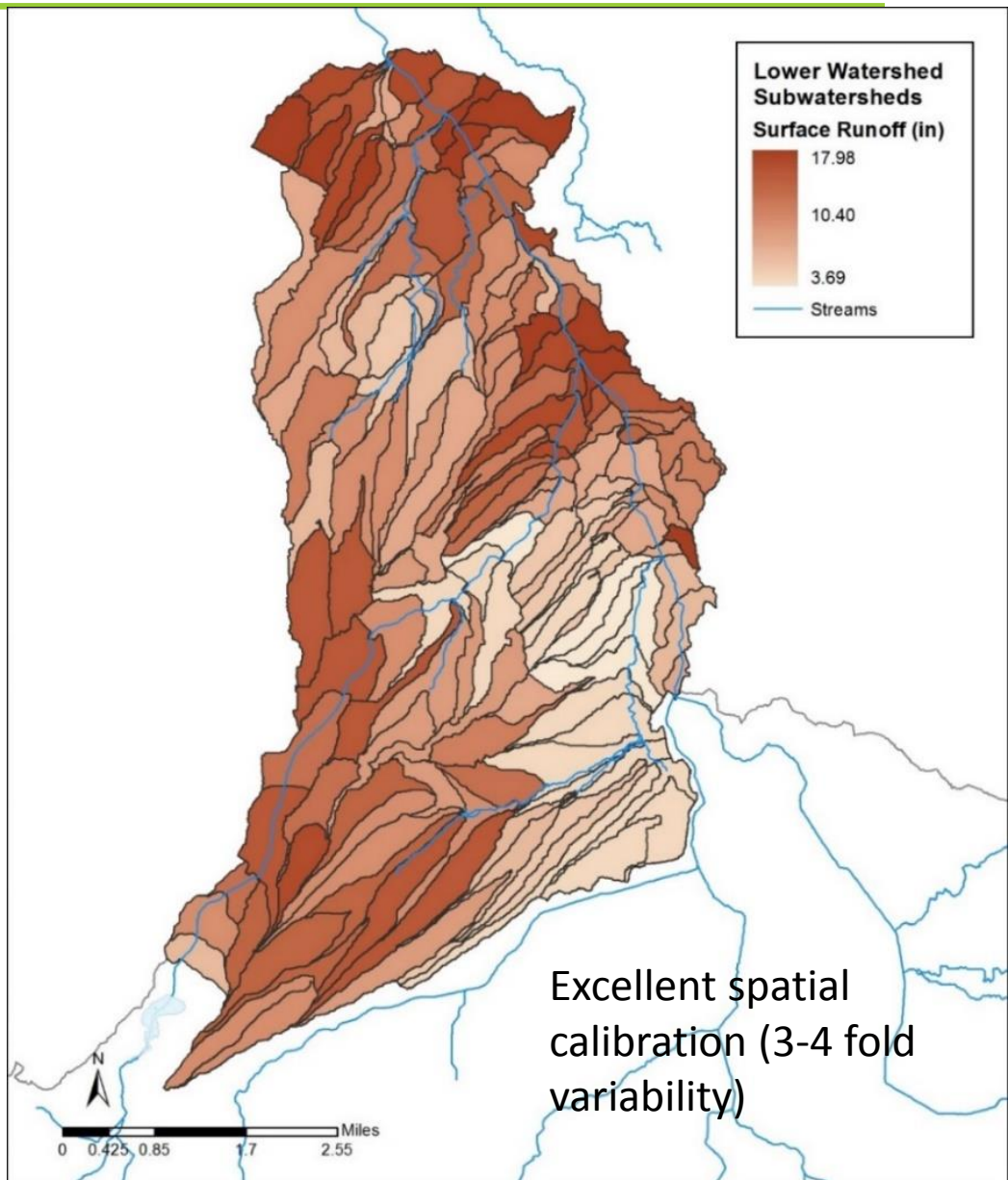
Model Calibration

- Excellent calibration for both flow timing and magnitude



What is the Model output used for?

- Set stage for Green Infrastructure cost-effectiveness optimization
- Ready for Reasonable Assurance Analysis



Excellent spatial calibration (3-4 fold variability)

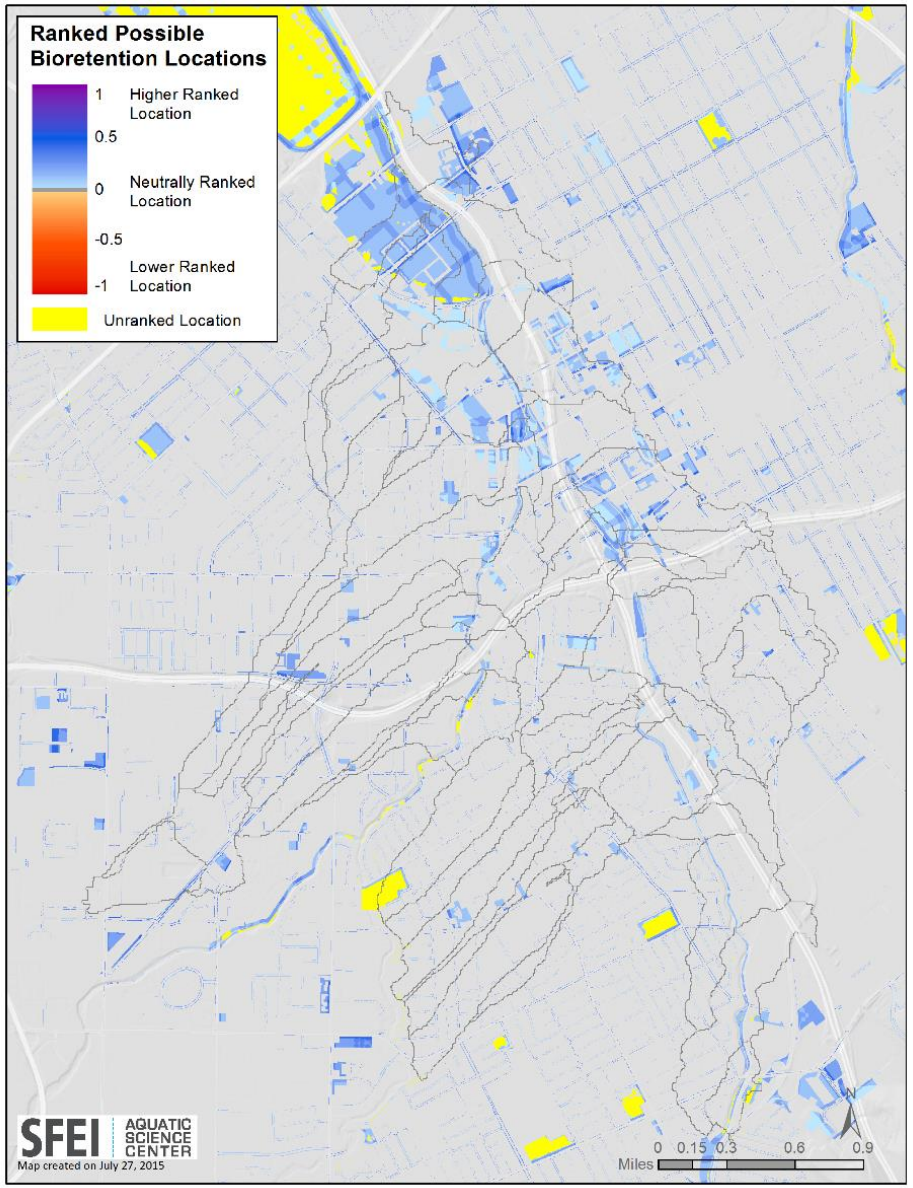
Optimization tool

Value proposition:

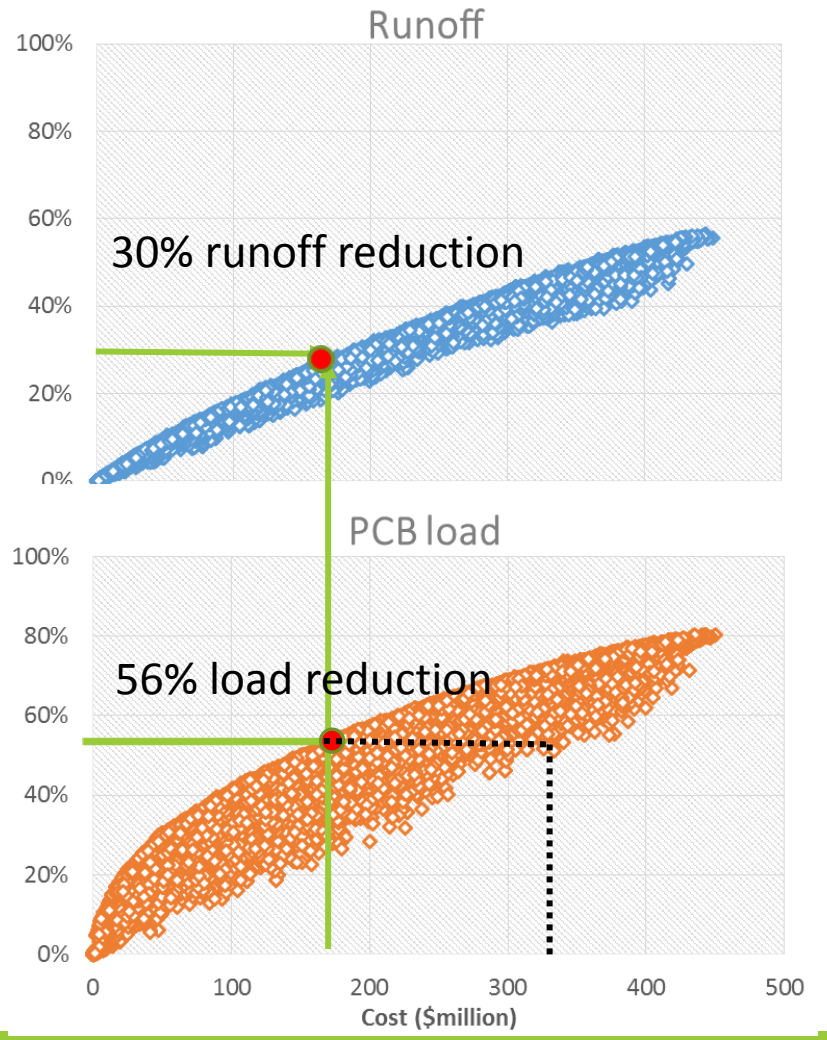
Take the user from thousands of feasible locations to 100s of optimal locations

Thousands of Possible Sites….

- But what are the most cost-effective Green Infrastructure combinations?
- …and at what price?

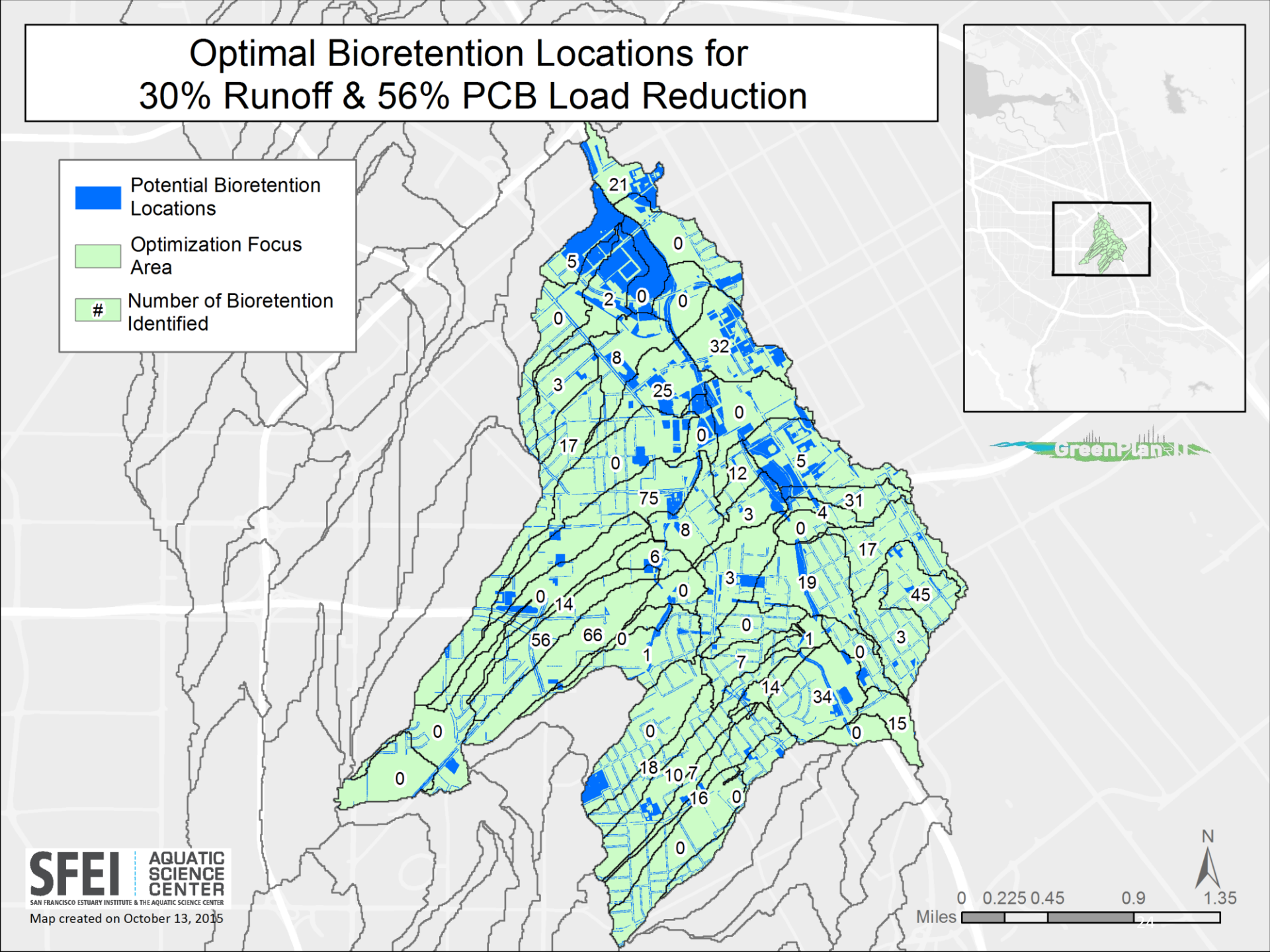


Example Optimal Solution



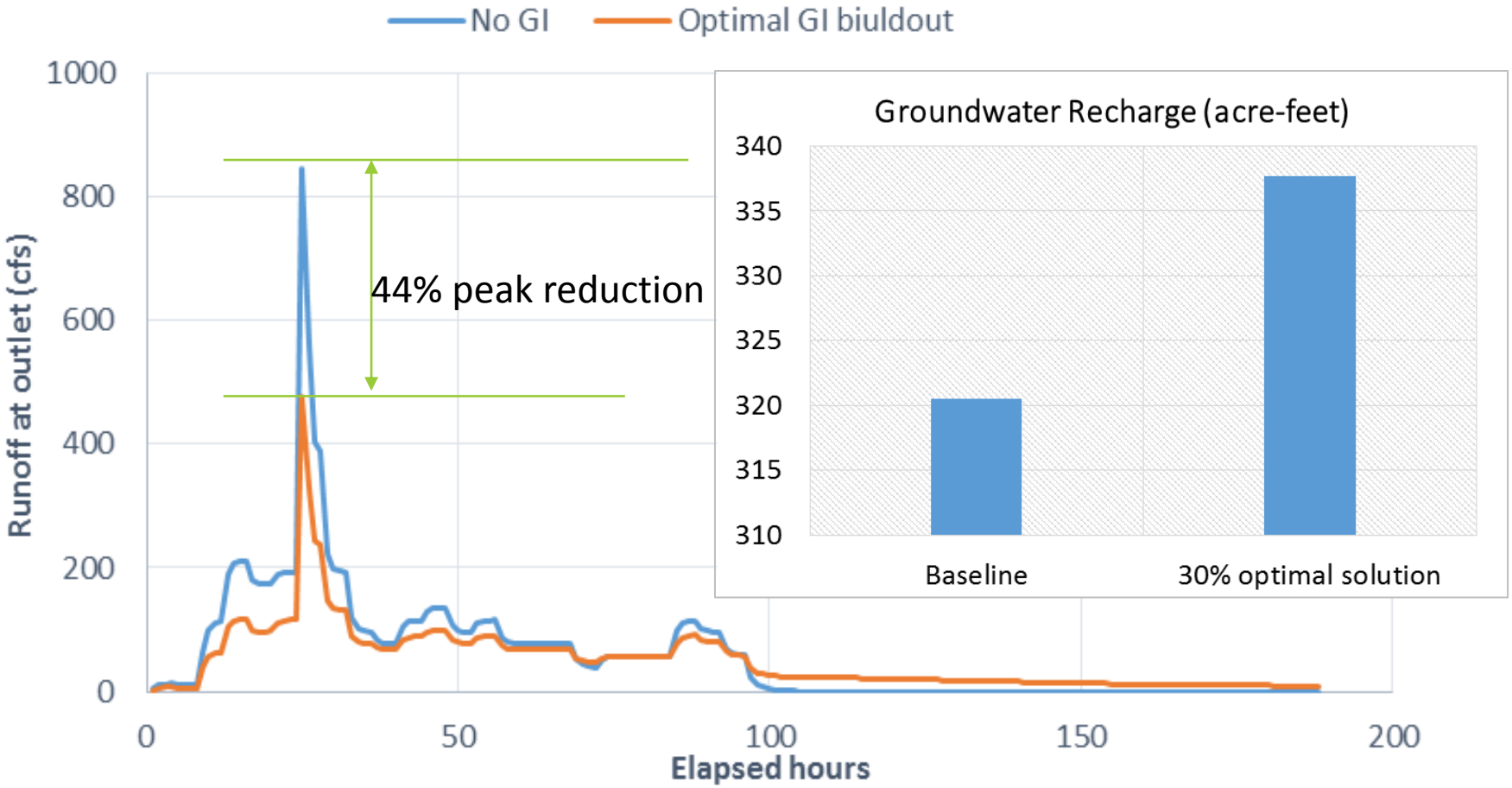
- Note the difference in relative cost!
- Random acts of kindness will cost us twice as much

Optimal Bioretention Locations for 30% Runoff & 56% PCB Load Reduction



Programmatic Outcomes!

- 44% peak flow reduction
- 5.5 million gallons of additional recharge



GreenPlan-IT Tool Summary

- **Designed to meet municipal planning needs!**
  - Identifies and ranks feasible locations for GI
  - Models hydrology, groundwater, and contaminants
  - Identifies best GI implementation scenarios at lowest cost
  - Provides the basis for a reasonable assurance analysis

Toolkit Download & Documentation

http://greenplanit.sfei.org/

- ✓ Toolkit
- ✓ User manual
- ✓ Toolkit requirements
- ✓ Demonstration report