

Design and Implementation of

BMP Monitoring Programs

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Water Resources, Wetlands and Ecology

Project Scope

The Project employed various approaches to measure the performance of stormwater BMPs at three locations in Northeastern Illinois.

- ❖ Our Lady Gate of Heaven Church/Banner School
- ❖ St. Margaret Mary Parish and School
- ❖ Village of Bellwood Water Department

Our Lady Gate of Heaven

- ❖ Located on the south side of Chicago
- ❖ 660 ft² bioswale
- ❖ 12,433 ft² tributary area (parking lot)
- ❖ Construction Design
 - ❖ 12" Gravel
 - ❖ 12" Engineered Soil
 - ❖ Native Plantings

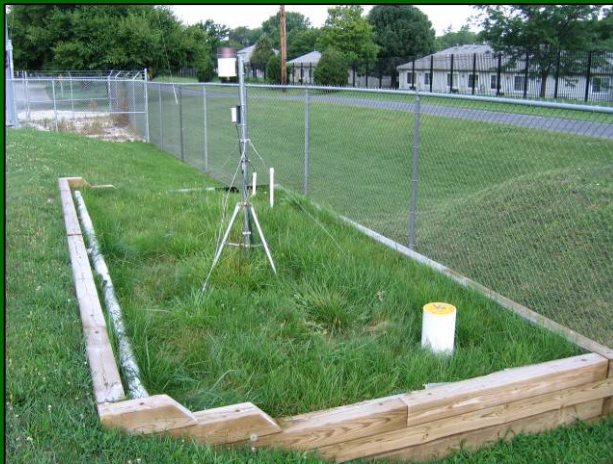


St. Margaret Mary

- ❖ Located on the north side of Chicago
- ❖ Three BMPs
 - ❖ Bioswale
 - ❖ 933 ft² in size
 - ❖ 8,325 ft² tributary area (parking lot)
 - ❖ Two rain gardens
 - ❖ 96 ft² in size
 - ❖ 755 ft² tributary area (roof)
- ❖ Construction Design
 - ❖ 12-18" Engineered Soil
 - ❖ Native Plantings



Bellwood Water Department



❖ Two Rain Gardens

❖ Native

- ❖ 230 ft² in size
- ❖ 1,540 ft² tributary area (roof)

❖ Turf Grass

- ❖ 220 ft² in size
- ❖ 1,340 ft² tributary area (roof)

❖ Construction Design

- ❖ Elevated Planter Box
- ❖ 24" Engineered Soil
- ❖ Weir

Monitoring Plan: Equipment

- ❖ Our monitoring plan focused on water quantity and volume control.
- ❖ Measurements included:
 - ❖ Tributary Area
 - ❖ Rainfall
 - ❖ Water Level
 - ❖ Soil Moisture

Monitoring Equipment

- ❖ Rain Gauge
 - ❖ Hobo Weather Station
Tipping Bucket Gauge
 - ❖ Hobo MicroStation
Data Logger
- ❖ Recorded 5 minute
rainfall



Monitoring Equipment

❖ Water Level Meters

- ❖ Hobo 30-foot depth data logger
- ❖ Recorded on a 5-minute interval
- ❖ Requires independent barometric pressure reading



Monitoring Equipment

- ❖ Monitoring Well
 - ❖ Metal well covers
 - ❖ PVC well slotted for:
 - ❖ Surface
 - ❖ Engineered soil/aggregate
 - ❖ Subsoil
 - ❖ Bentonite seal
 - ❖ Uniform-grade sand for well pack



Monitoring Equipment



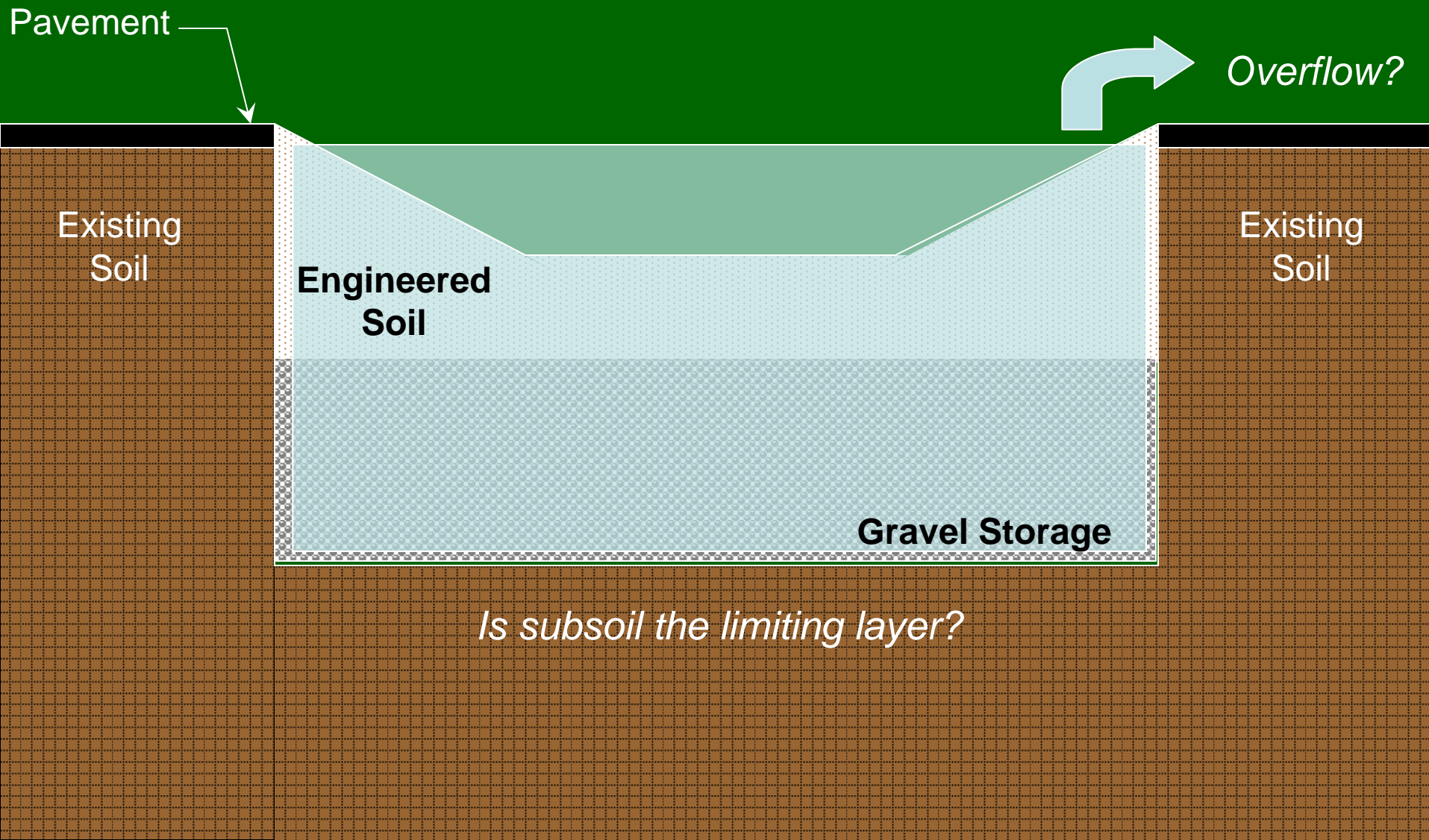
- ❖ Soil Moisture Meters
 - ❖ ECH 2 O Soil Moisture Sensor (dielectric)
 - ❖ Hobo Microstation Data Logger
- ❖ Recorded 5-min soil moisture data
- ❖ In-laboratory soil specific meter calibration
- ❖ Used to determine soil saturation and soil porosity by volume

Monitoring Plan

Research questions:

- ❖ BMP Performance
 - ❖ Rate and volume capacity
- ❖ Design/environmental factors:
 - ❖ Vegetation type
 - ❖ Soil type
 - ❖ High groundwater
 - ❖ Initial soil moisture conditions
 - ❖ Rate of infiltration through various layers

BMP Performance



BMP Performance

Pavement

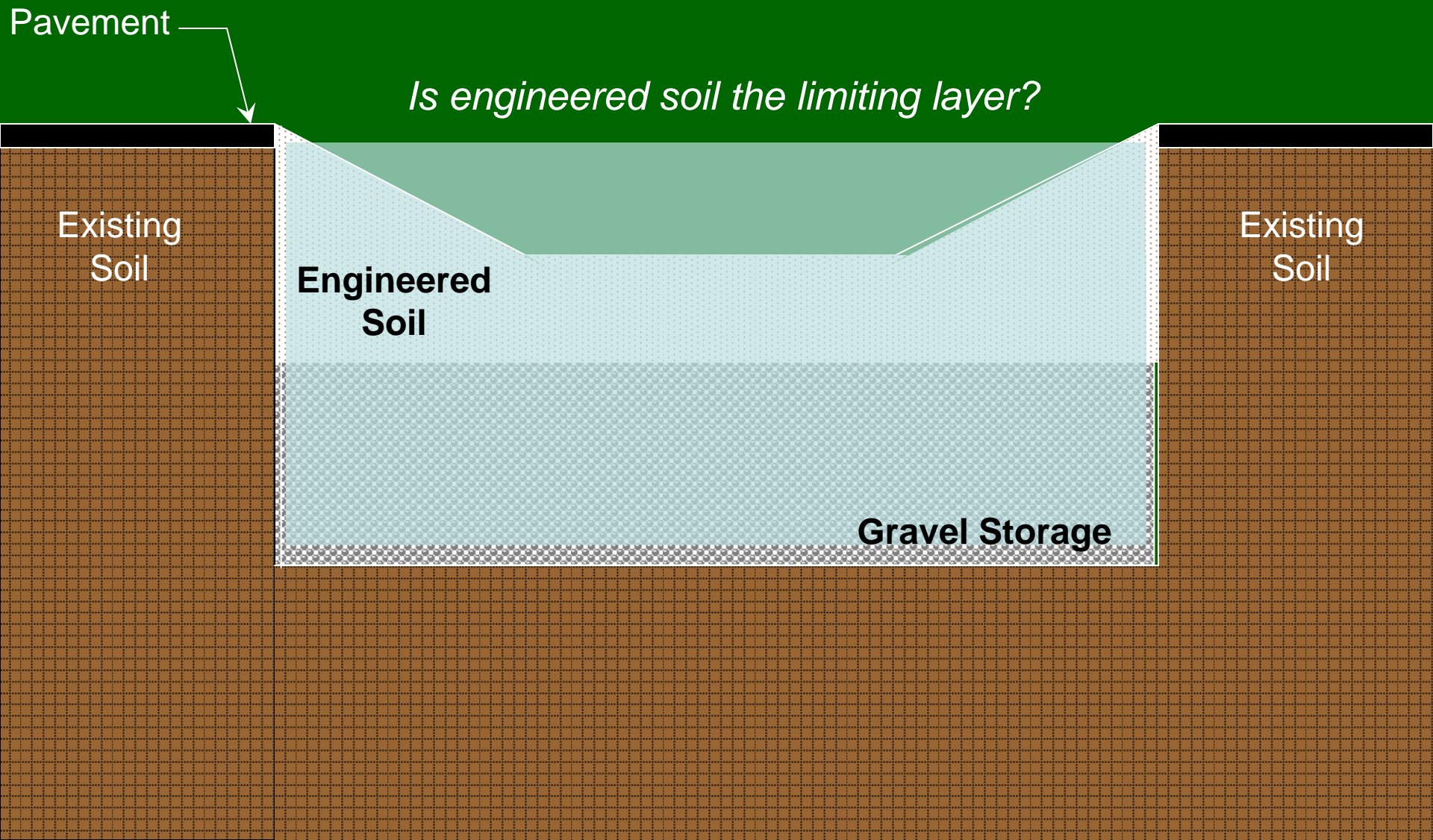
Is engineered soil the limiting layer?

Existing
Soil

Engineered
Soil

Existing
Soil

Gravel Storage



Monitoring Data/Computations

*Runoff computed from Rainfall
and tributary area*

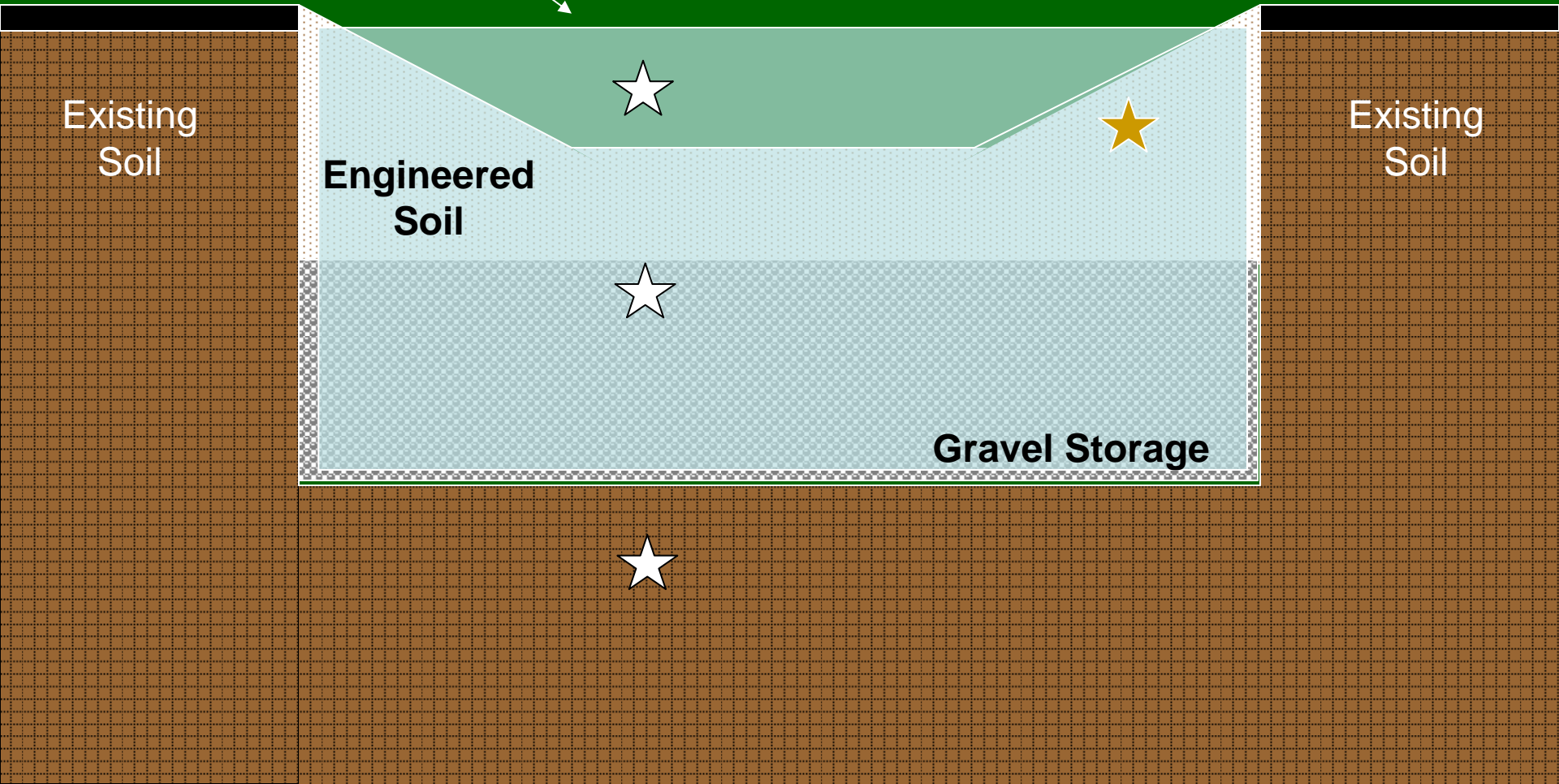
*Outflow
unmeasurable
in 4 of 6 BMPs*

Existing
Soil

**Engineered
Soil**

Existing
Soil

Gravel Storage

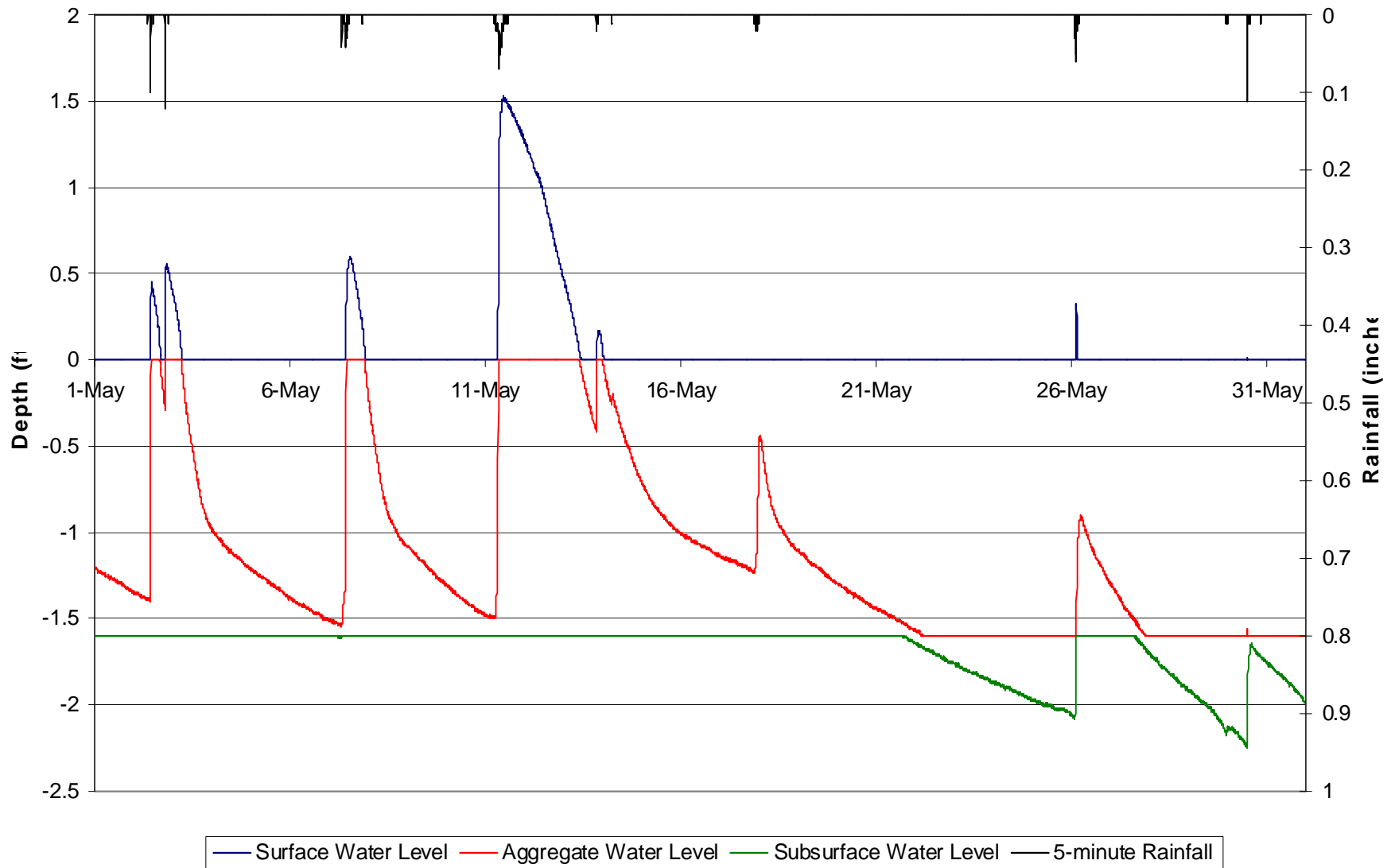


Our Lady Gate of Heaven

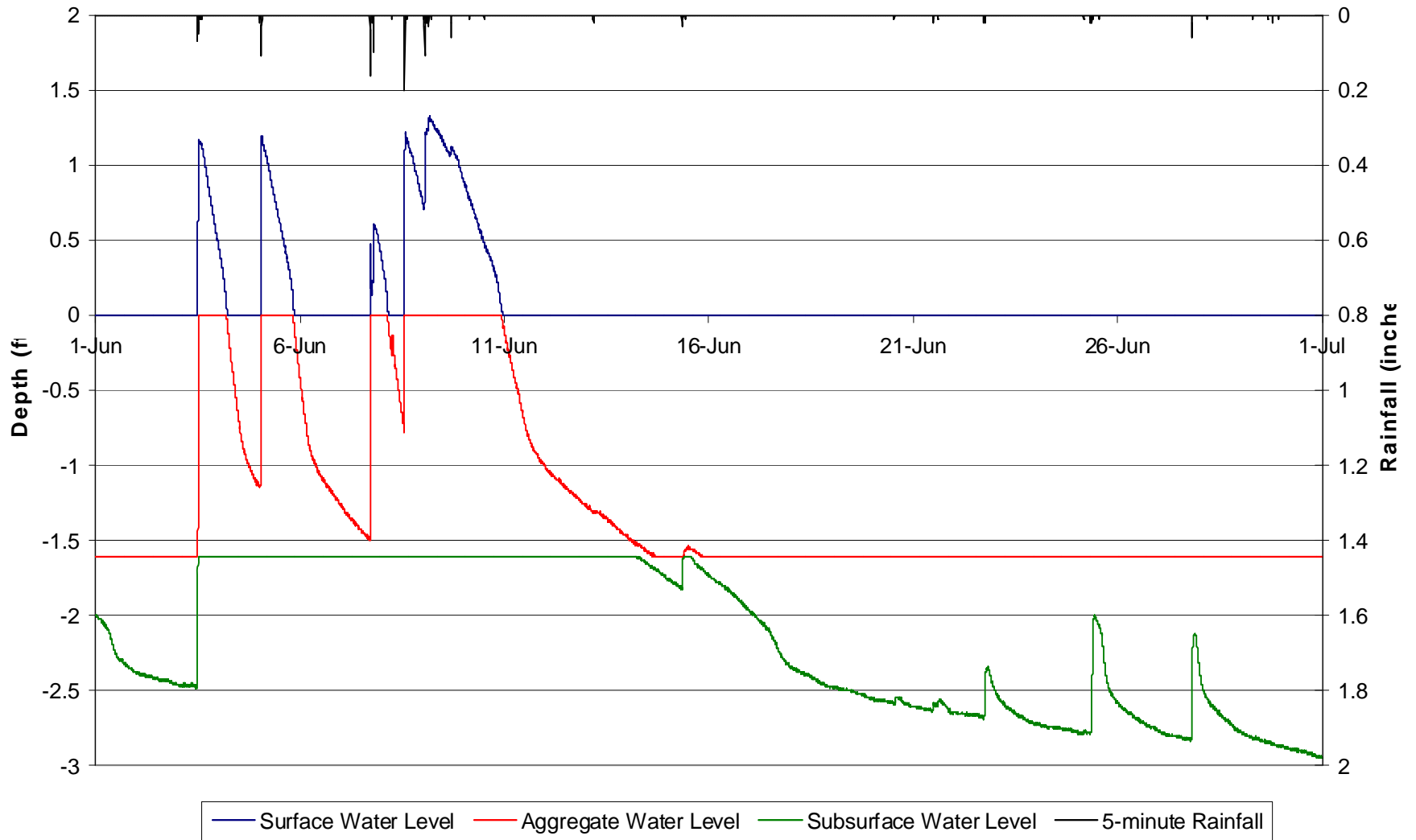
❖ Monitoring Data Summary and Results

- ❖ Data collected between April 2008 and October 2008
- ❖ Infiltration rates of 0.2 to 0.8 inches per hour
- ❖ Effective for events up to 0.5 inches
- ❖ Unknown performance for events over 0.5 inches

Our Lady Gate of Heaven May 2008

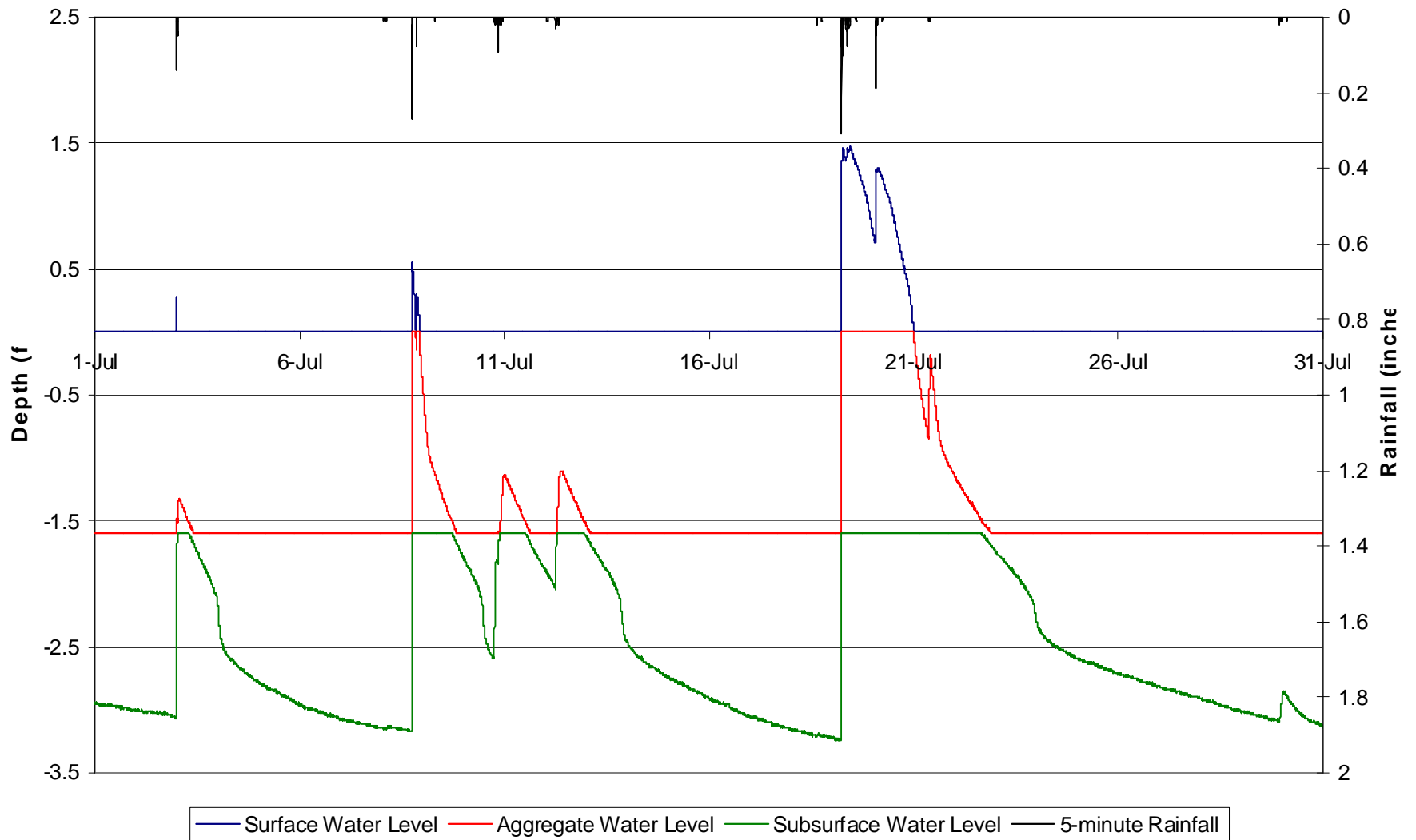


Our Lady Gate of Heaven June 2008

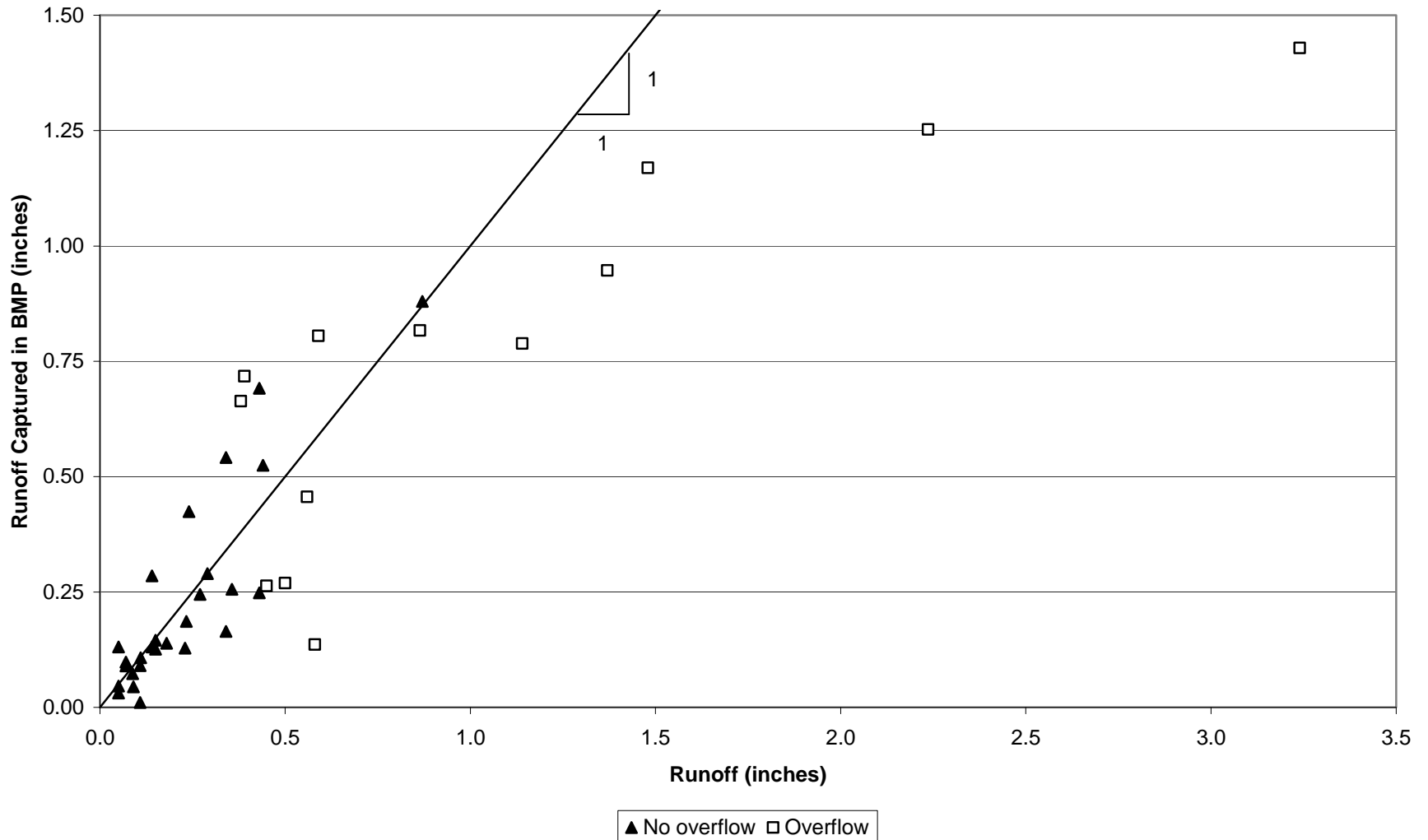


Our Lade Gate of Heaven

July 2008



Our Lady Gate of Heaven Swale

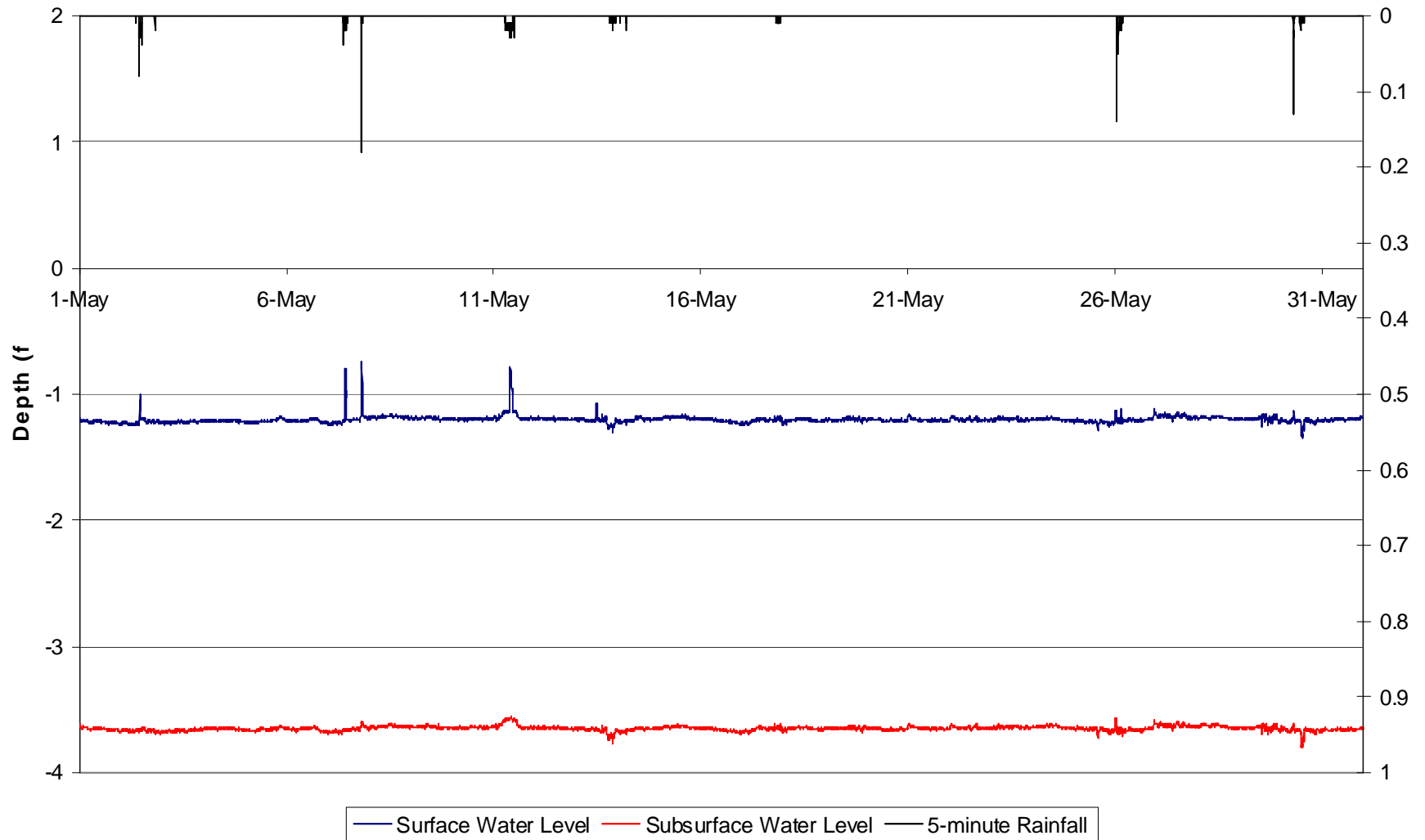


St. Margaret Mary

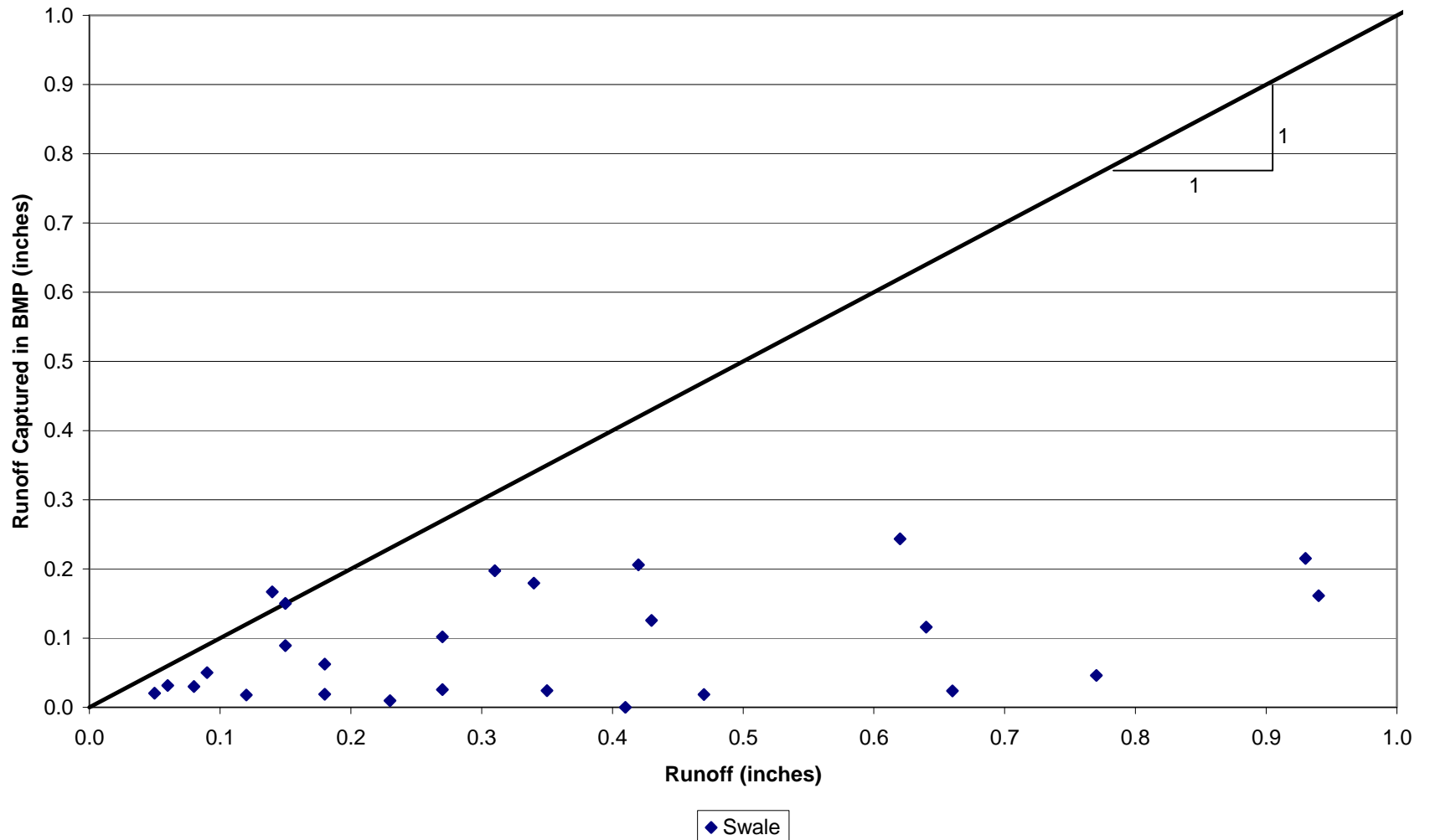
❖ Monitoring Data Summary and Results

- ❖ Data collected between May 2008 and October 2008
- ❖ BMPs worked exceedingly well and no surface water storage was ever observed
- ❖ Since the monitoring protocol was designed to measure free water surface, the protocol was not as successful at this site as at OLGH

St Margaret Mary Swale May 2008



St. Margaret Mary Swale

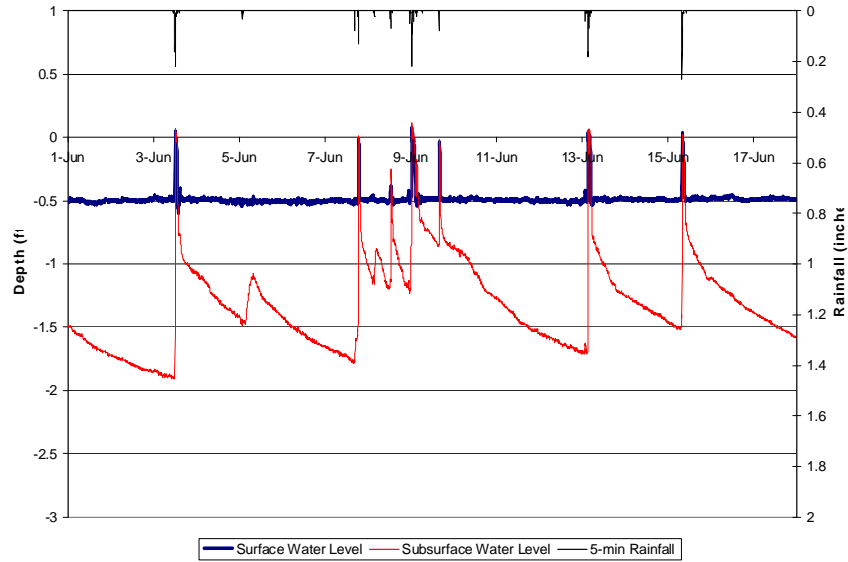


Bellwood Water Department

❖ Monitoring Data Summary and Results

- ❖ Data collected between May 2008 and October 2008
 - One well was insufficient to represent water captured in the gardens, even though they are only 230 square feet
 - The turf rain garden is performing better thus far in the project
 - The 5-minute recording period may have been too long to catch the near immediate response time of above ground storage in these small gardens
 - A water level recording interval was reduced to one minute in July and V-notch weirs were added

Bellwood Native Raingarden
June 2008



Bellwood Turf Raingarden
June 2008

