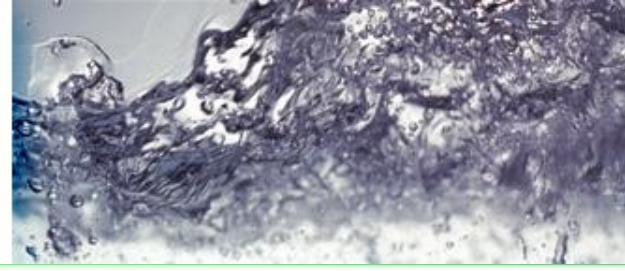


# What is Capiphon?



## Revolutionary Drainage Technology

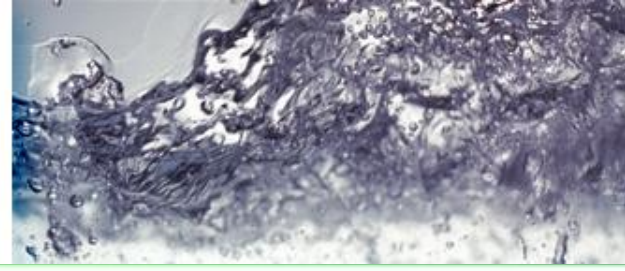


**Best Invention  
of the Year 1999**

**International Exhibition  
on Ideas, Inventions  
and Novelties  
Nuremberg**



# What is Capiphon?

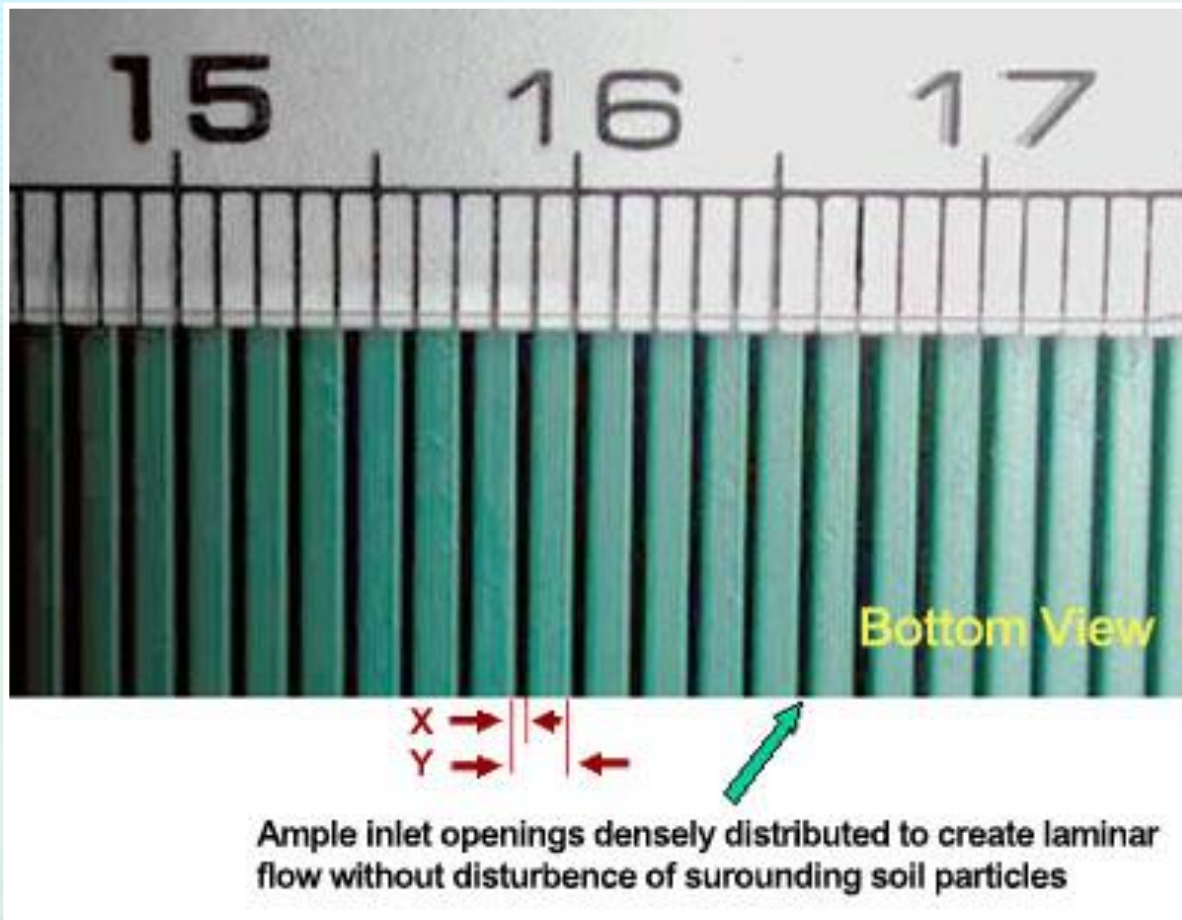
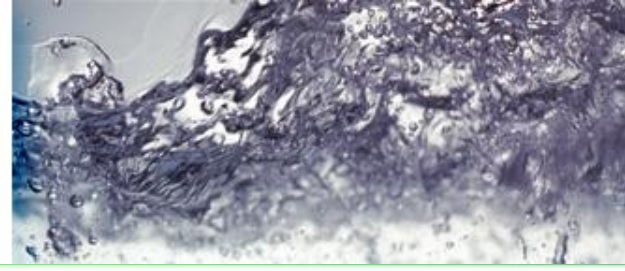


- 20 cm wide belt of soft durable plastic
- 2 mm thick
- $\Omega$  (Greek Omega) shaped grooves on under-side
- 0.3 mm opening, 1 mm internal pore

DRAINAGE WATER STORAGE  
SAVE URBAN NATURAL  
BREAKTHROUGH

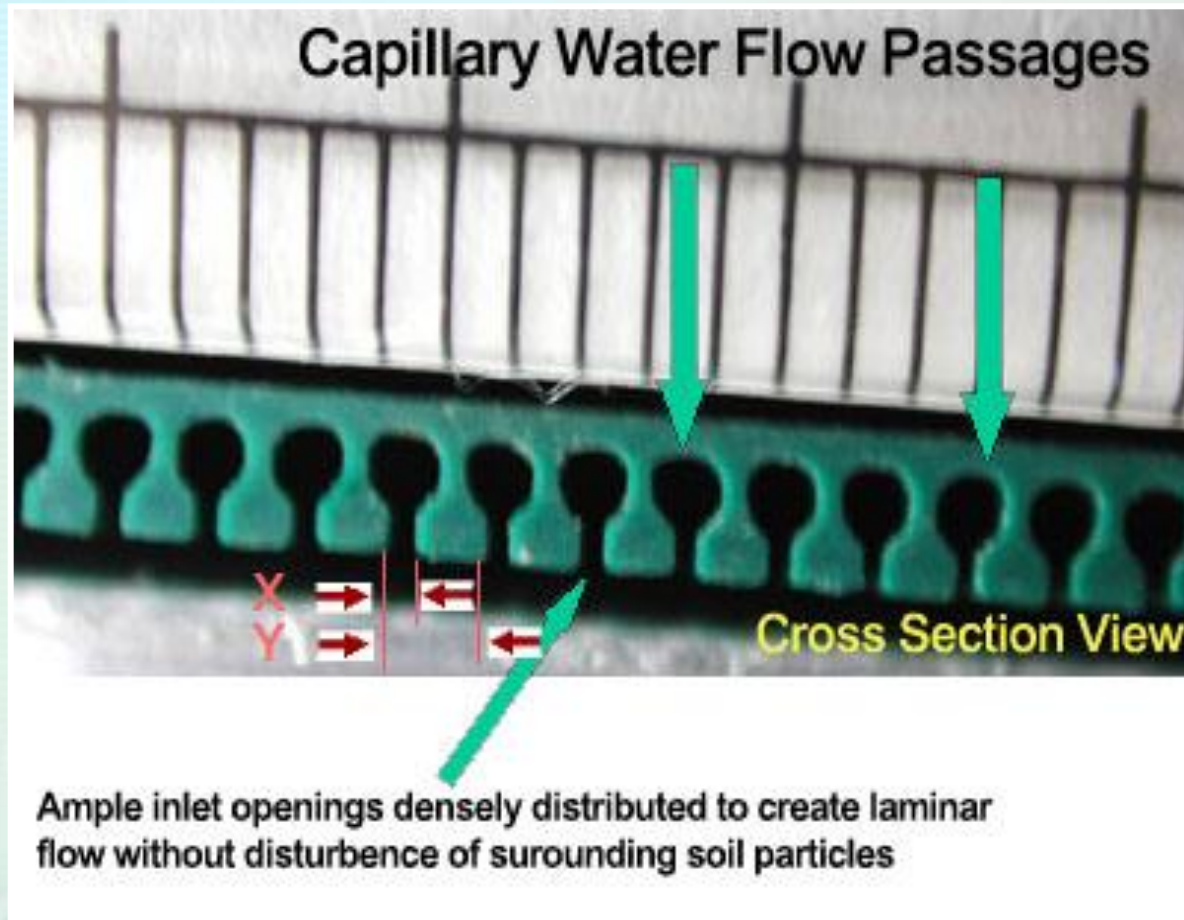
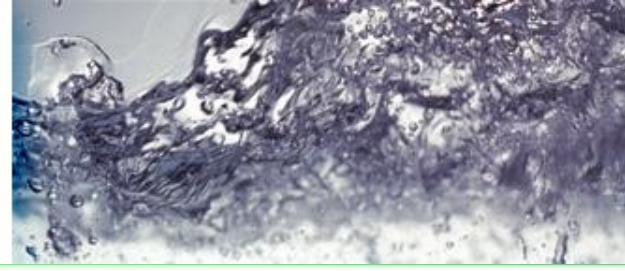


# What is Capiphon?

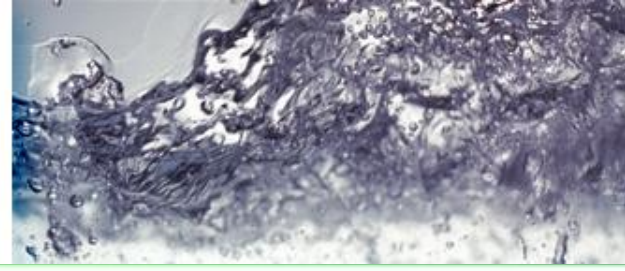




# What is Capiphon?



# What's in a Name?

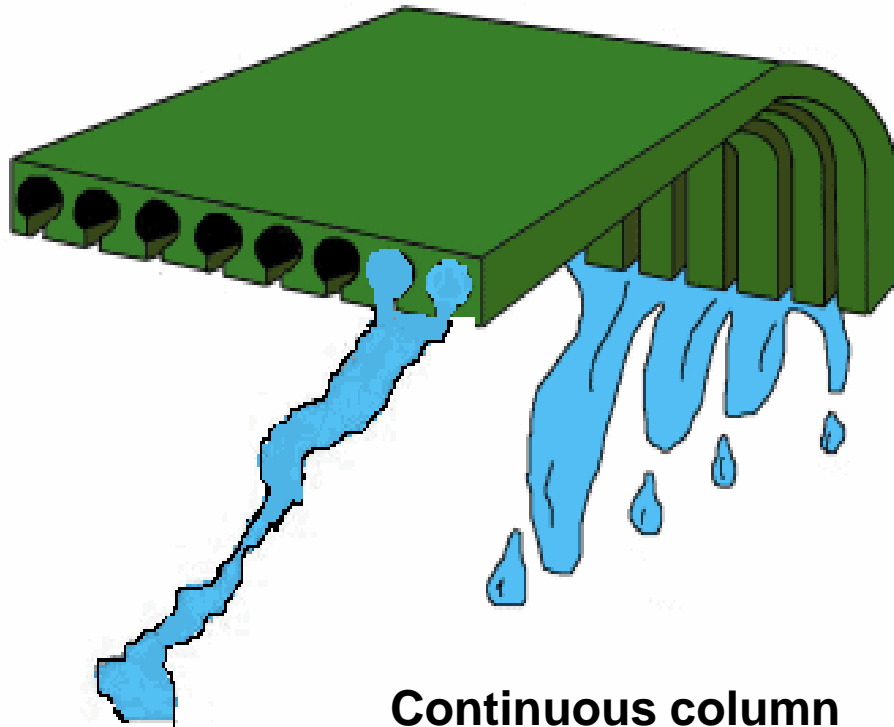
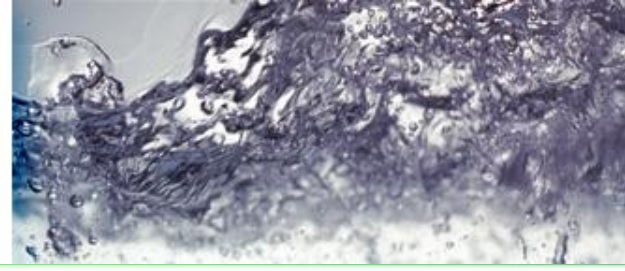


- Capiphon = **cap**illary + **si**phon
  - Capillarity
  - Siphon
  - Surface Tension
  - Gravity

DRAINAGE WATER STORAGE  
SAVE URBAN  
BREAKTHROUGH NATURAL



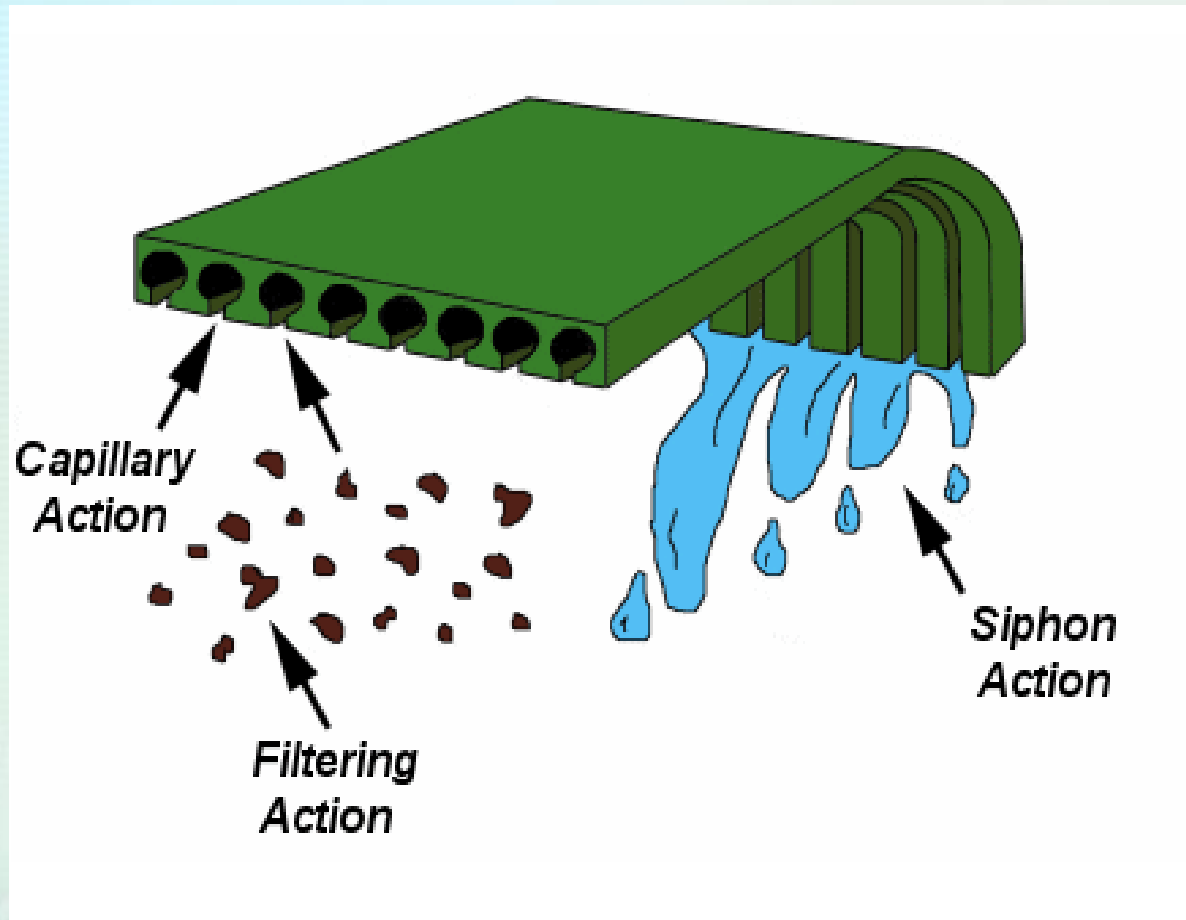
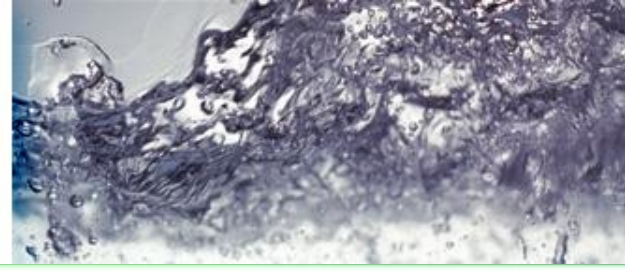
# How does it work?



**Continuous column  
of water in soil**

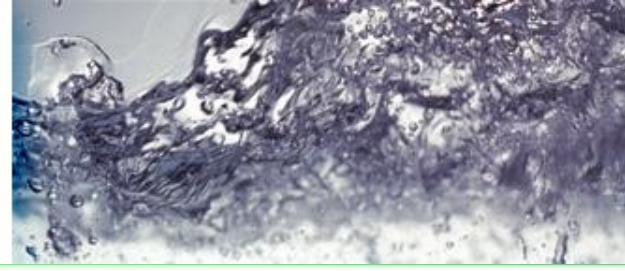


# How does it work?

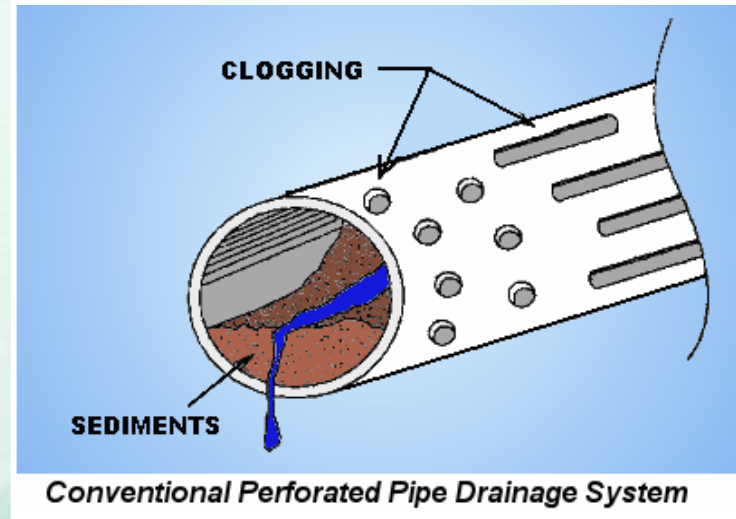




# What makes Capiphon better?

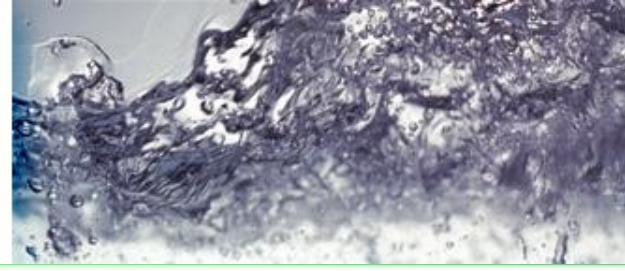


- Blockage Free
  - Gravity pulls larger particles down away
  - Smaller particles fall through or are flushed out
- Conventional systems flow rate decreases over time





# What makes Capiphon better?



**Blockage Free**

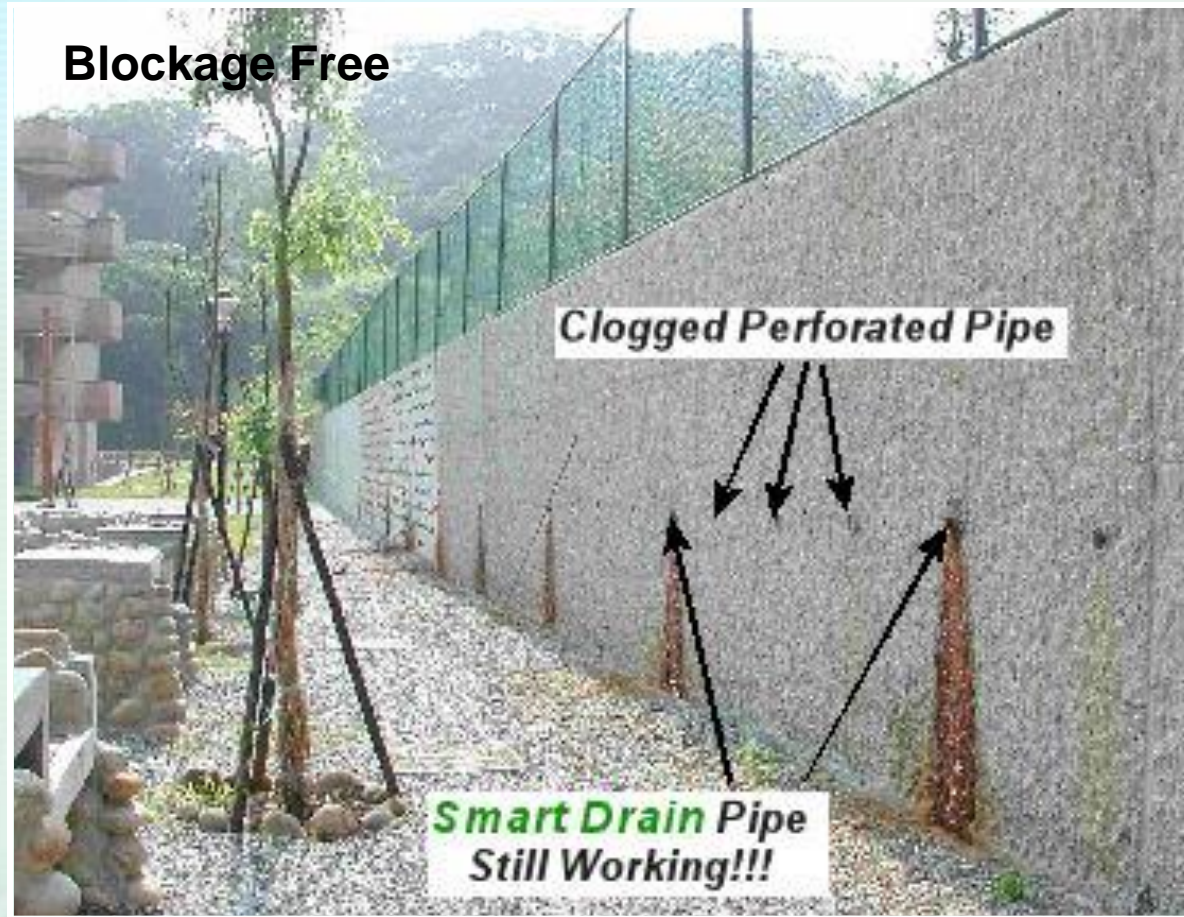
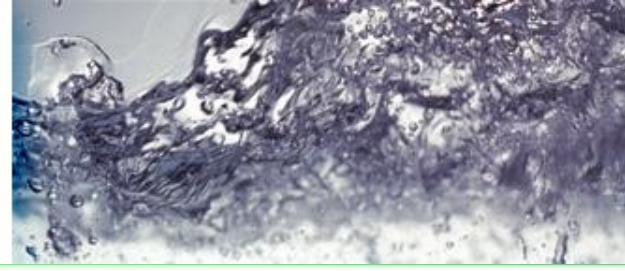


**Clogged Perforated Pipe**

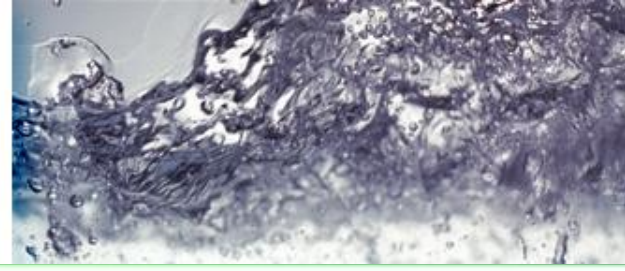




# What makes Capiphon better?



# What makes Capiphon better?



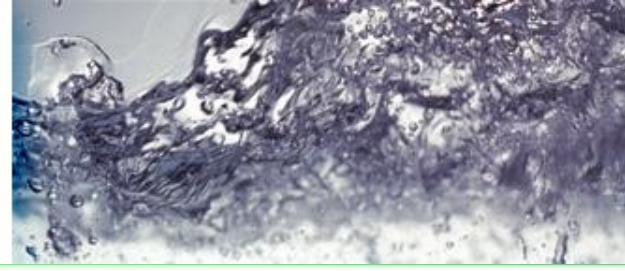
- Draws water in all directions
- 5 cm below belt in many soils

DRAINAGE WATER STORAGE  
SAVE URBAN  
BREAKTHROUGH NATURAL





# What makes Capiphon better?

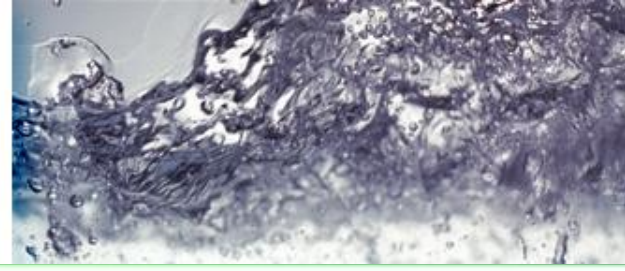


- Flexible
  - Low fuss installation
  - Suitable for unstable soils



DRAIN  
SAVE  
BREAKTHROUGH  
NATURAL

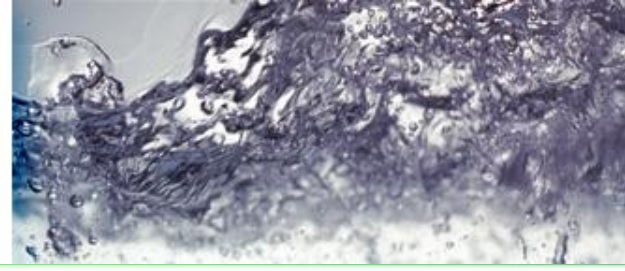
# What is Capiphon?



DRA  
SAVE  
BREAKTHROUGH

NATURAL

# What makes Capiphon better?



## **Compression Resistant & Resilient**

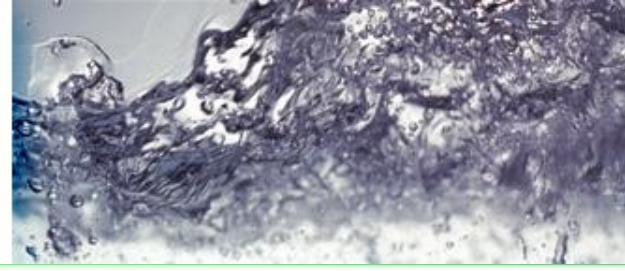
- Carry heavy traffic immediately after installation
- Can be placed under massive structures

DRAINAGE WATER STORAGE  
SAVE URBAN NATURAL  
BREAKTHROUGH





# What makes Capiphon better?



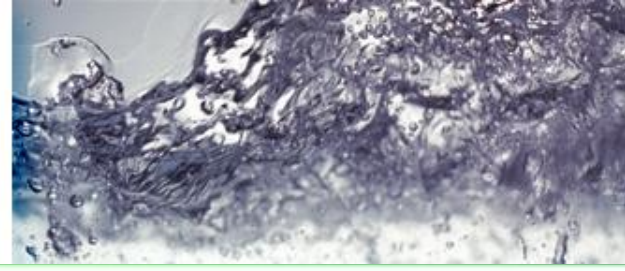
## Easy Handling & Storage

- Warehouse & On-site
- 100m Rolls in Stackable cartons (33kg)
- Simple roll out at installation

DRAINAGE WATER STORAGE  
SAVE URBAN  
BREAKTHROUGH NATURAL



# What makes Capiphon better?



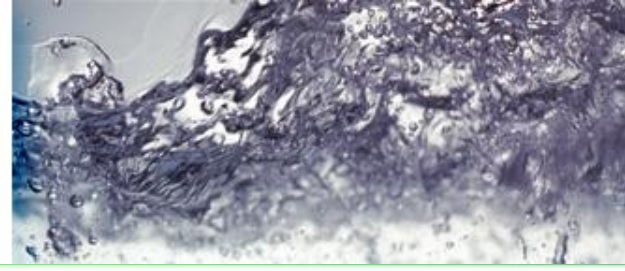
## Simple, Low Risk Installation

- No need to excavate to an accurate gradient level
- Fabric free
- Aggregate filter free
- Few fittings

DRAINAGE WATER STORAGE  
SAVE URBAN NATURAL  
BREAKTHROUGH



# What makes Capiphon better?



## Potential for Mechanical Installation

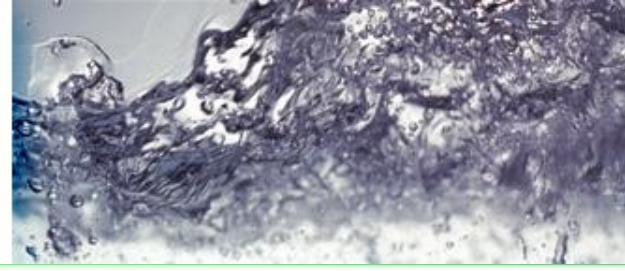
- Significant cost & time benefits
- Minimal soil profile disturbance
- Minimal turf disturbance
- Retrofit sub-surface drainage.

DRAINAGE WATER STORAGE  
SAVE URBAN  
BREAKTHROUGH NATURAL





# What makes Capiphon better?



## Trouble-Free, Long-Term Performance

- No mechanical parts
- Anti-clogging forces constantly active
- Resists root invasion
- Not affected by normal soil movement
- Chemically inert (grey water, leachates)
- Low Life-time Cost



# Objectives

- **Compare flow characteristics:**

Capiphon Belt vs Capiphon Pipe vs Drain Coil

- In water
- In soil
  - Flooding
  - Natural rainfall

- **Case Study**

# Capiphon Pipe vs Belt

- Head loss proportional to pipe length
- High friction loss expected in 1mm pipe
- Capiphon pipe designed to pass water into pipe every 1 metre
- Hypothesis: Higher flow rate in pipe





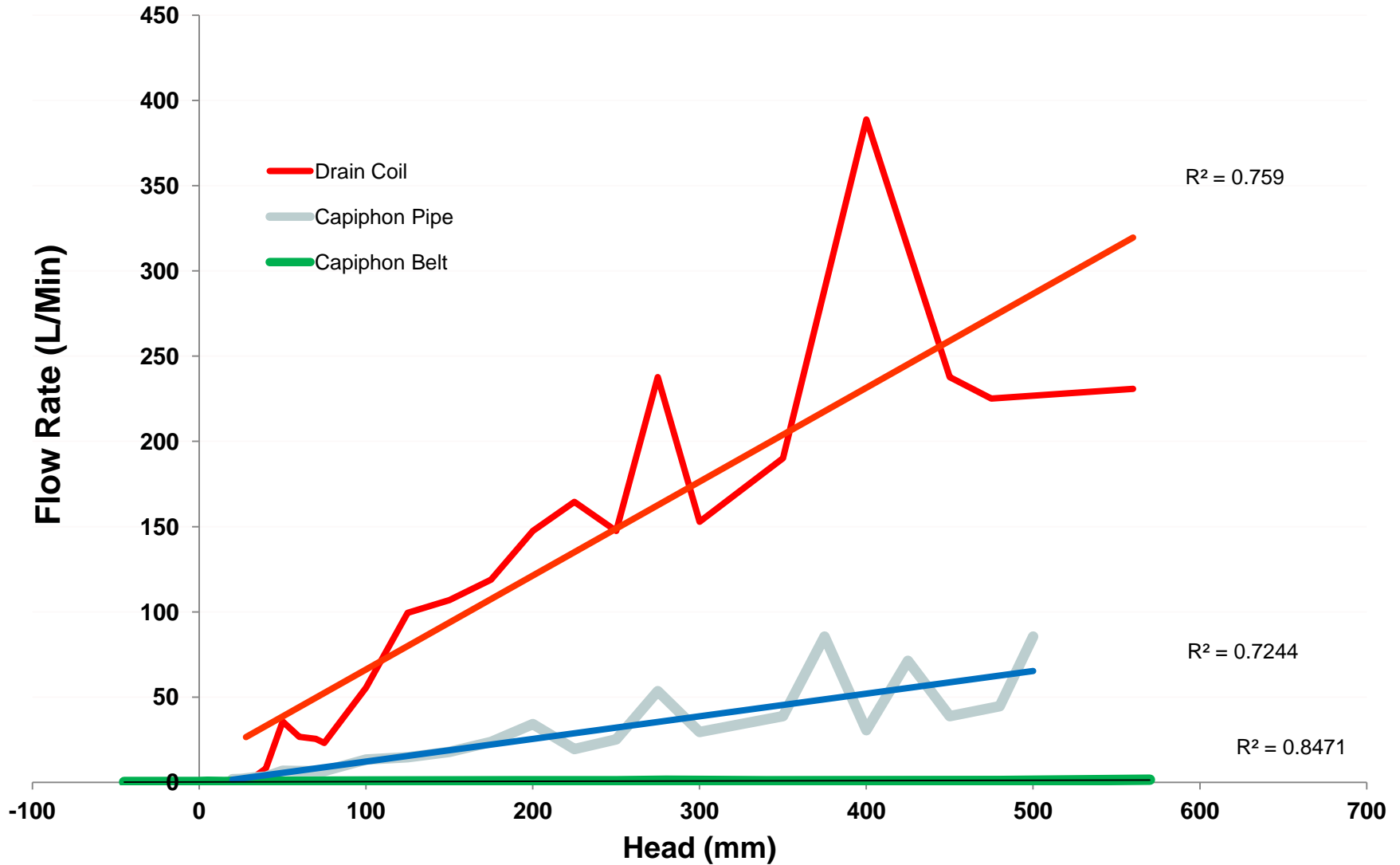






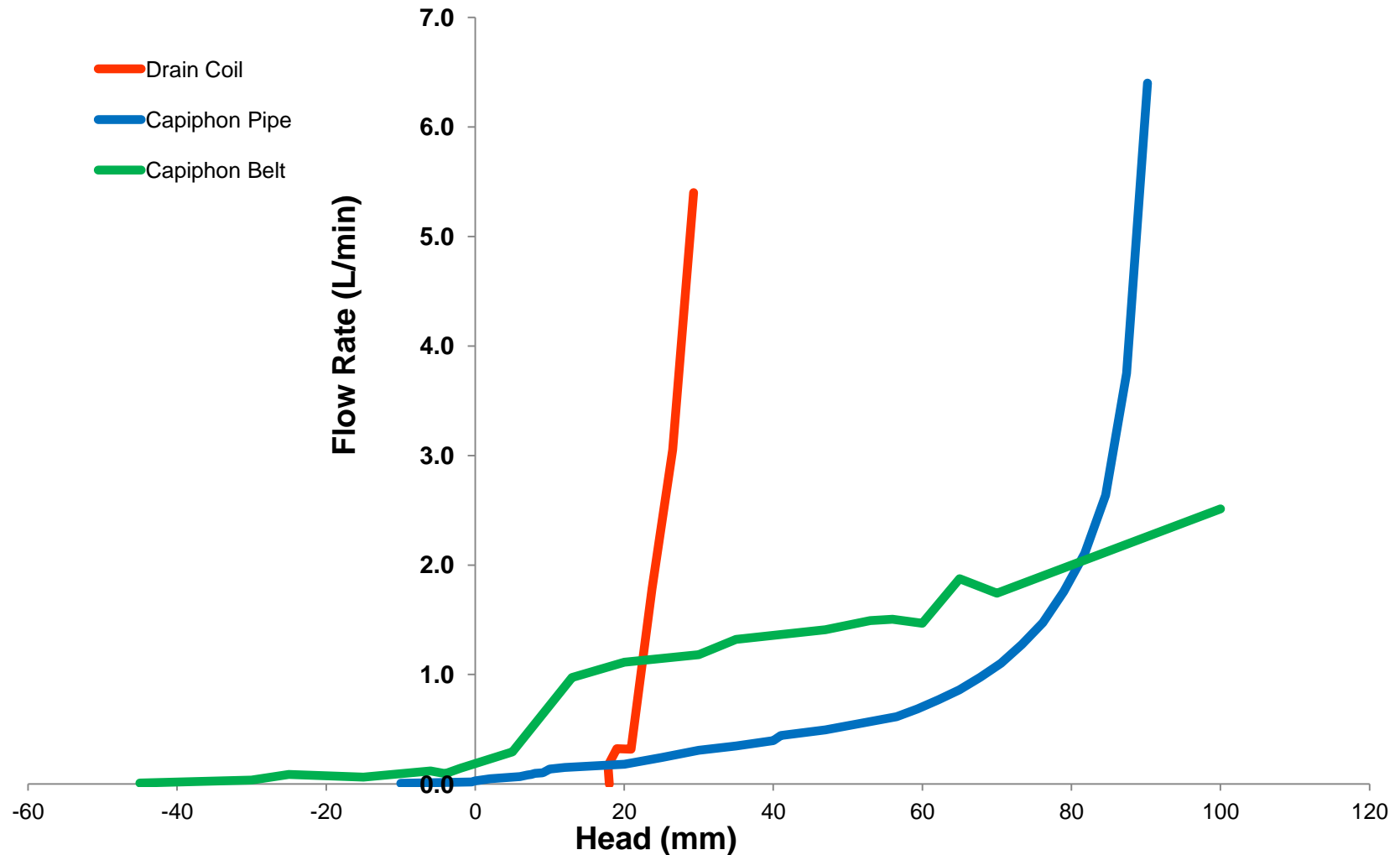


# Drainage in Free Water



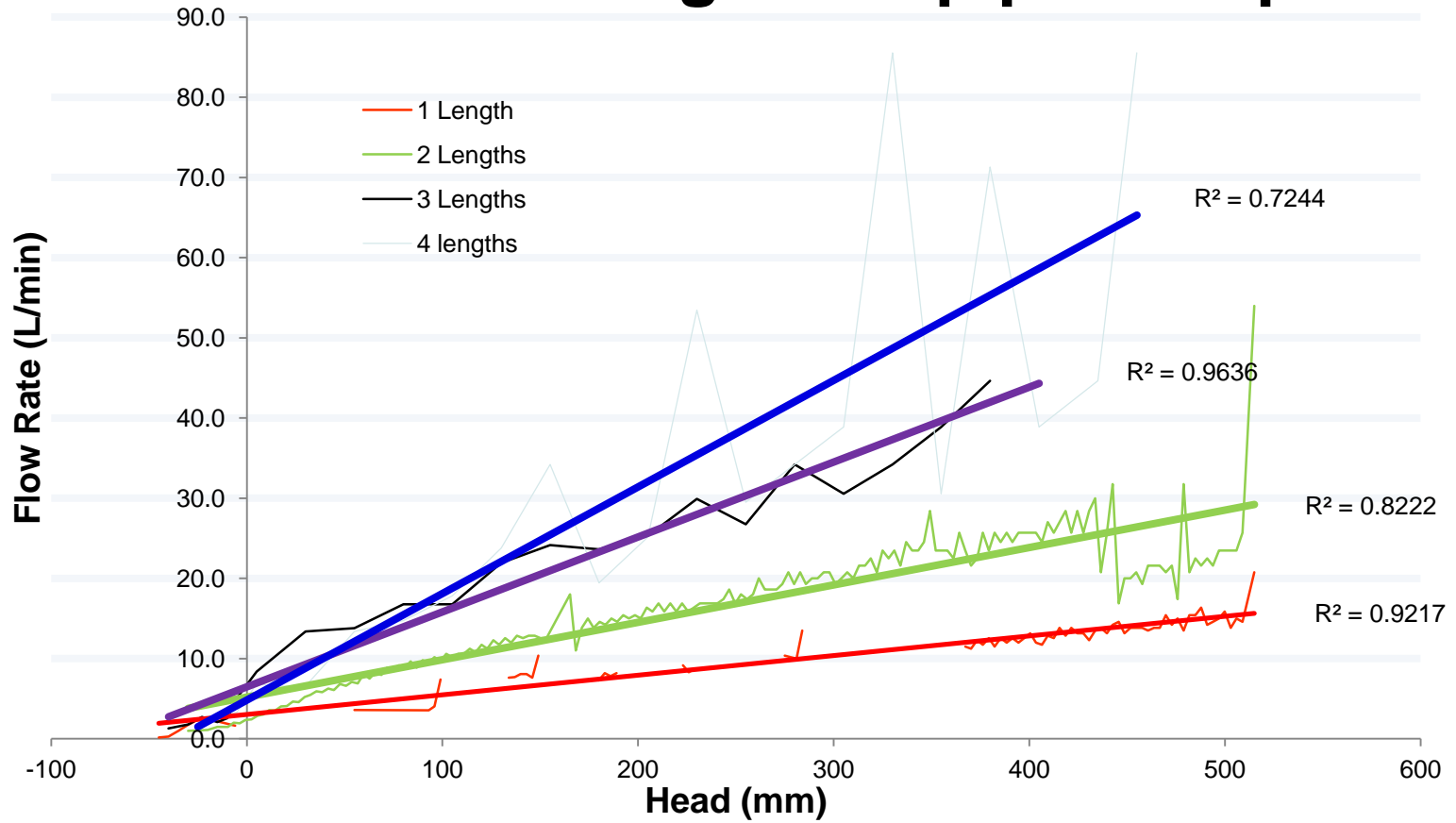


# Drainage in Free Water: At Low Head





# Flow Rate & Lengths Capiphon Pipe



# Flow Characteristics in Soil

- Soil Analysis:

<b>Clay</b>	<b>13 %</b>
Silt	7.03 %
Fine Sand	37.59 %
Coarse Sand	42.38 %



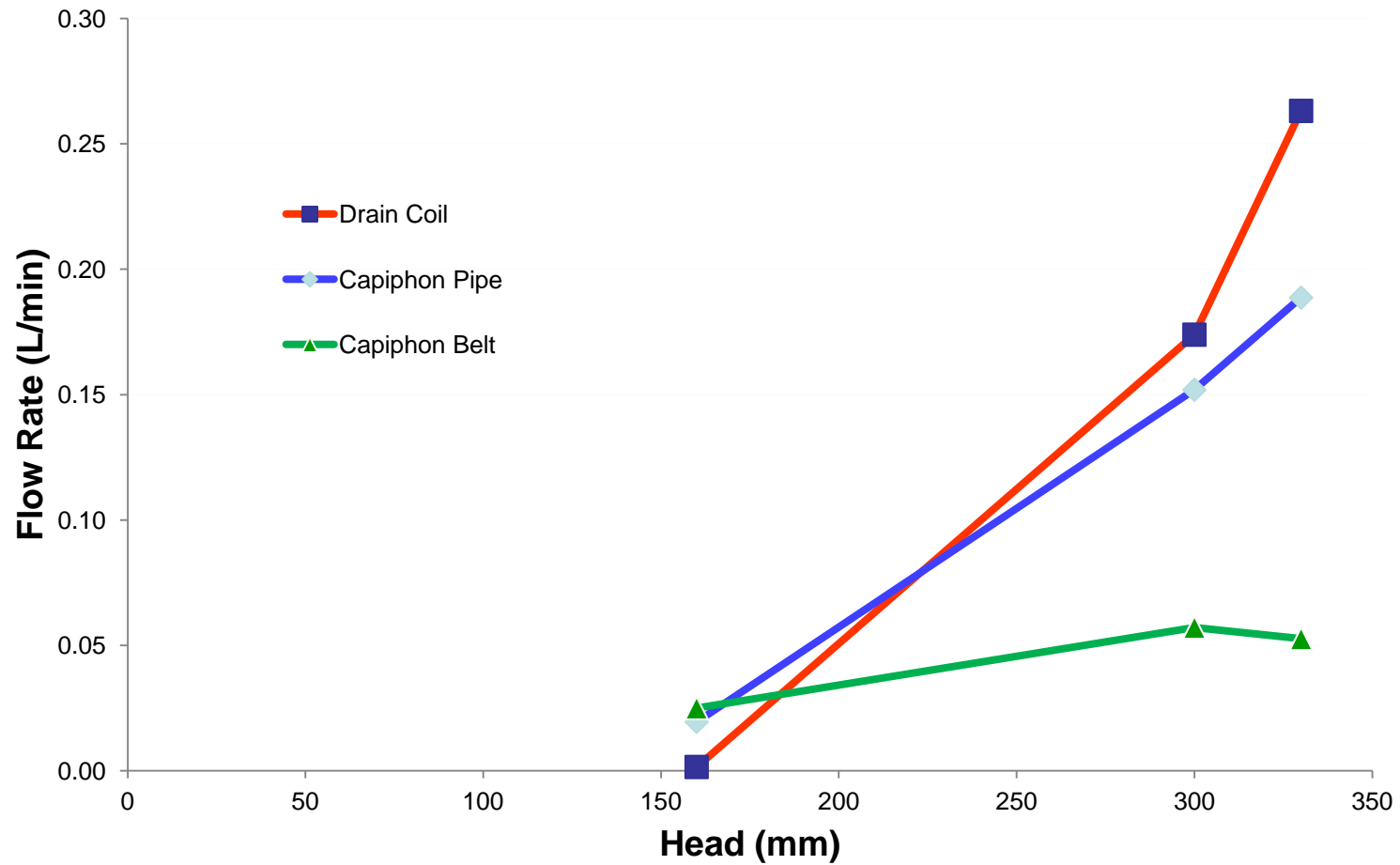






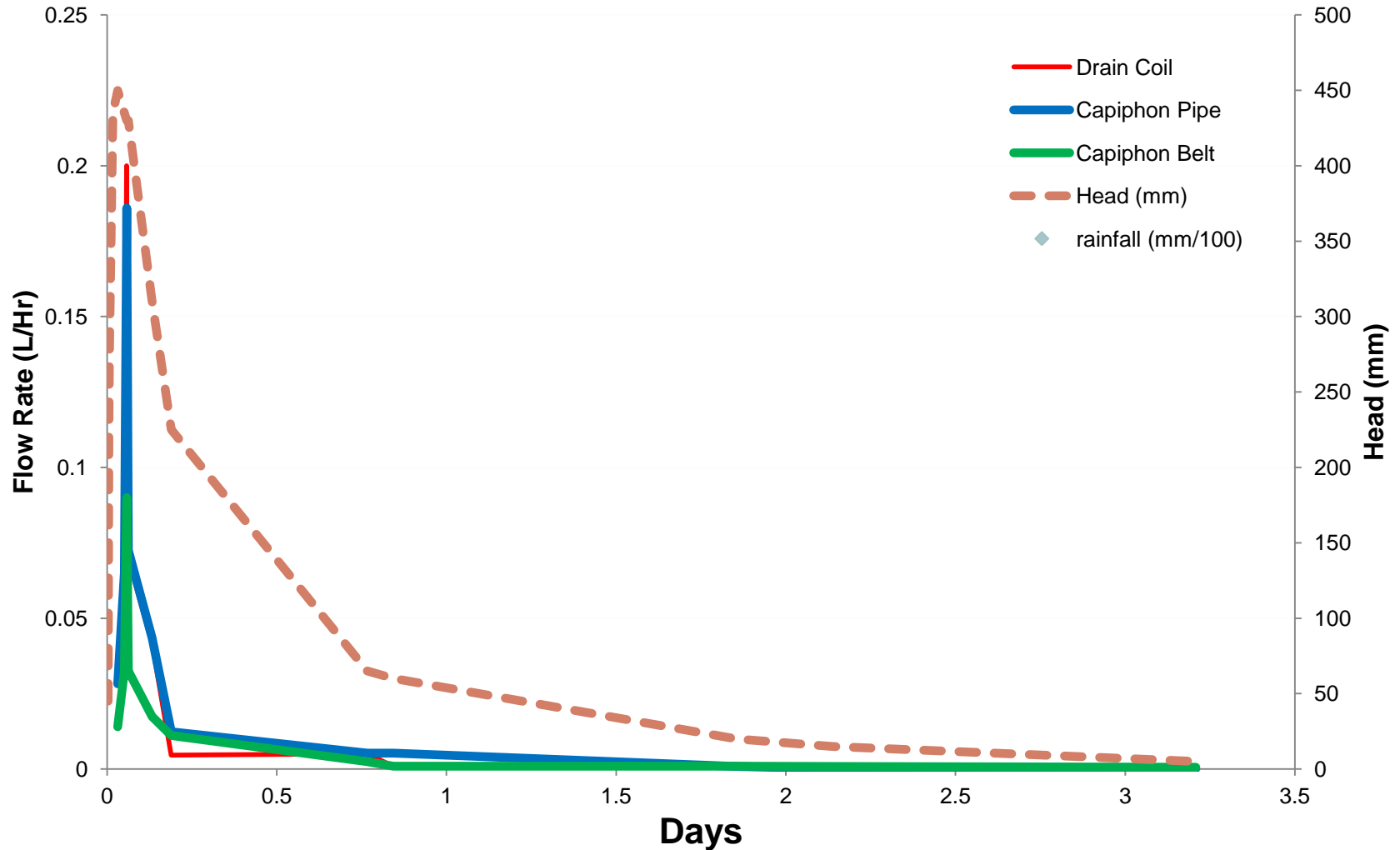


# Drainage in Soil: First Run (10 March)



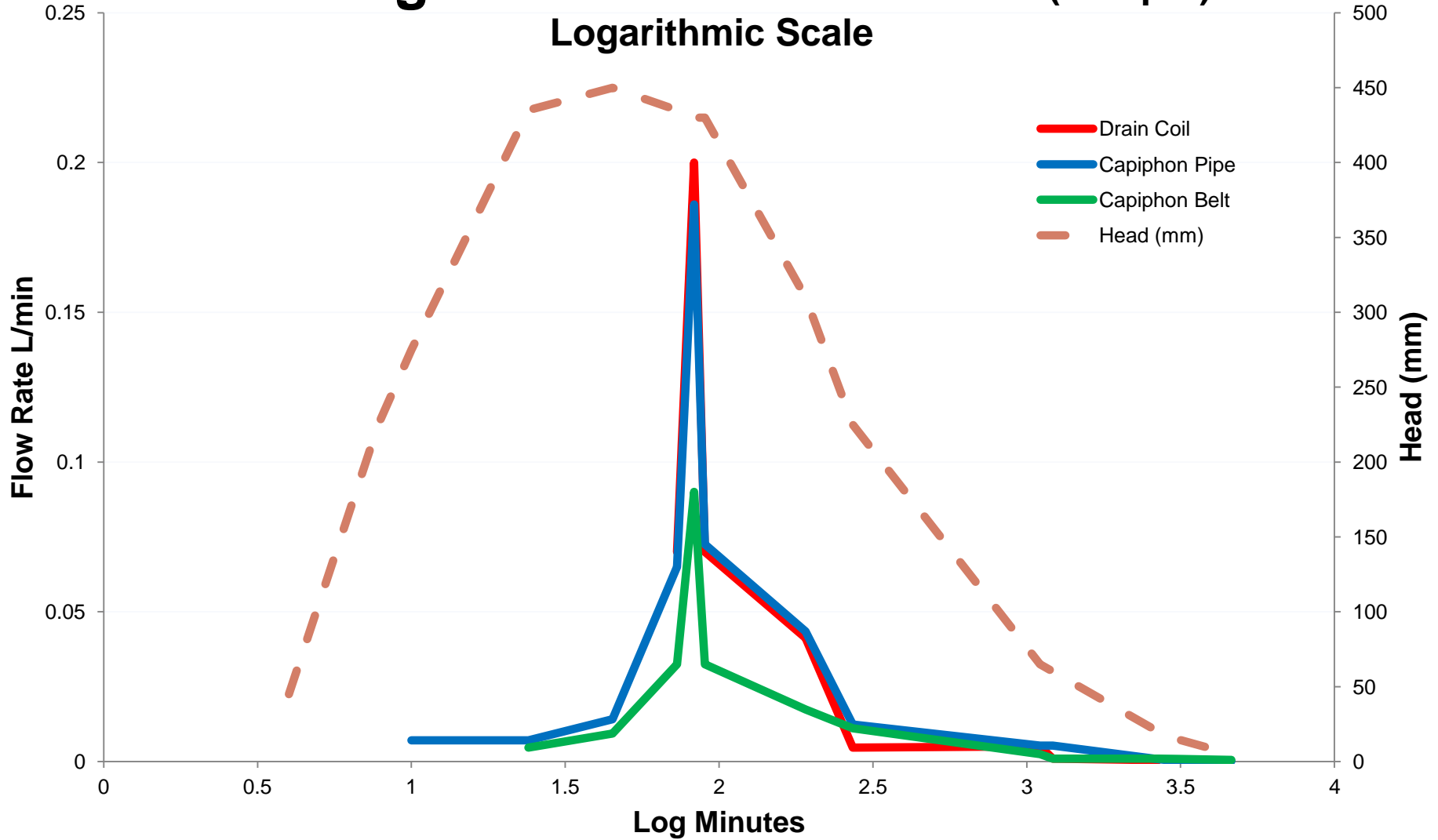


# Drainage in Soil: Second Run (2-April)



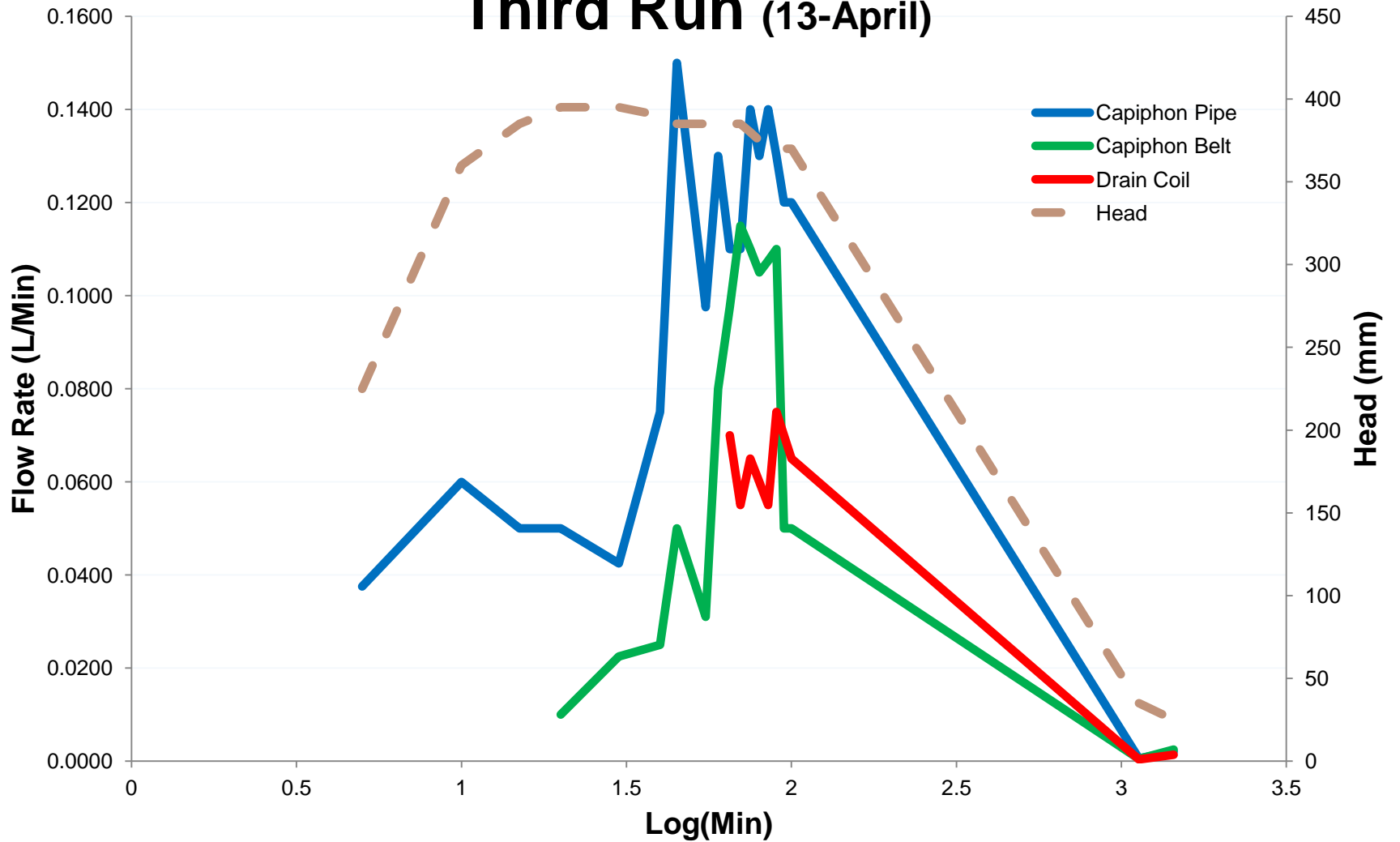


# Drainage in Soil: Second Run (02-April)

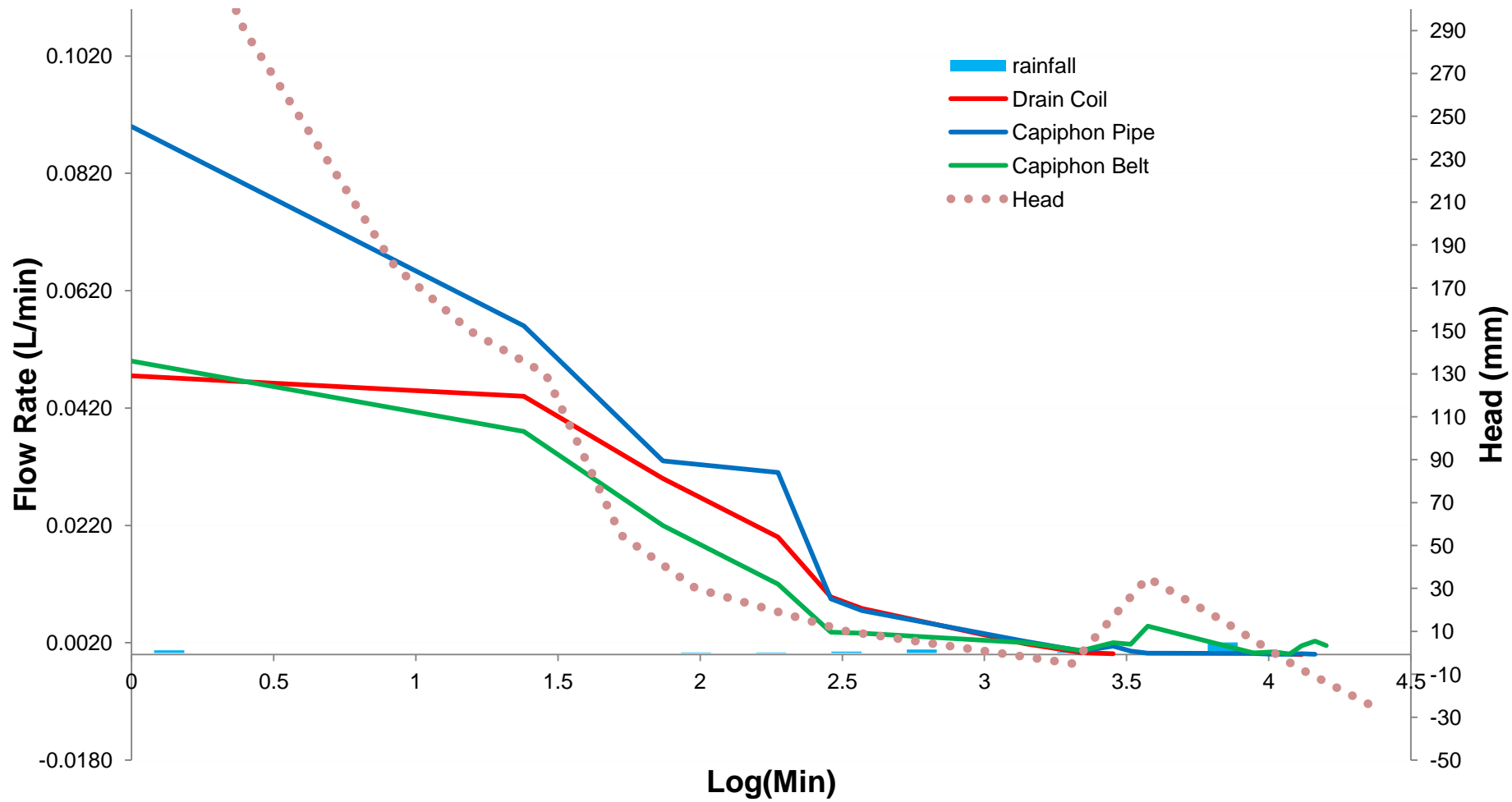




# Third Run (13-April)



# Fourth Run (20-April)

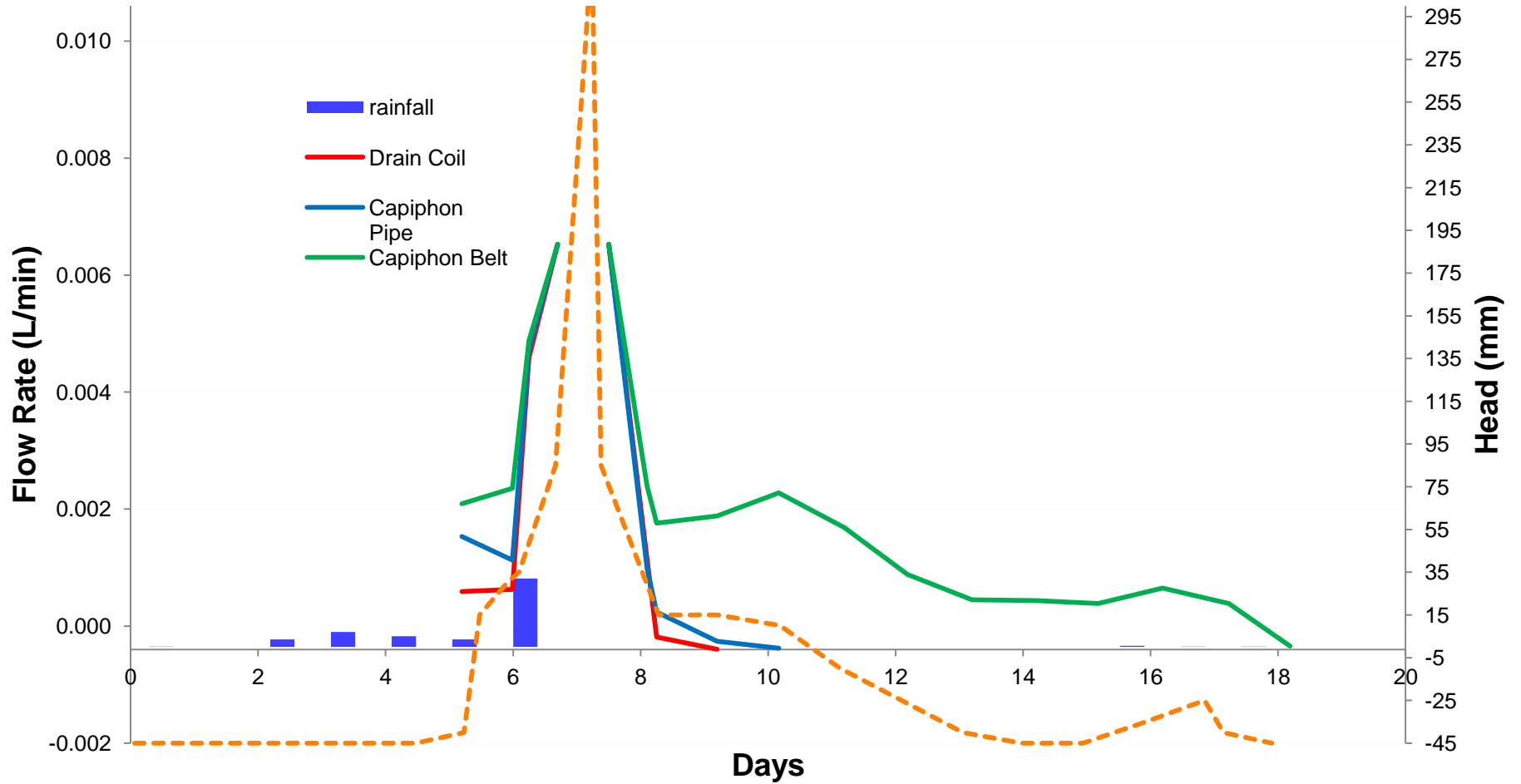


## Time for Flow Commencement (min:sec)

DATE	CAPIPHON PIPE	CAPIPHON BELT	DRAIN COIL
3 March	3:00	5:15	20:30
8 March	5:15	7:00	20:45
2 April	2:45	7:50	51:15
13 April	3:00	9:55	61:45



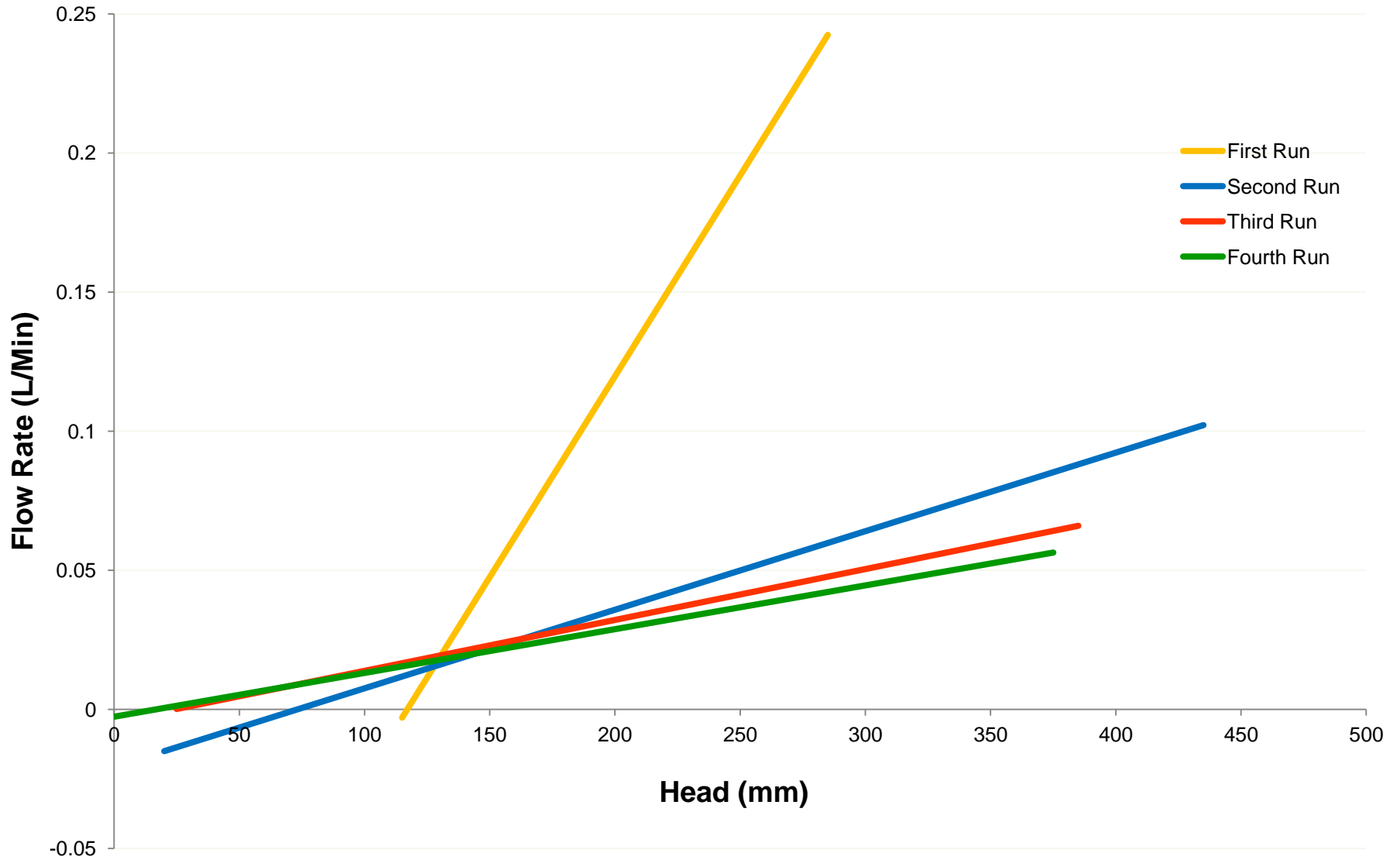
# Normal Rain Events



## Volume Drained Over 47 Days (L/m<sup>2</sup>)

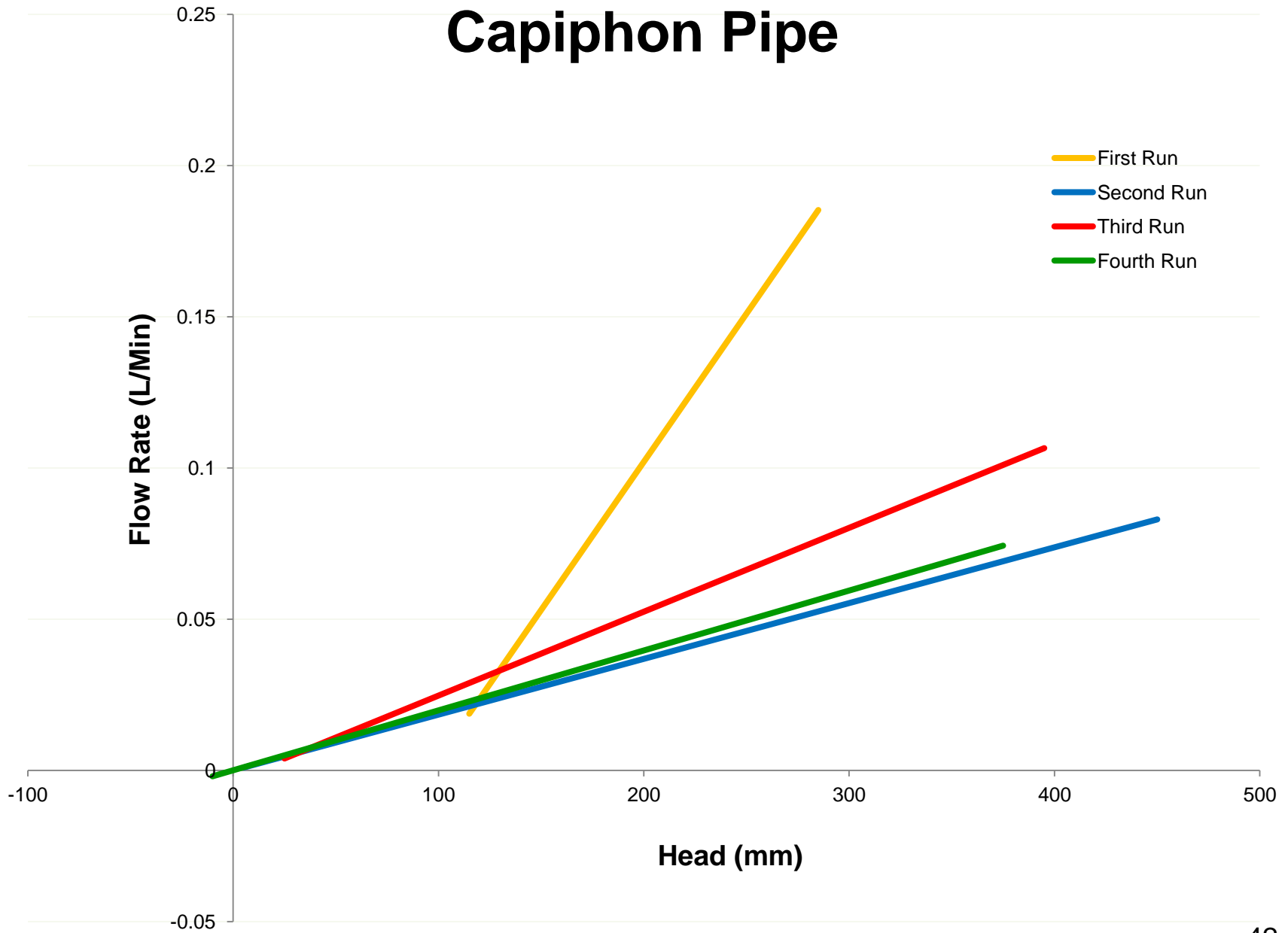
CAPIPHON PIPE	CAPIPHON BELT	DRAIN COIL
9.8	27.6	7.4

# Drain Coil

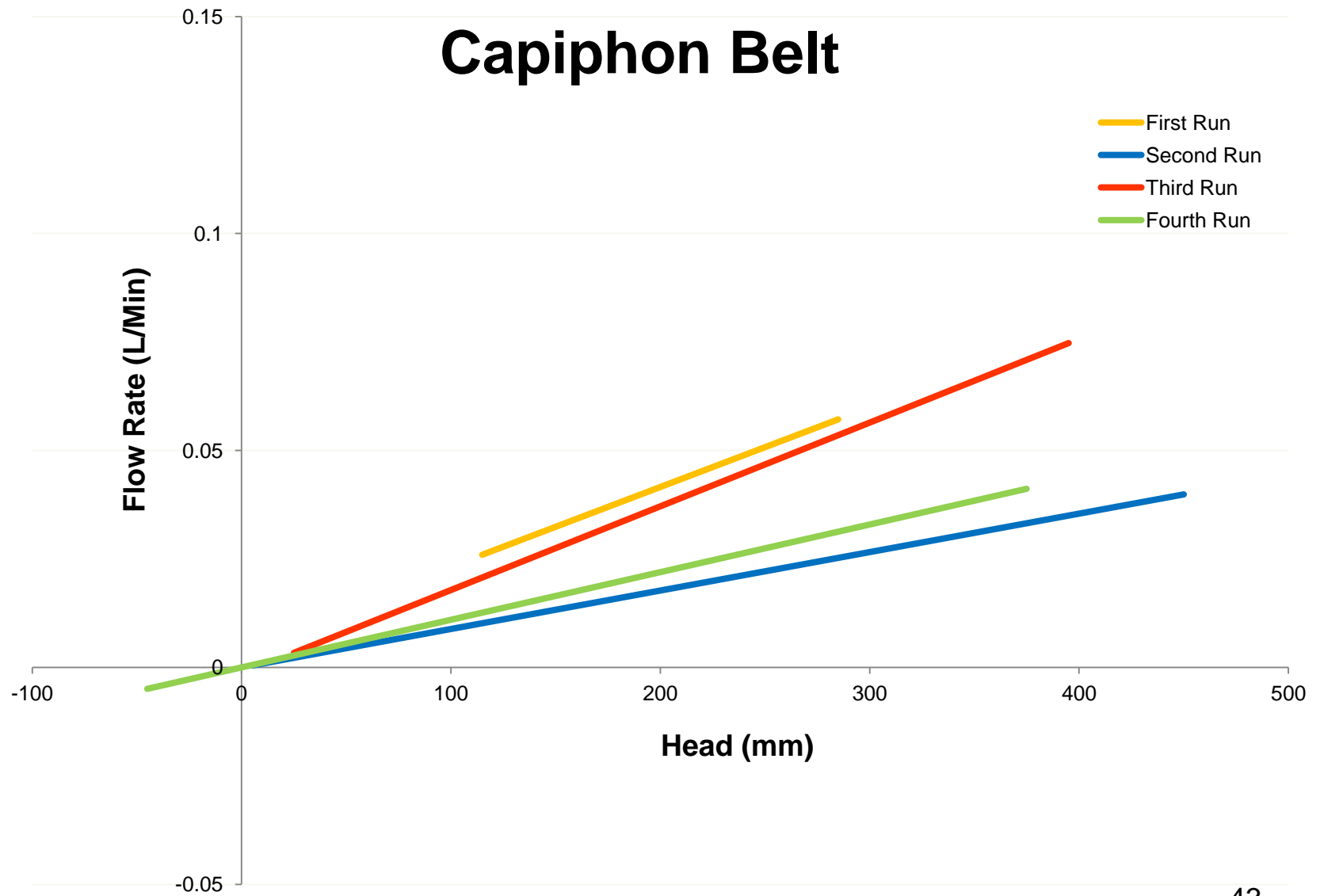




# Capiphon Pipe



# Capiphon Belt



August 2011





April 2012





















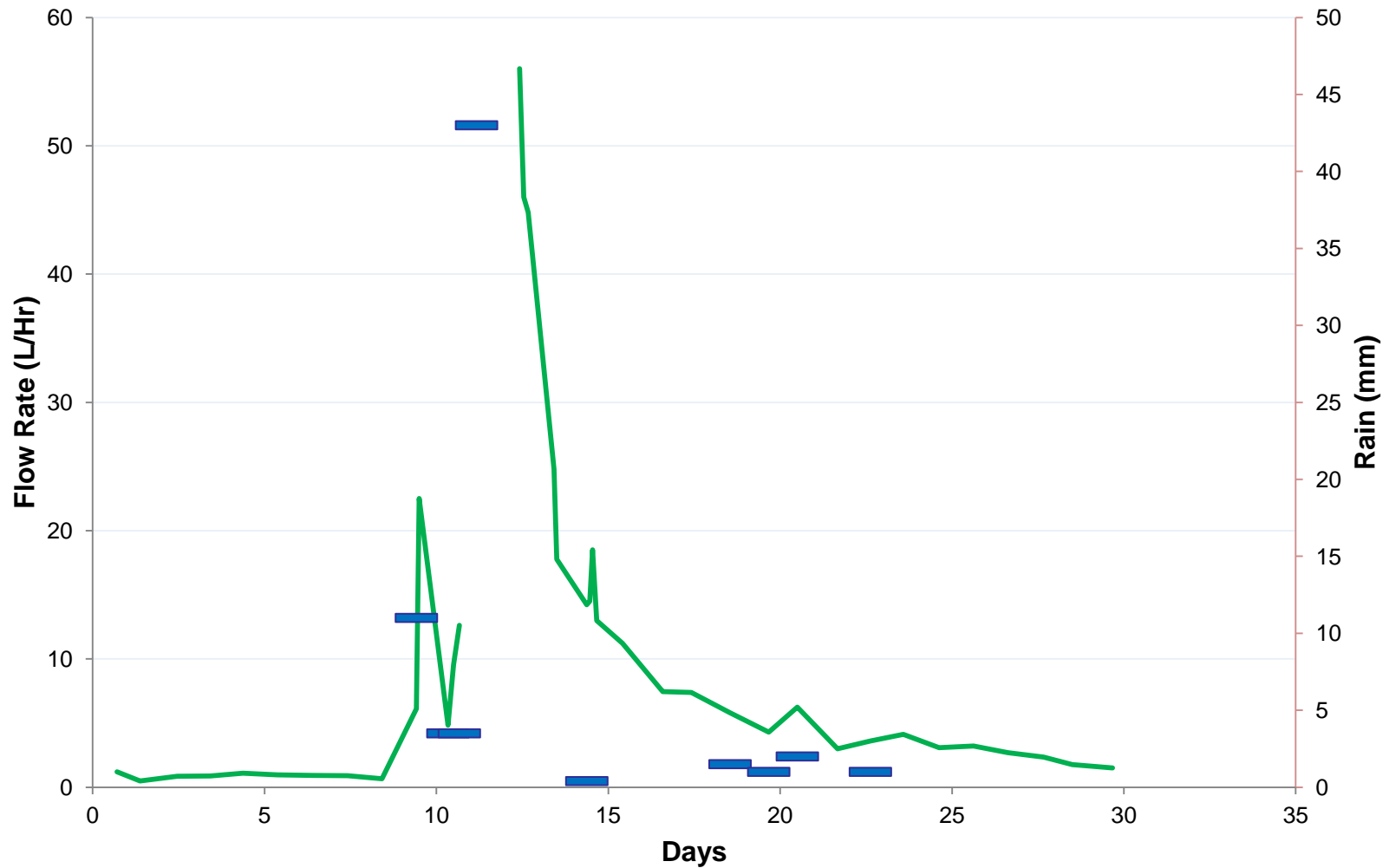




2 Hours after 43 mm downpour



# Playground Soft-fall Drainage





# Conclusions

- Capiphon performs better in soil
  - Commences flow sooner
  - Flows longer
  - Greater volume drained
- Drain Coil ceases to flow at 20 mm head
- Capiphon continues to flow to at least -45 mm

# Conclusions

- Capiphon ideal for:
  - Playing fields
  - Race tracks
  - Under buildings, roads
  - Retaining walls
  - Rooftop gardens
  - Bioretention swales
  - Mining waste
  - Biomass
  - Etc, etc

# Case Study 2

## Race Track Renovation

- **Problem:**
  - 2 metre dip along back straight
  - High % fines in soil
  - Turf sodden & poor growth
  - Drain Coil dry with silt and roots
- **Solution:**
  - 8 cm wide trench, 350 mm deep, 2% slope
  - 150 mm fine gravel, 200 mm coarse sand
  - Run to Drain Coil trench alongside track





# Capiphon Trial

- 10 mm coarse sand
- 50 mm belt
- Gravel & sand as before
- Run belt into Capiphon pipe









