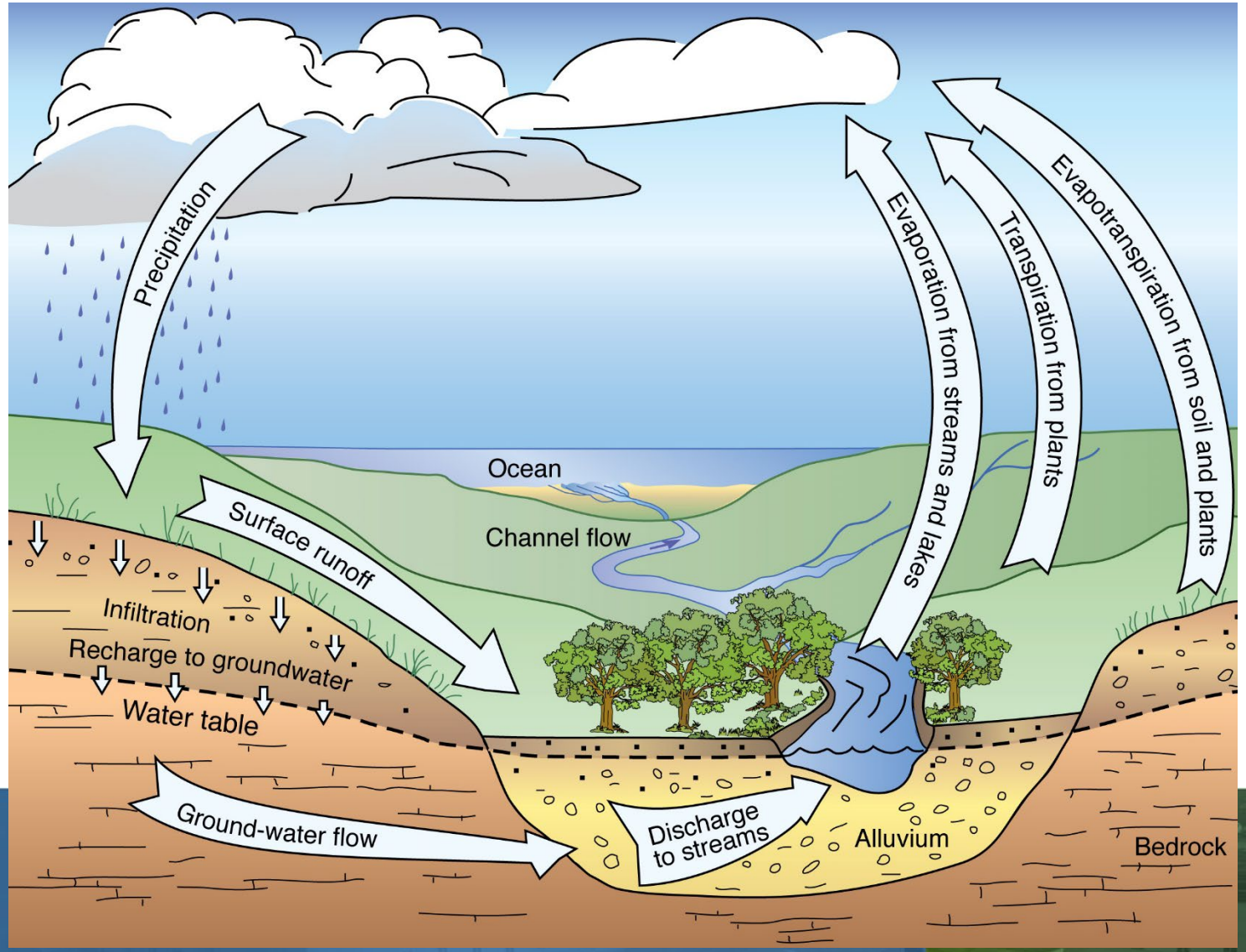
ENRAC – STORMWATER REGULATION

MANAGING STORMWATER IN VOLUSIA

Tadd Kasbeer, P.E.

ENRAC – STORMWATER PRIMER

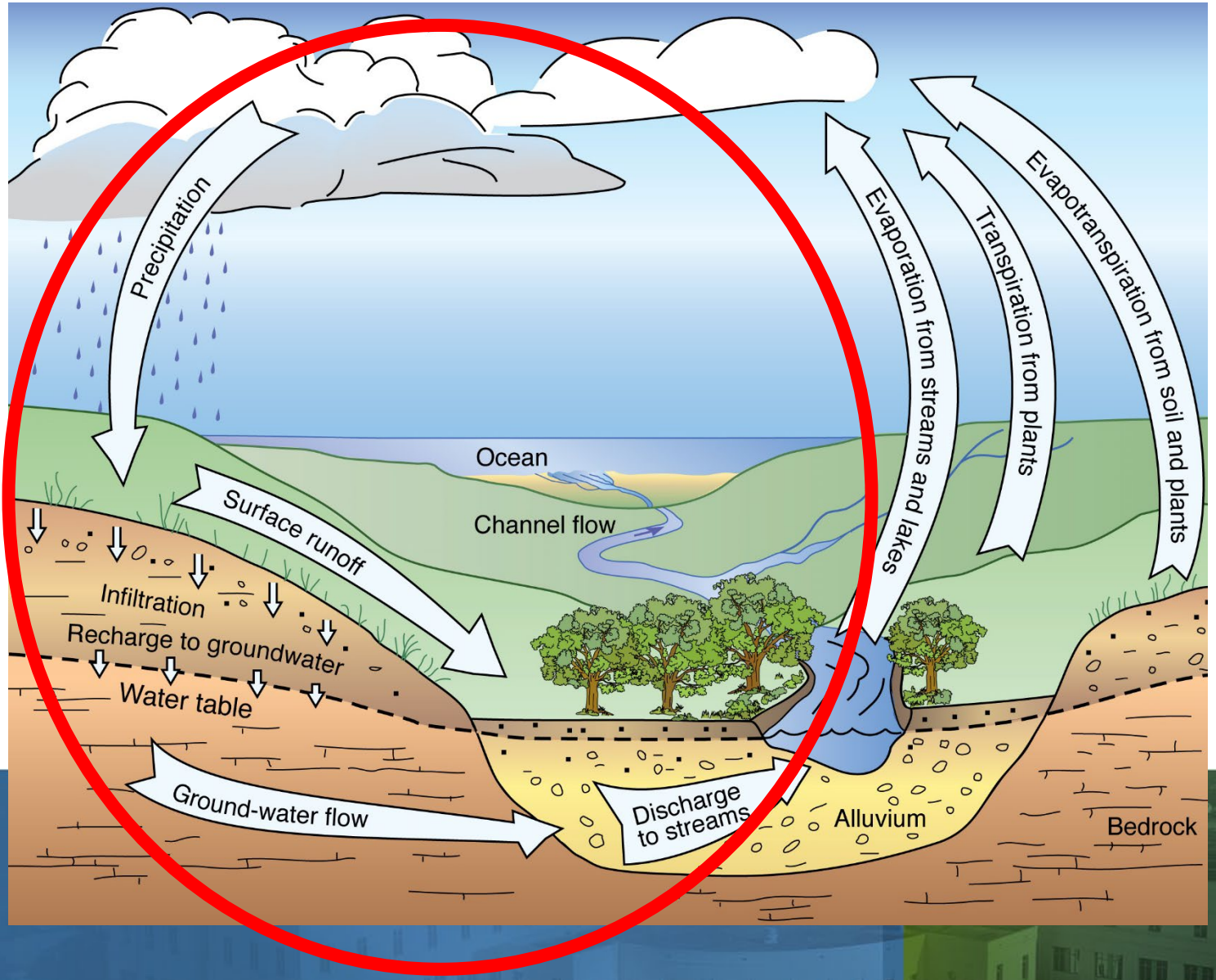
Hydrologic Cycle Open Basin



Volusia County FLORIDA

ENRAC – STORMWATER PRIMER

Hydrologic Cycle
Open Basin

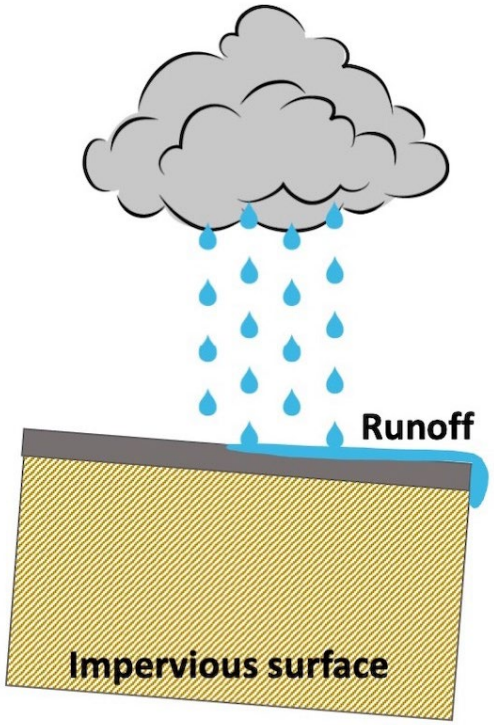


Volusia County
FLORIDA

Stormwater Runoff Management – Attenuation

Pre versus Post Runoff

- Rate
- Volume



ENRAC – STORMWATER PRIMER

Stormwater Runoff

Stormwater runoff volume and rate are based on:

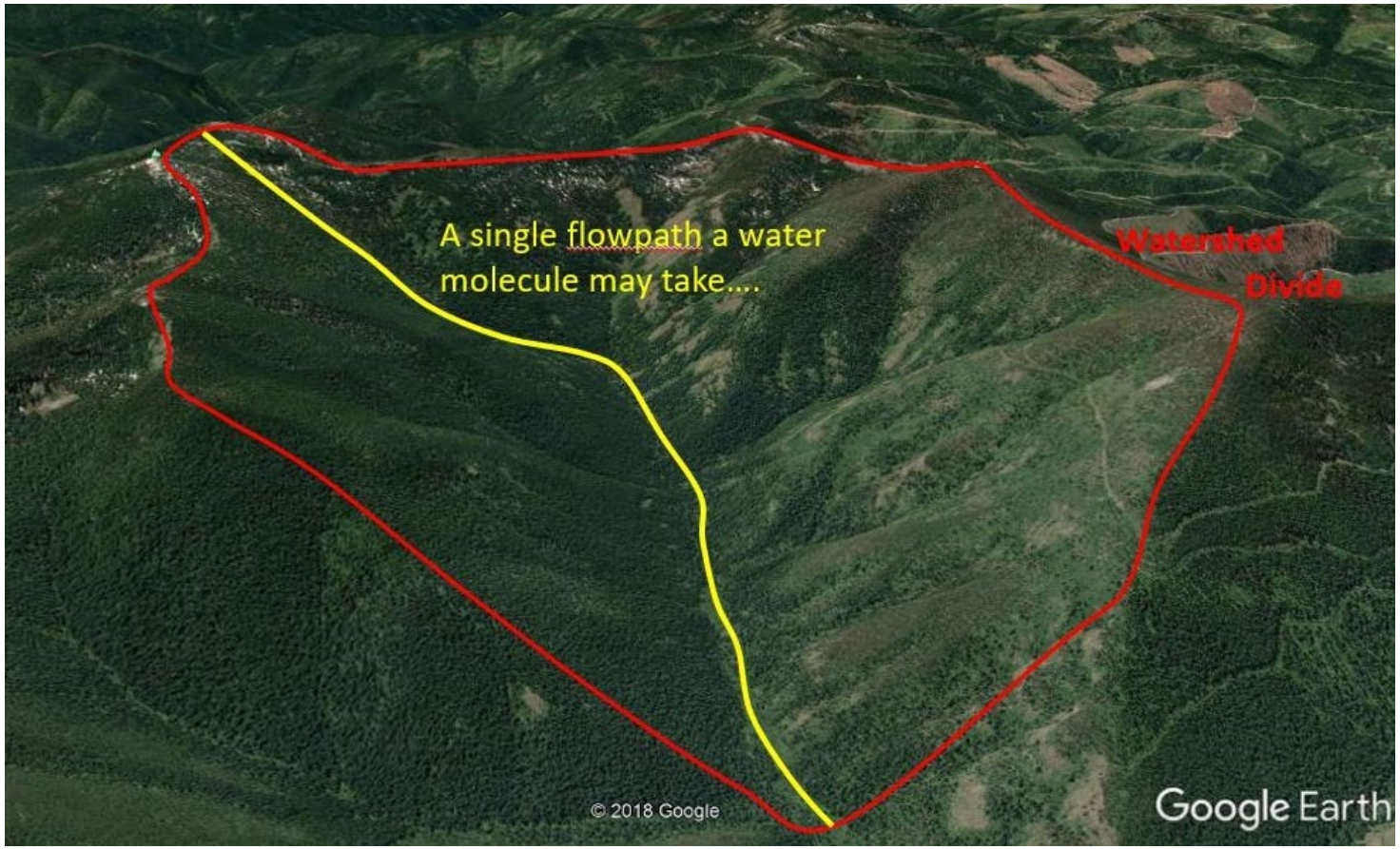
- Area of basin / Time of concentration
- Runoff vs infitration
- Rainfall amount/duration

Model run for both the Pre and the Post to determine difference in volume of the stormwater runoff.

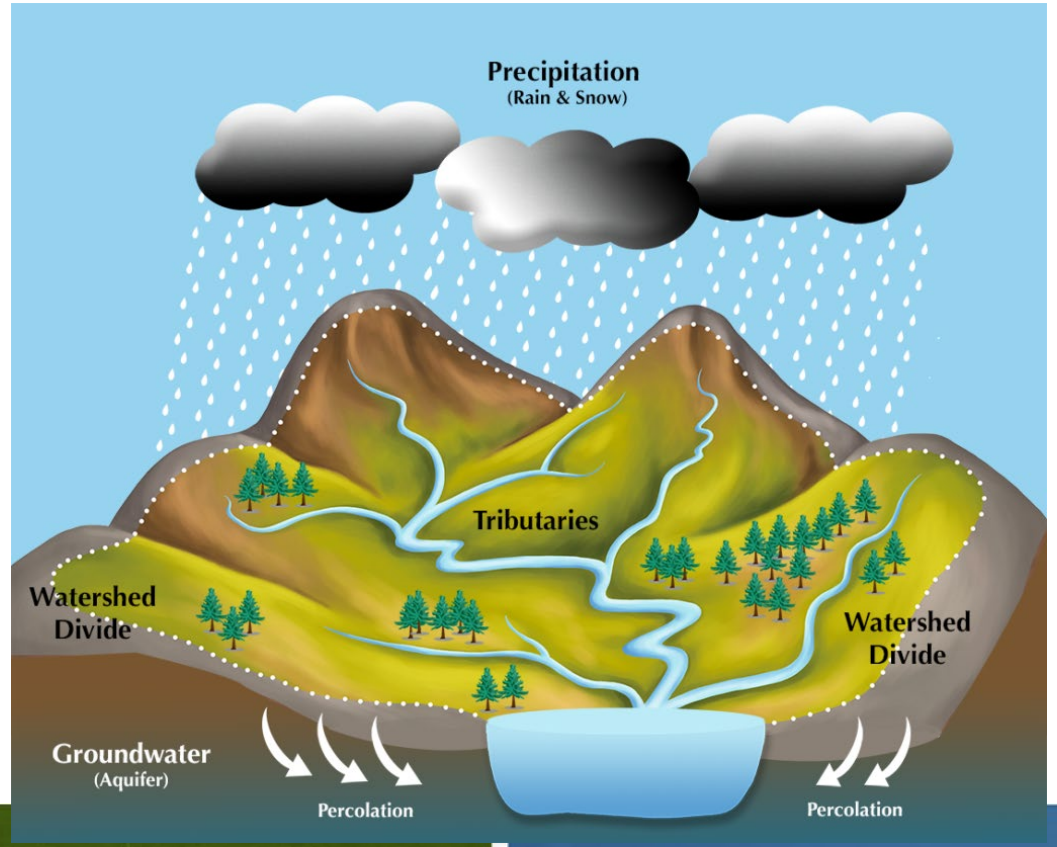
ENRAC – STORMWATER PRIMER

Stormwater Runoff - Basin

How are the limits a basin determined?



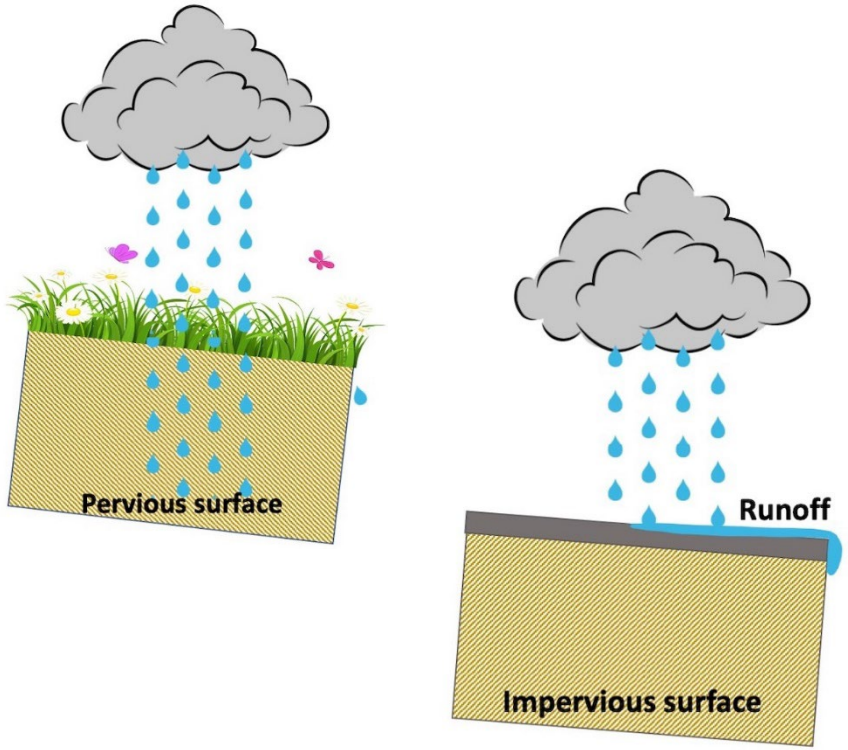
Hydrologic Cycle – Open versus Closed Basin



- Open – runoff/surface water has path to ocean as surface water
- Closed (aka Land Locked) – runoff/surface water does NOT have path to ocean as surface water

Basin type does not affect runoff amount but are modelled using different storms.

Stormwater Runoff versus Infiltration



Factors that affect runoff vs infiltration:

- Surface cover – pervious vs impervious
- Slope of the ground
- Soil type – sandy vs clayey/organics
- Voids in soil
- Saturation of soils

Stormwater Runoff – Runoff Rate

Type	TR-55 Cover Type	Curve Number (TR – 55)			
		HSG A	HSG B	HSG C	HSG D
Assumed Impervious	Impervious Area	98	98	98	98
Sidewalk	Impervious Area	98	98	98	98
Road/Parking	Impervious Area	98	98	98	98
Building	Impervious Area	98	98	98	98
Other Asphalt/Concrete	Impervious Area	98	98	98	98
Dense Forest	Woods	36	60	73	79
Light Forest/Tree Canopy	Woods - Grass Combination	43	65	79	82
Brush/Bush	Brush	35	56	70	77
Open Space (Lawn)	Open Space	49	69	79	84
Gravel	Streets & Roads - Gravel	76	85	89	91
Light Bush/Dirt/Mulch	Open Space - Poor Condition	68	79	86	89
Dirt	Streets & Roads - Dirt	72	82	87	89

"A" Soils = sandy, well drained soils

"D" Soils = clayey, heavily saturated soils with organics

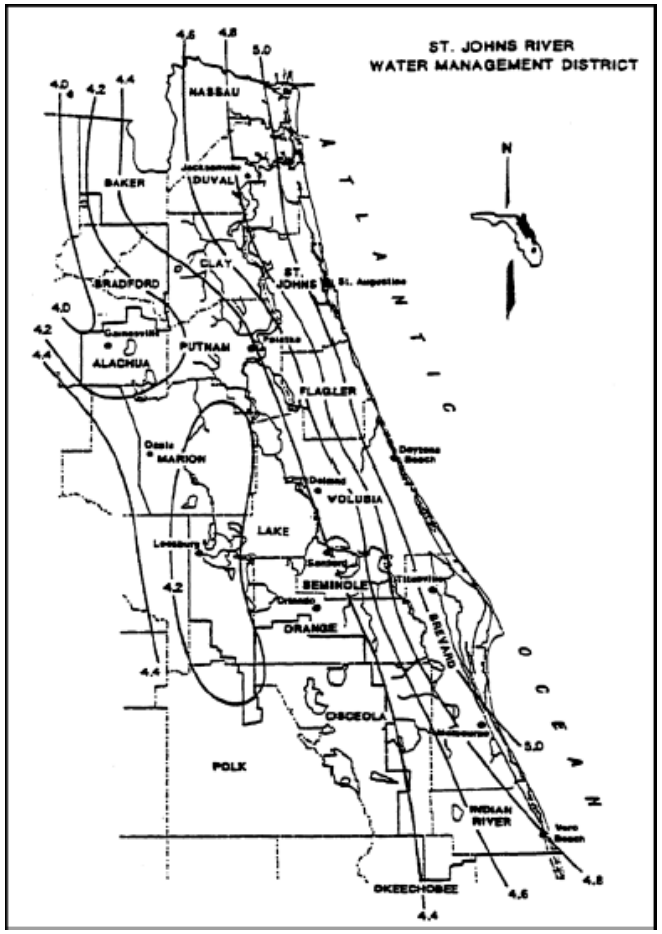
What would the number be for wetlands?

ENRAC – STORMWATER PRIMER

Stormwater Runoff – Rainfall

Depending on basin there are different storm sizes/rainfall amounts:

- Open Basin – Mean Annual (~5 inches) & 25 year/24 hour (~8 inches)
- Closed Basin – 25 year/96 hour (~11 inches)



Stormwater Runoff – Flood Control (Attenuation)

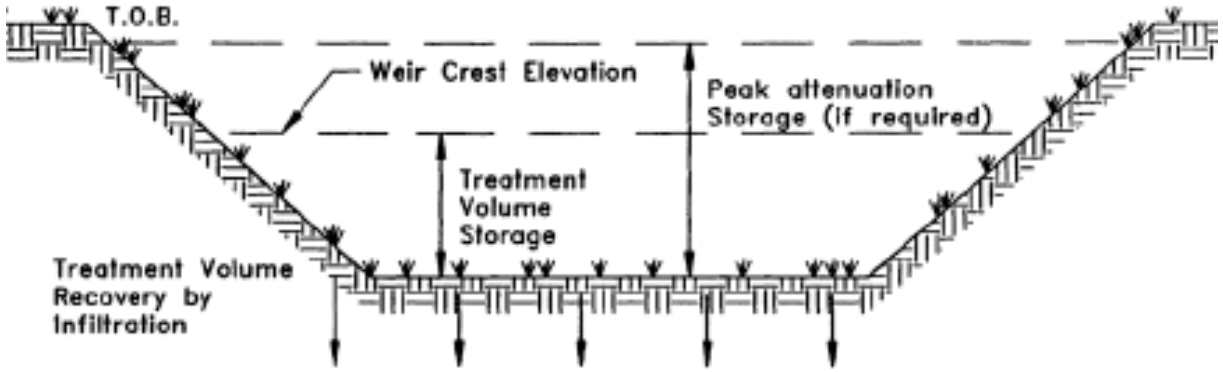
Many types of stormwater impoundment:

- Wet/Dry Ponds
- Underground Storage
- Swales
- LID methods

Stormwater Attenuation - Design

Design factors:

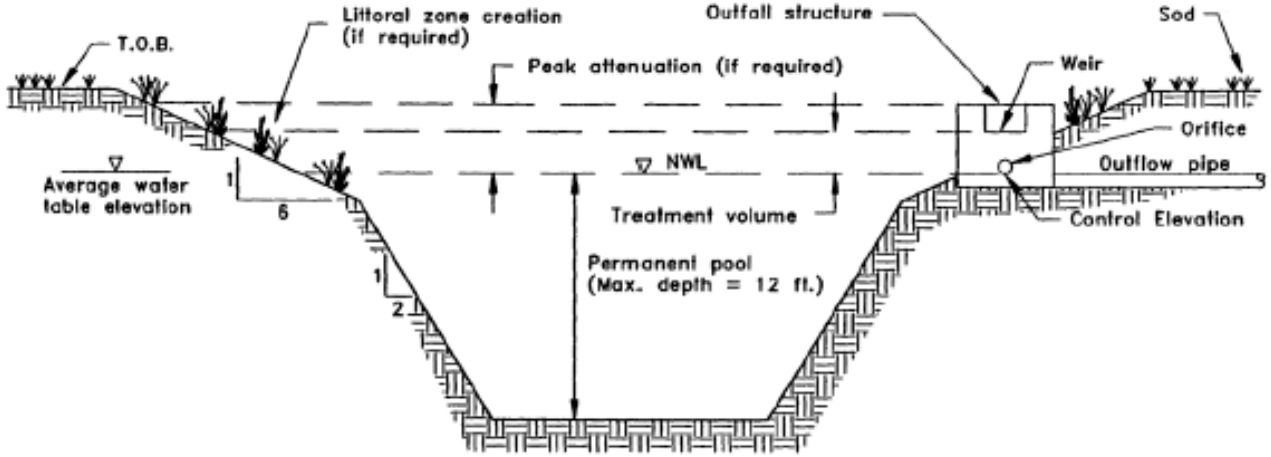
- Existing Water Table Elevation
- Runoff Volume
- Soil Types/Characteristics
- Tailwater



Stormwater Attenuation - Design

Existing/Design Water Table Elevation will:

- Dictate either wet/dry system
- Dictate the bottom elevation of attenuation system
- Start chain of establishing elevations throughout development



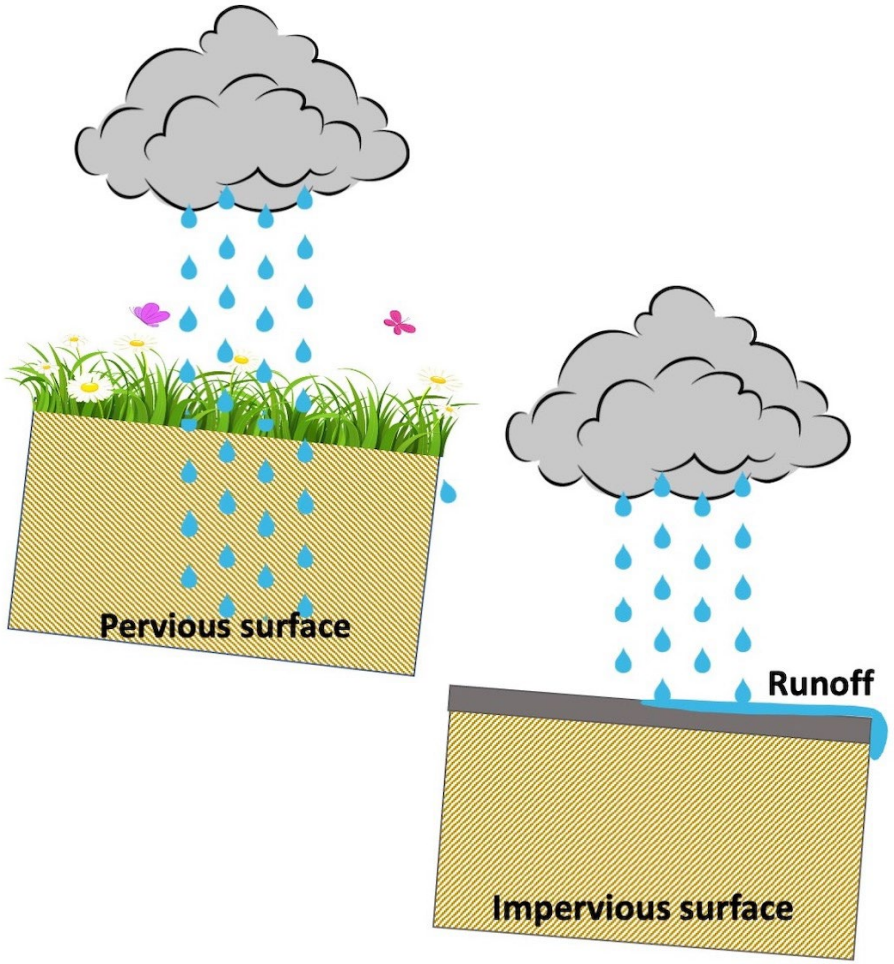
Stormwater Attenuation – Affect on a Development

The size of attenuation system will dictate elevations (in order):

1) Maximum/Peak stage in the stormwater pond
2) Minimum elevation of stormwater runoff collection system
3) Minimum elevation of the road network/parking area
4) Minimum elevations of home or building floor elevations

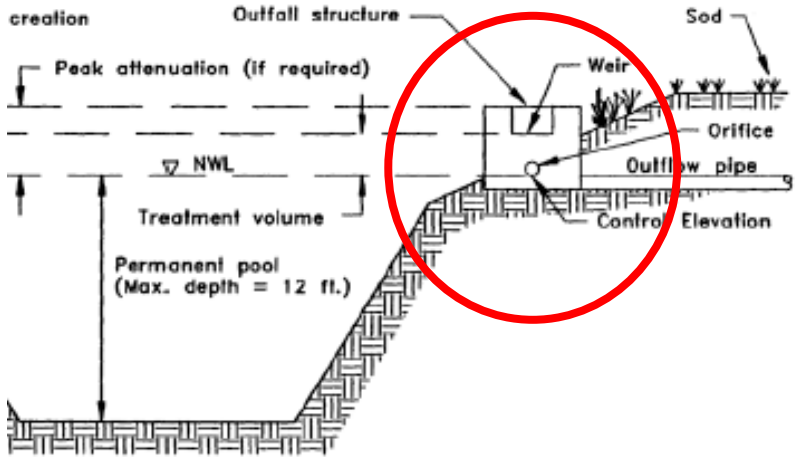
Stormwater Attenuation – Rate

- An increase in the rate of the runoff will increase chances of downhill/ downstream flooding
- Stormwater runoff rate does not have same negative effects if the rate is decreased as decrease in volume



Stormwater Attenuation – Discharge Design

- Attenuation system designed to hold increase in volume and manage rate
- Attenuation system should allow Pre volume to discharge
- Discharging less than Pre volume can have negative effects



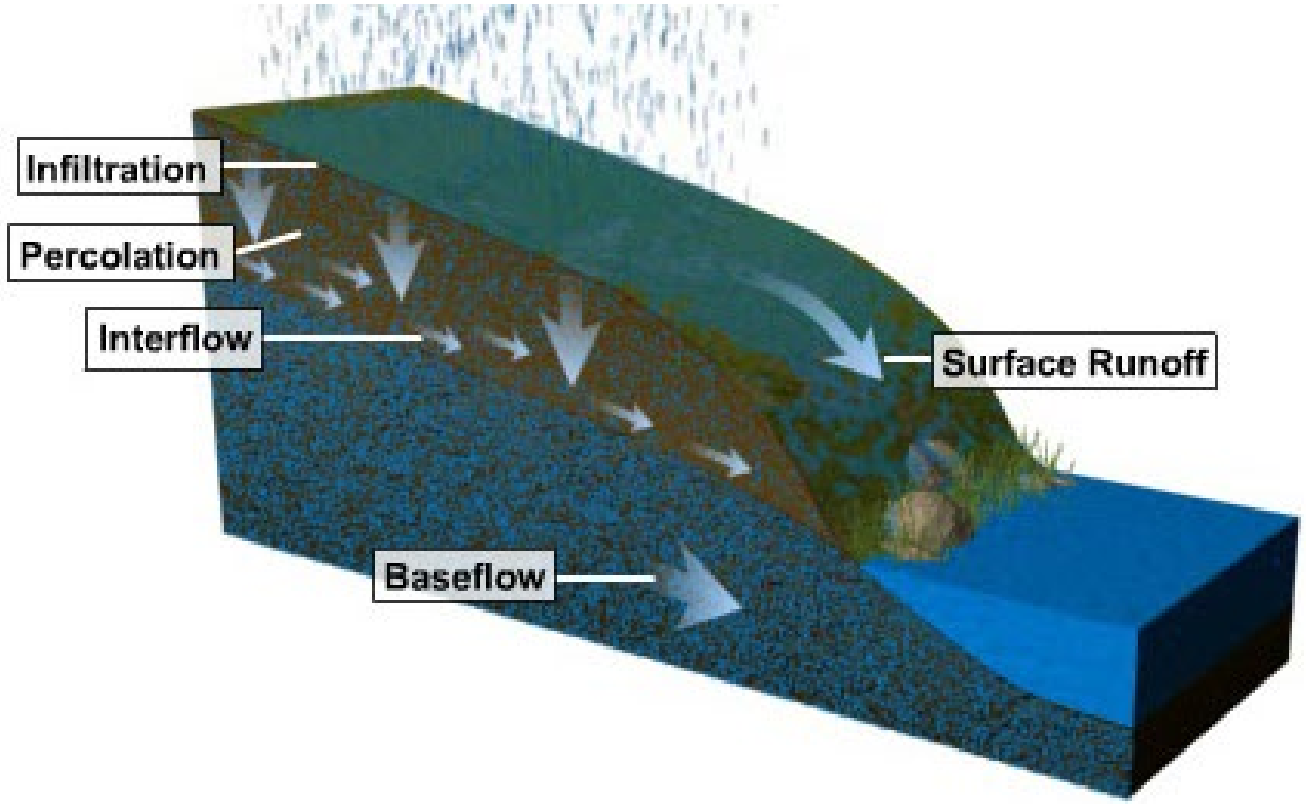
Stormwater Attenuation – Recovery

Recovery is the return of the system to pre-storm levels.

- Wet Systems – Release via an orifice and percolation
- Dry Systems – Percolation
- Required within a period of time (state)

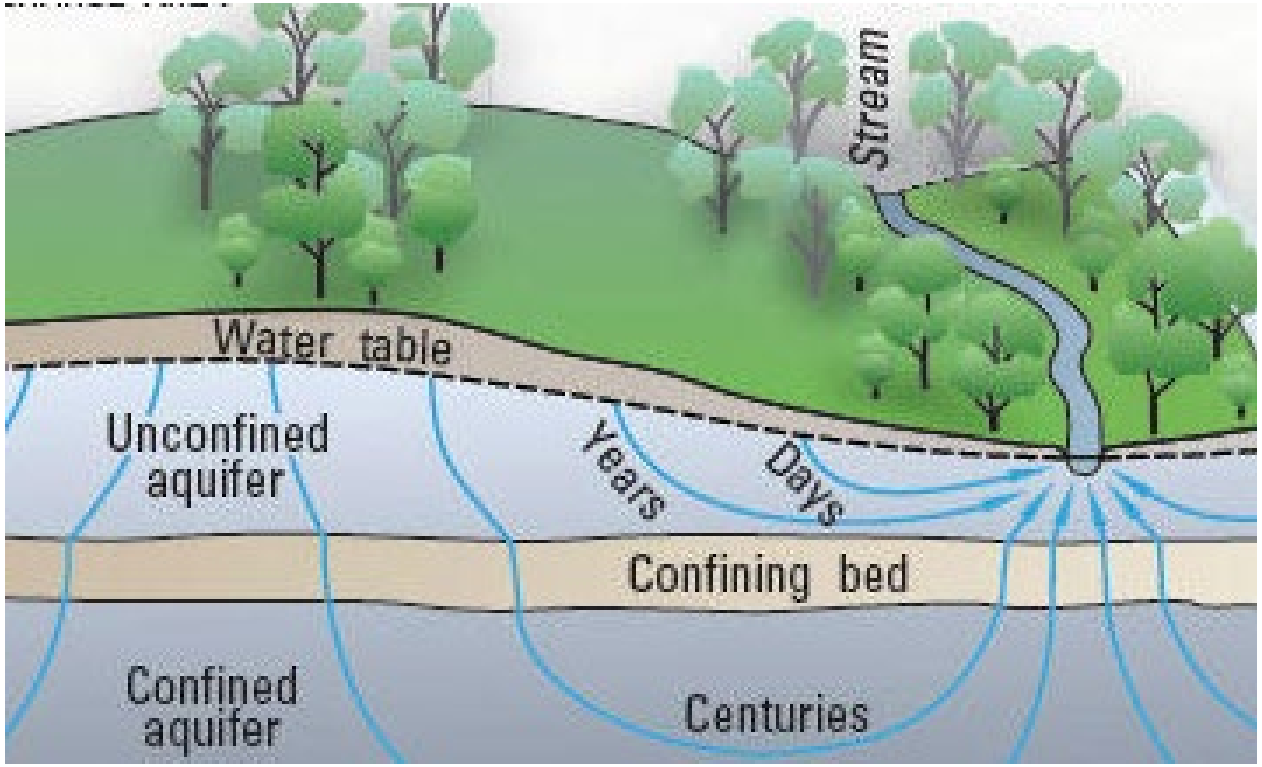
  Non-recovery requires a bigger stormwater system

Stormwater Infiltration – Groundwater Terms



Stormwater Infiltration - Groundwater

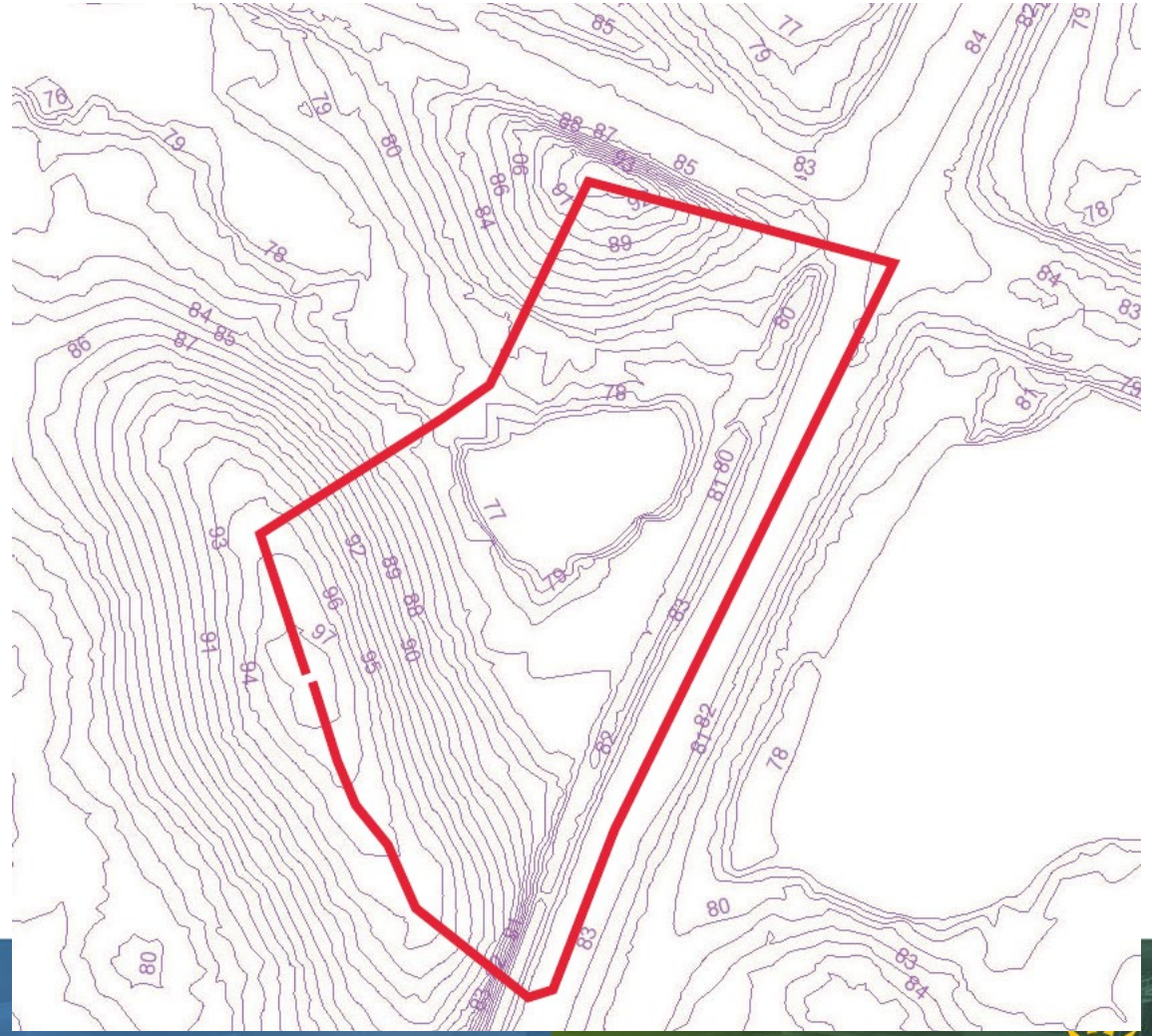
- Much slower flow rates than overland flow
- Water table mimics the ground elevation
- Confining layers affect flow/water table elevation



ENRAC – STORMWATER PRIMER

Stormwater – Closed Basins

- All runoff and infiltrated stormwater stays in basin
- Highly susceptible to flooding due to lack of discharge & increase in rainfall
- Modeled using a larger storm
- West Volusia predominantly

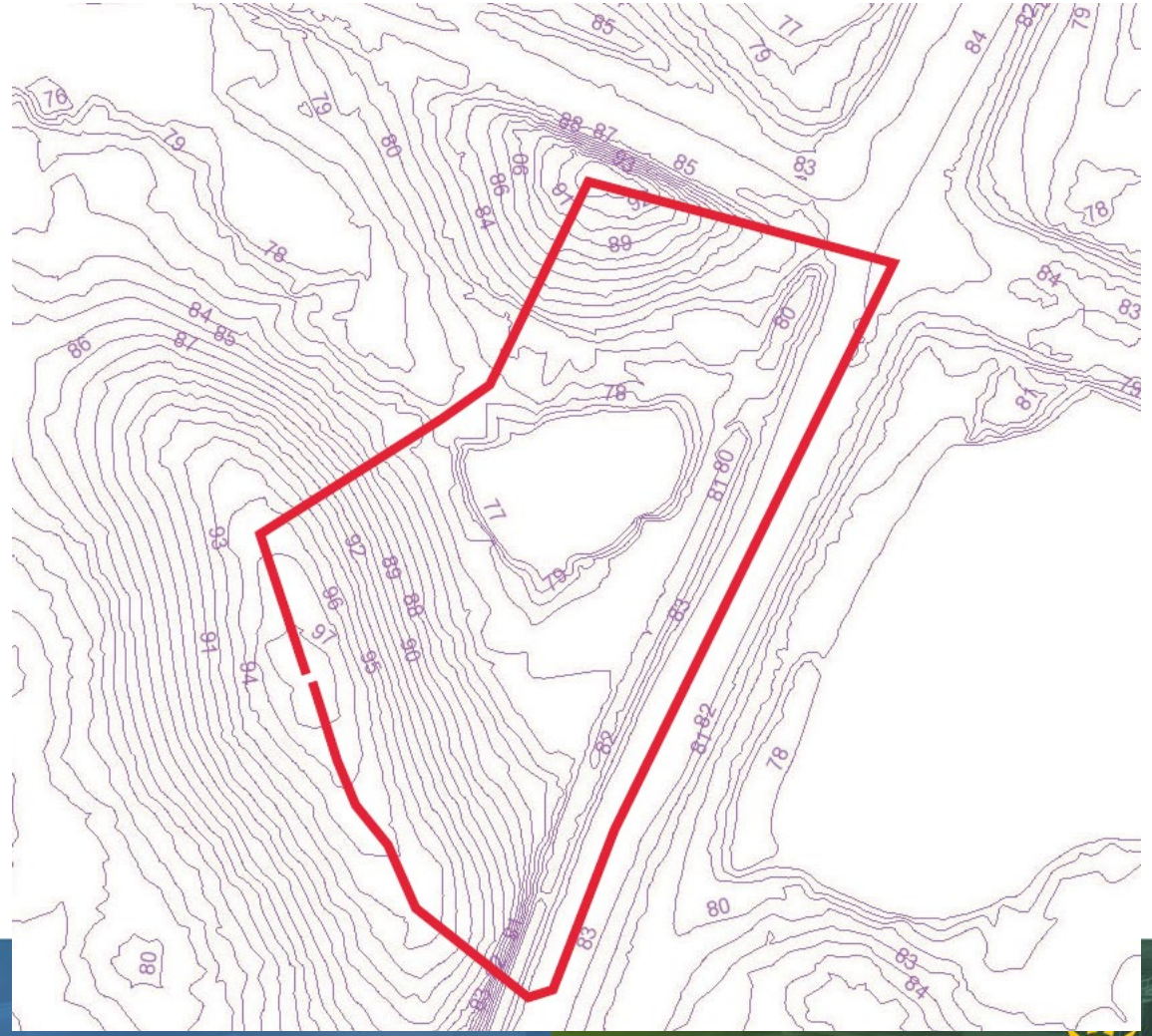


Volusia County
FLORIDA

Stormwater – Closed Basins

Percolation is only means of recovery (drop in water elevs) and it can be slowed by:

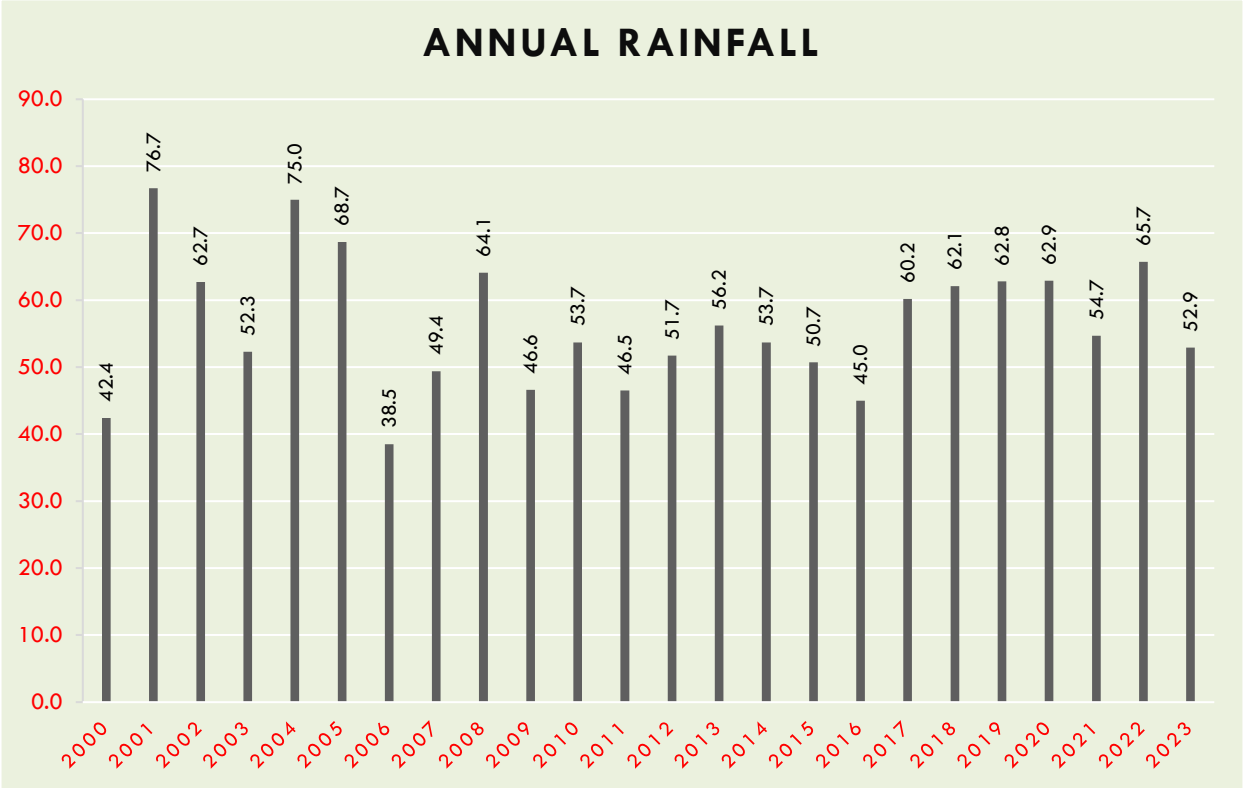
- Confining layers or poorly drained soils
- Higher rainfall amounts



Stormwater – Closed Basins

Percolation is only means of recovery (drop in water elevs) and it can be slowed by:

- Confining layers or poorly drained soils
- Higher rainfall amounts



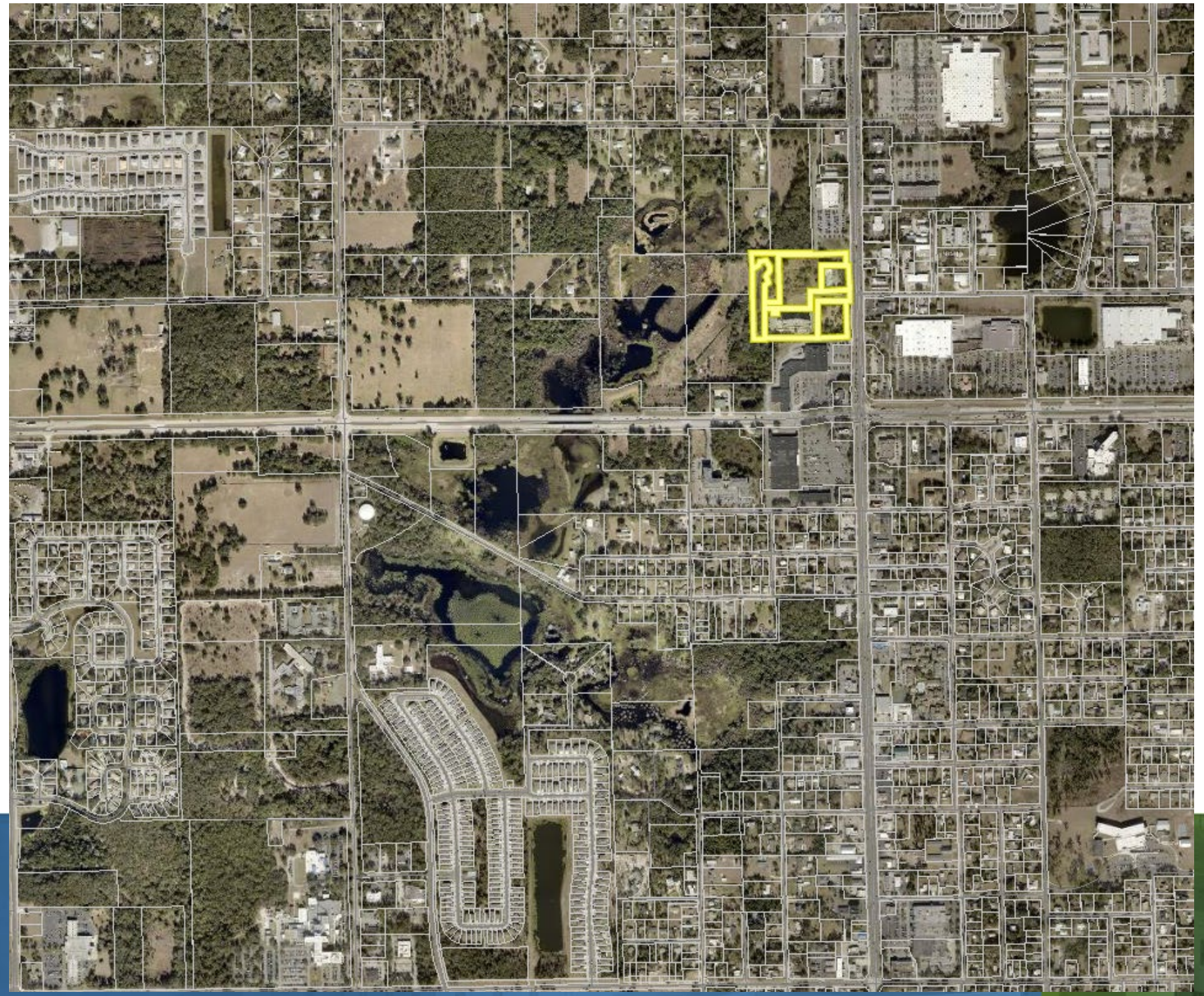
ENRAC – STORMWATER PRIMER

Stormwater – Treatment

- State regulates (FDEP & WMD) stormwater runoff treatment
- Treatment of “first flush”
- Stormwater system must retain first flush
- Wet ponds treat water via sun light
- Dry ponds treat water via filtration

ENRAC – STORMWATER PRIMER

Hampton Inn



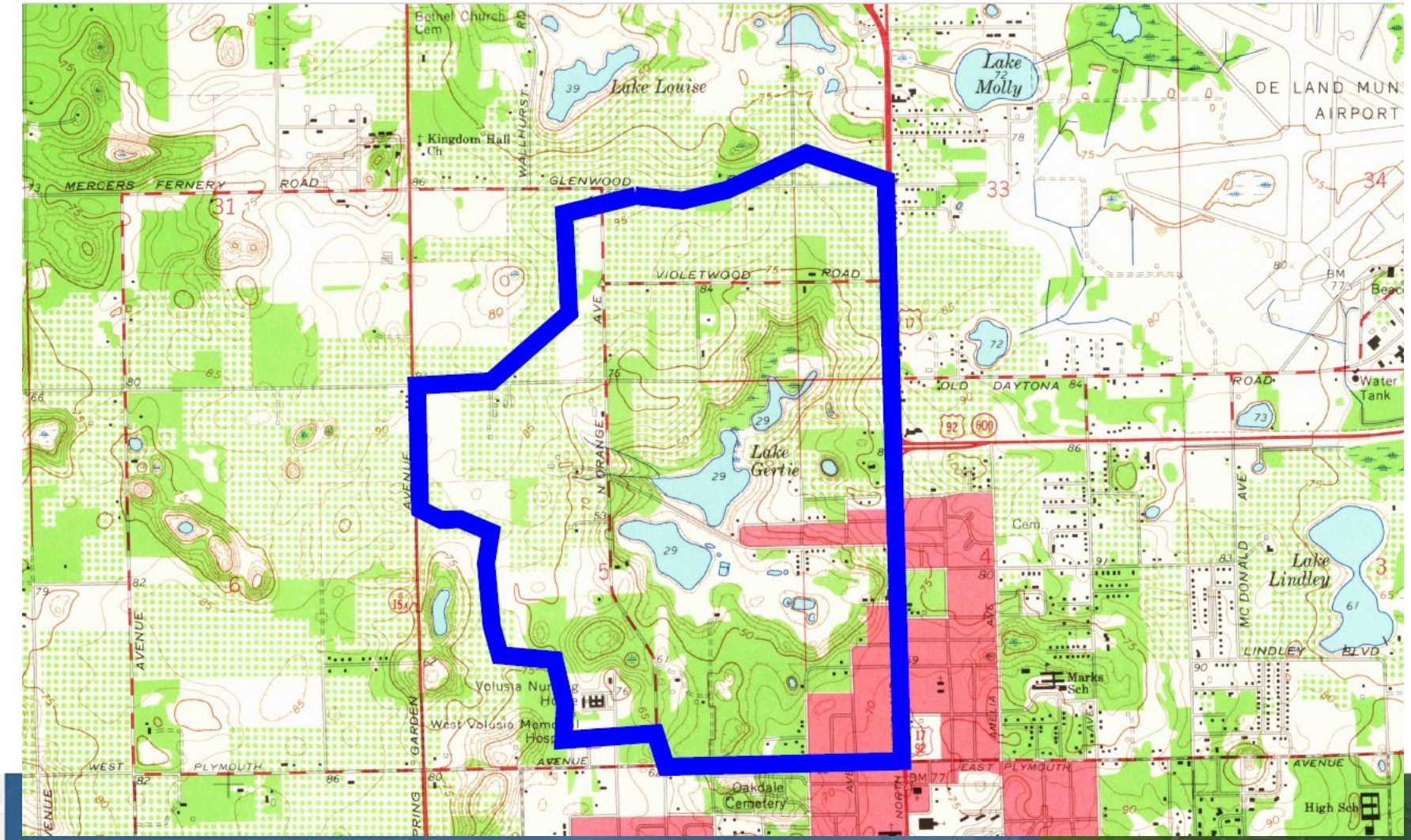
Volusia County
FLORIDA

ENRAC – STORMWATER PRIMER

Hampton Inn

ENRAC – STORMWATER PRIMER

Lake Gertie Basin



Volusia County FLORIDA