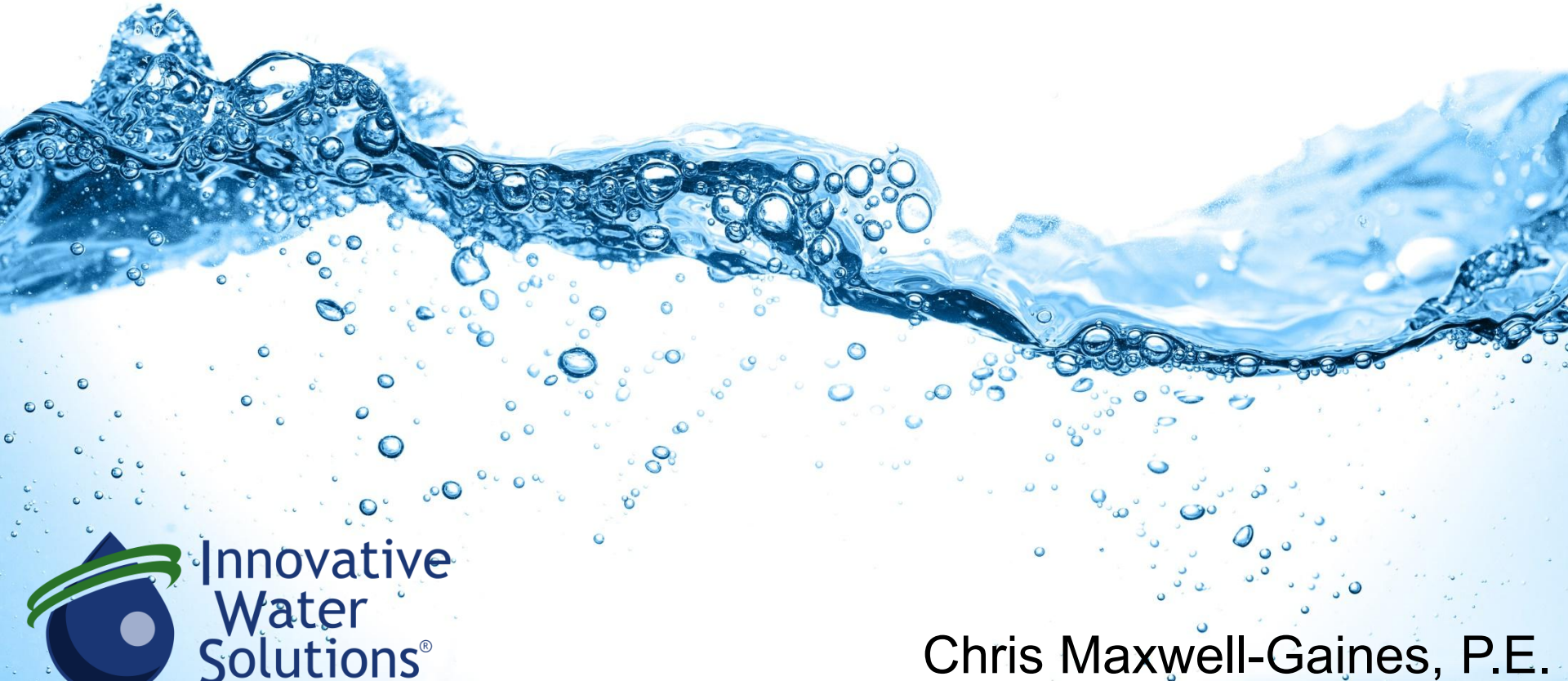
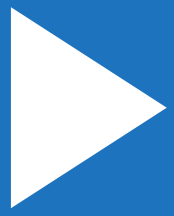
Active and Passive Stormwater Capture Methods to Achieve Stormwater Detention and Management Goal



Innovative Water Solutions®

Chris Maxwell-Gaines, P.E.



2004

Year Started

1976

Customers

1089

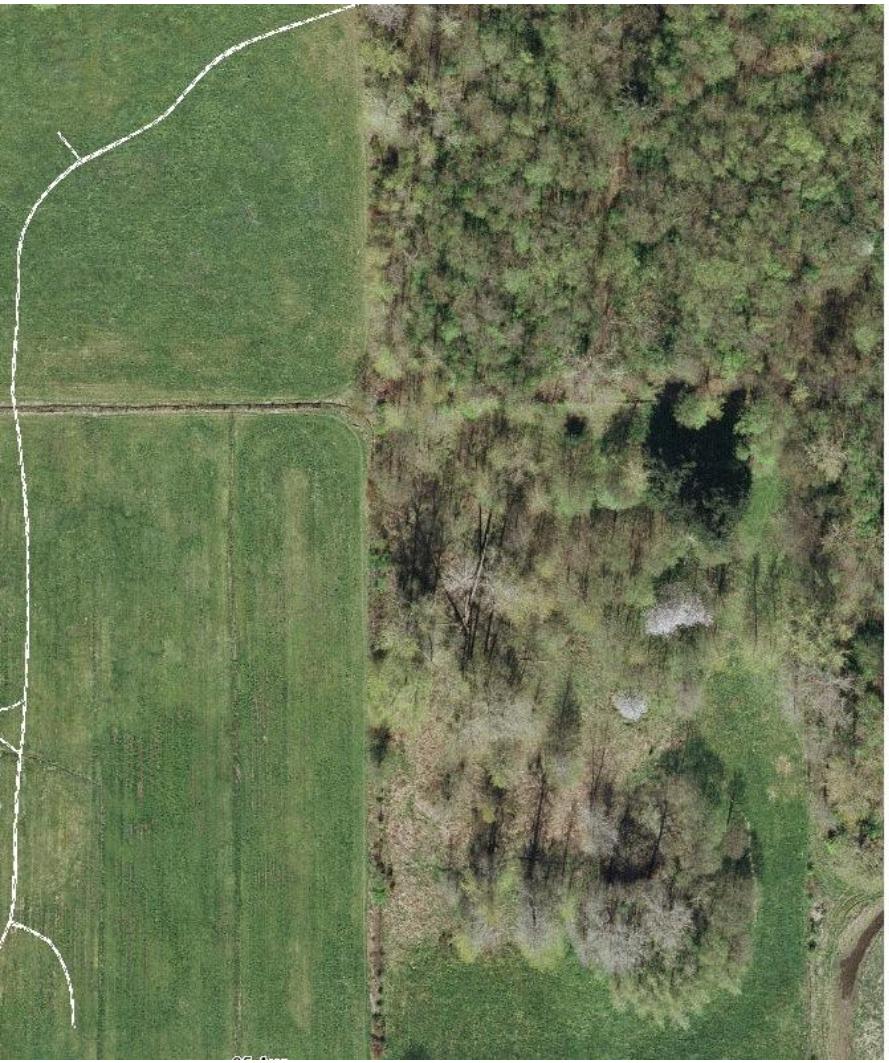
Rainwater Systems

11 M+

Gallons Installed

Why Do We Need Stormwater Management?

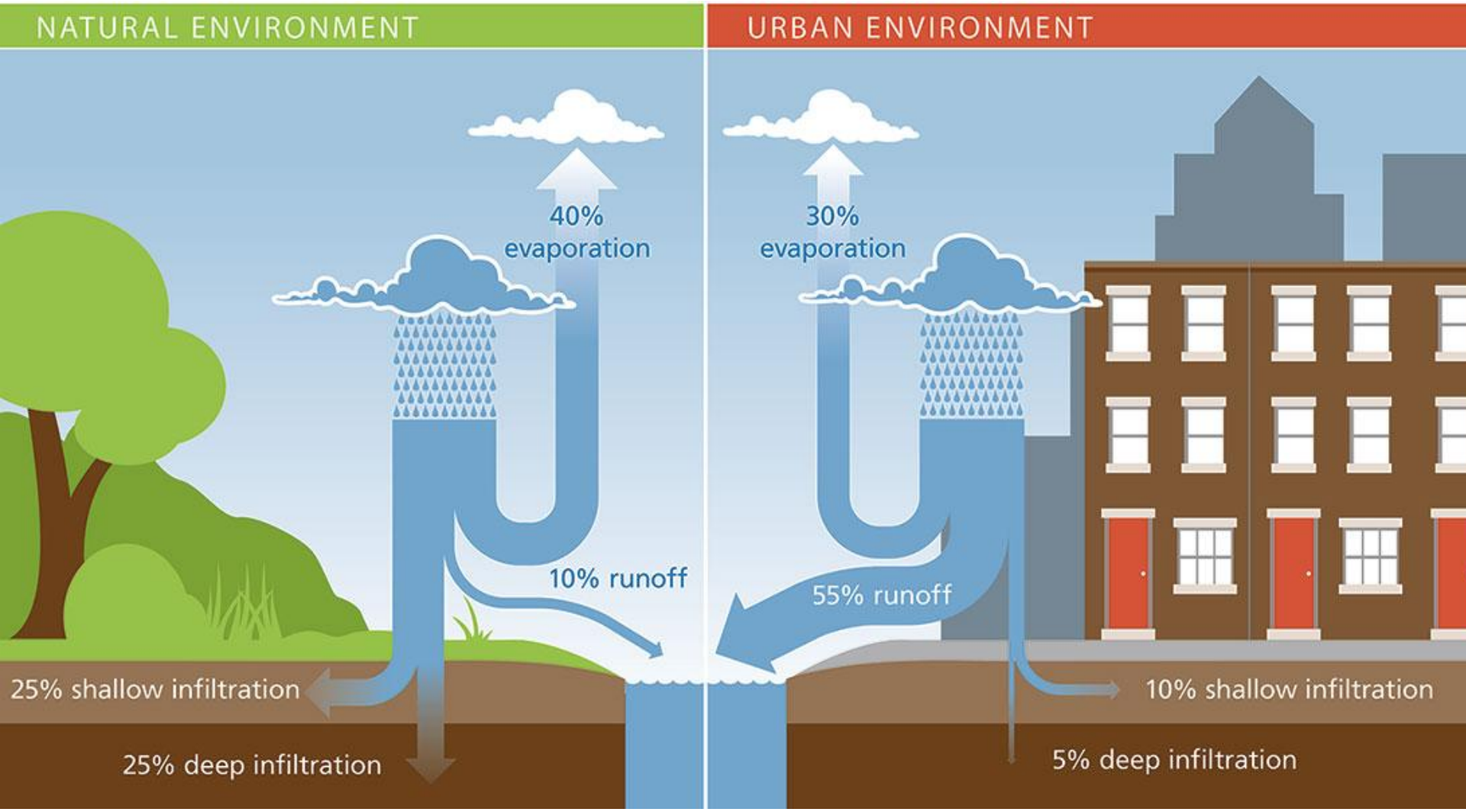

Growth of Impervious Cover




162 St
25 Ave

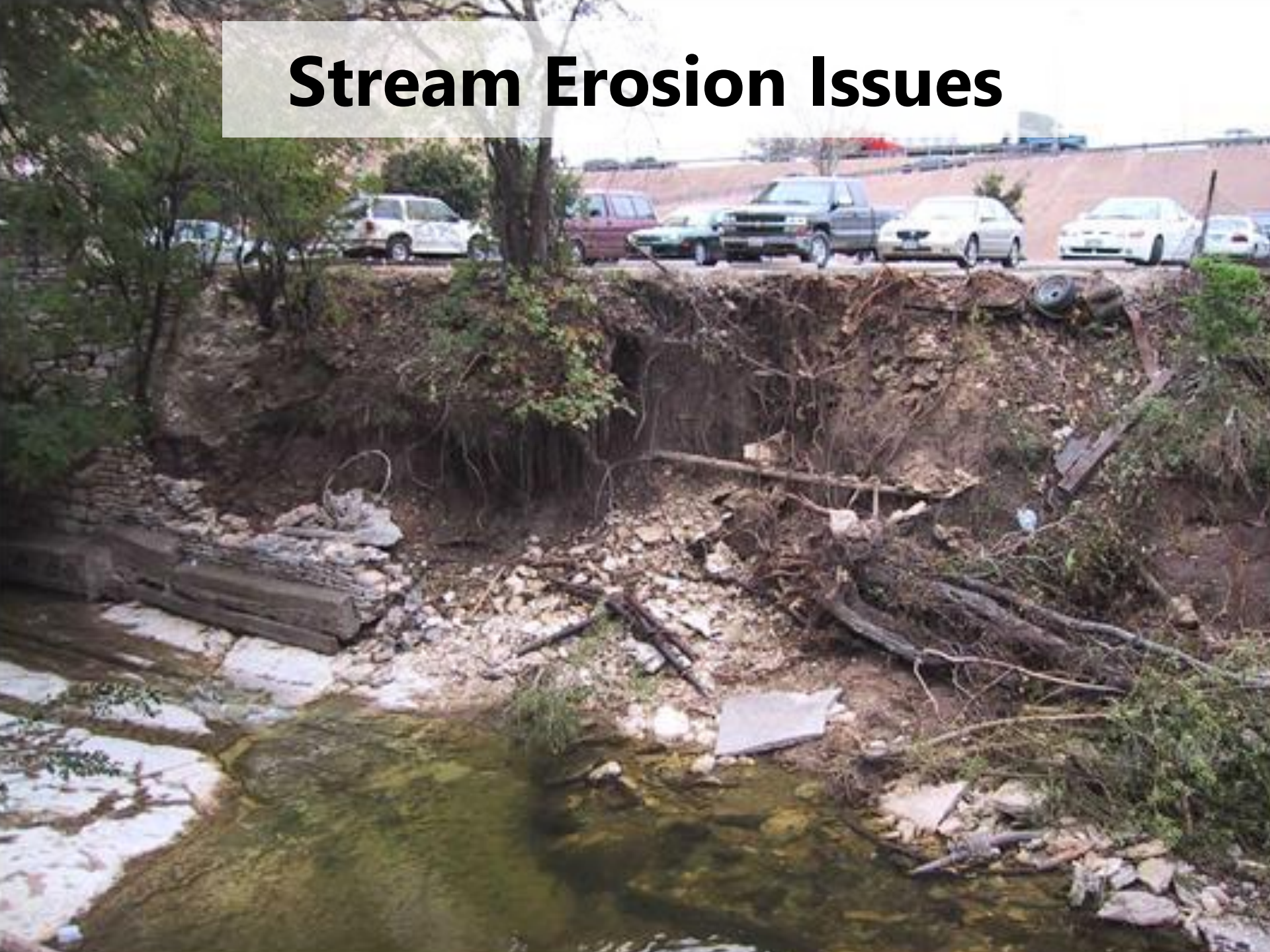

Springdale Rd
Springdale Rd


1317


NATURAL ENVIRONMENT
URBAN ENVIRONMENT
40% evaporation
30% evaporation
10% runoff
55% runoff
25% shallow infiltration
10% shallow infiltration
25% deep infiltration
5% deep infiltration

Growth of Localized Flooding Issues

Stream Erosion Issues

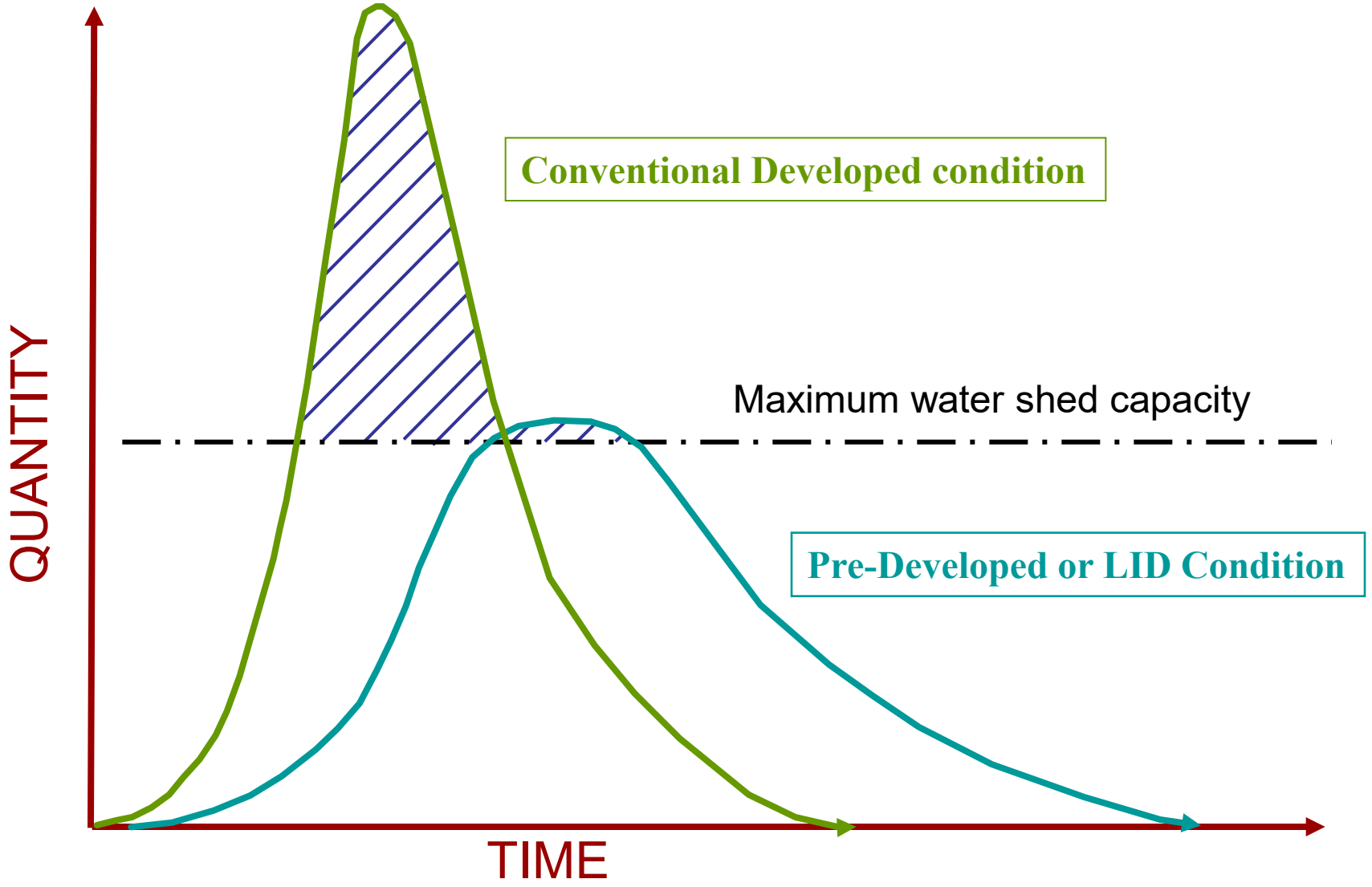


Increase of Stormwater Pollution

What is Stormwater Management?

- Post-development runoff must not exceed the pre-development runoff
- Calculate the pre- and post-development storm runoff
- Difference must be retained/detained onsite such that the additional runoff is not routed to the existing storm water system

Run-off Hydrograph



Traditional Stormwater Management

- Gray Infrastructure / Stormwater sewer systems
- Focus on collection and rapid removal of rainwater away from the point of impact
- Focus is to reduce or control localized flooding
- Stormwater treated as a waste product to be removed or “disposed”

LA River, Los Angeles, CA


TRADER JOE'S

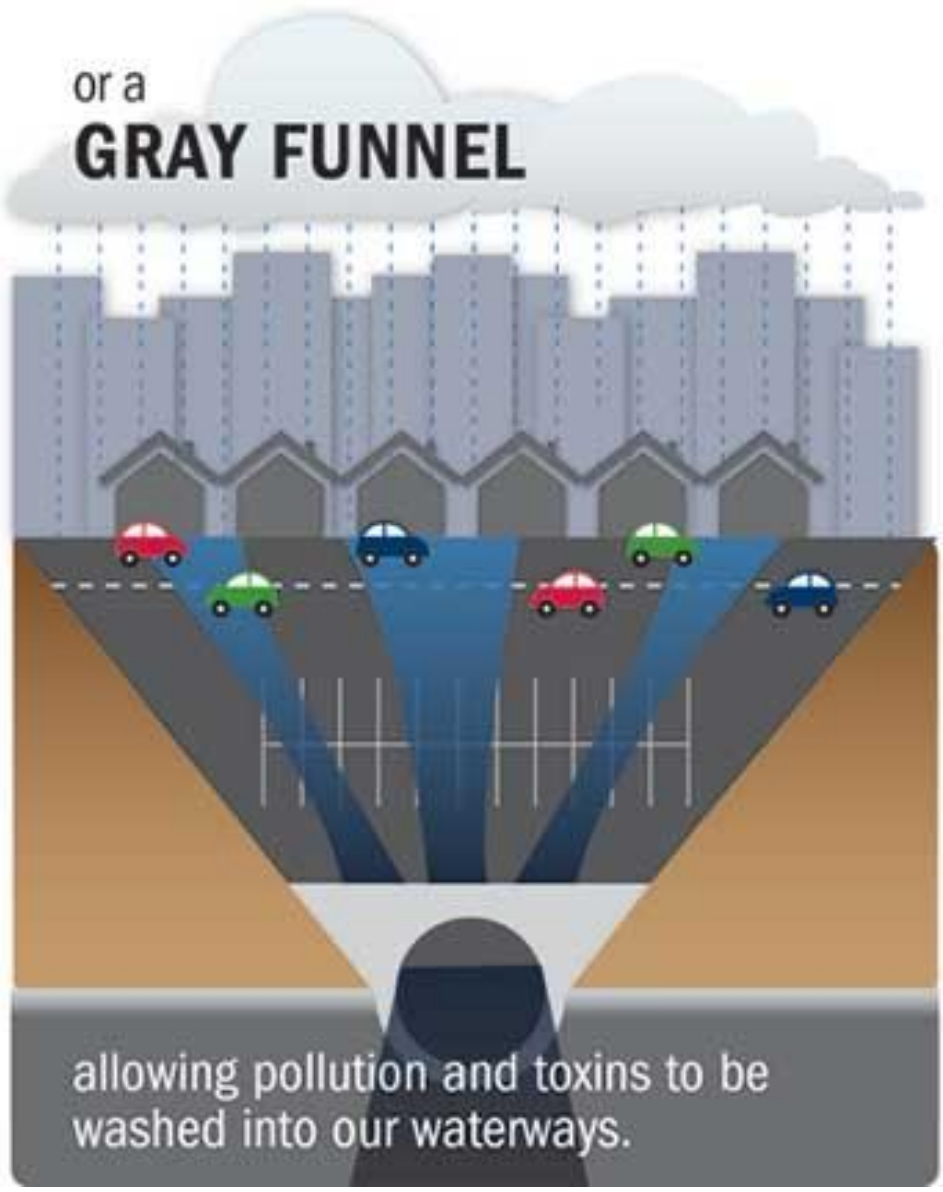
Case Against Traditional Stormwater Infrastructure

- Repair and replacement is becoming increasingly expensive
- Effective pollutant transport
- Concentrates flow
- It is a wasted opportunity

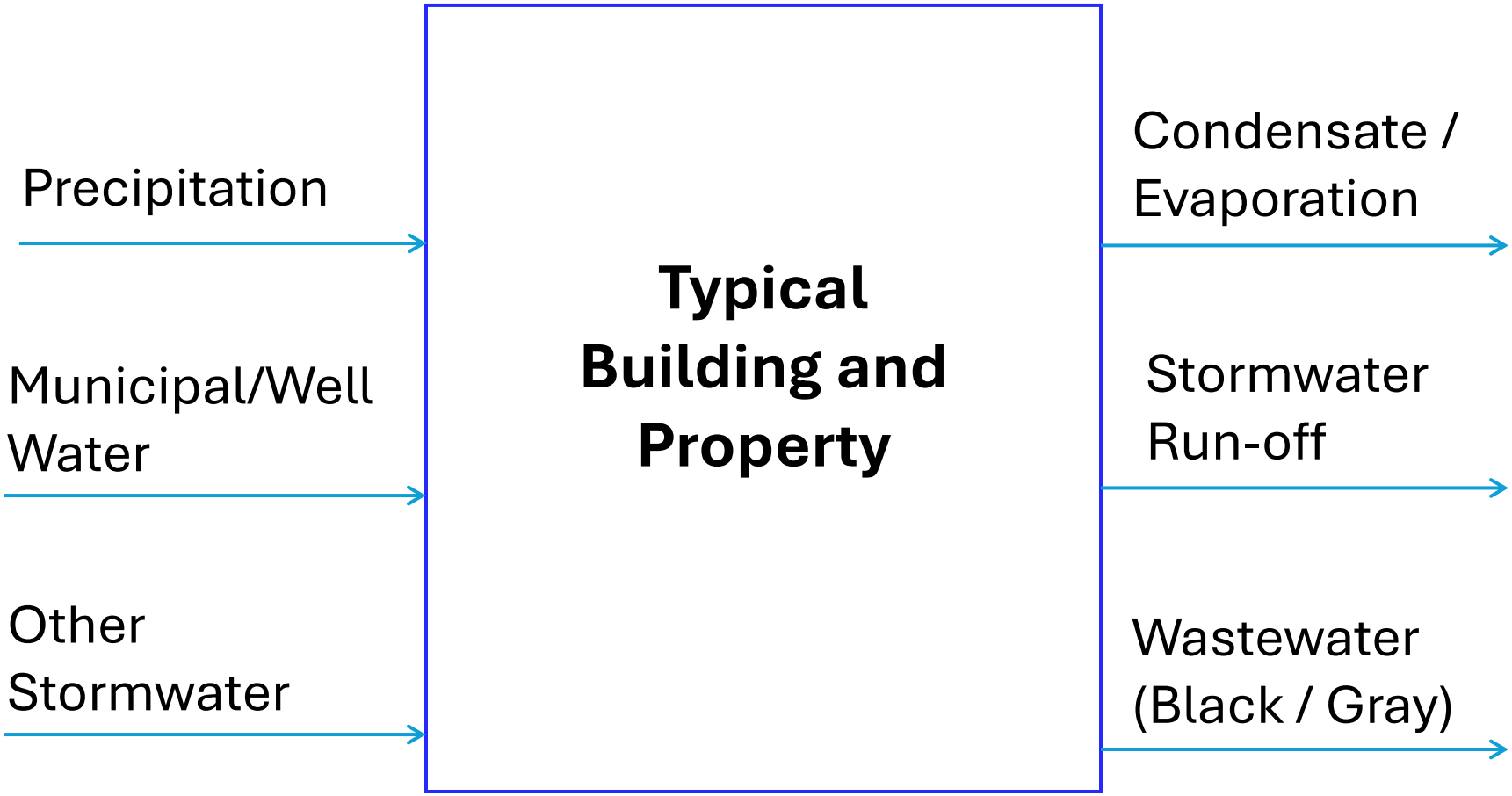
Sustainable Stormwater Management

- Green Infrastructure / Low Impact Development
- Focus on detention and infiltration of rainwater away from the point of impact
- Focus on retaining rainwater for beneficial use
- Stormwater treated as an opportunity and asset

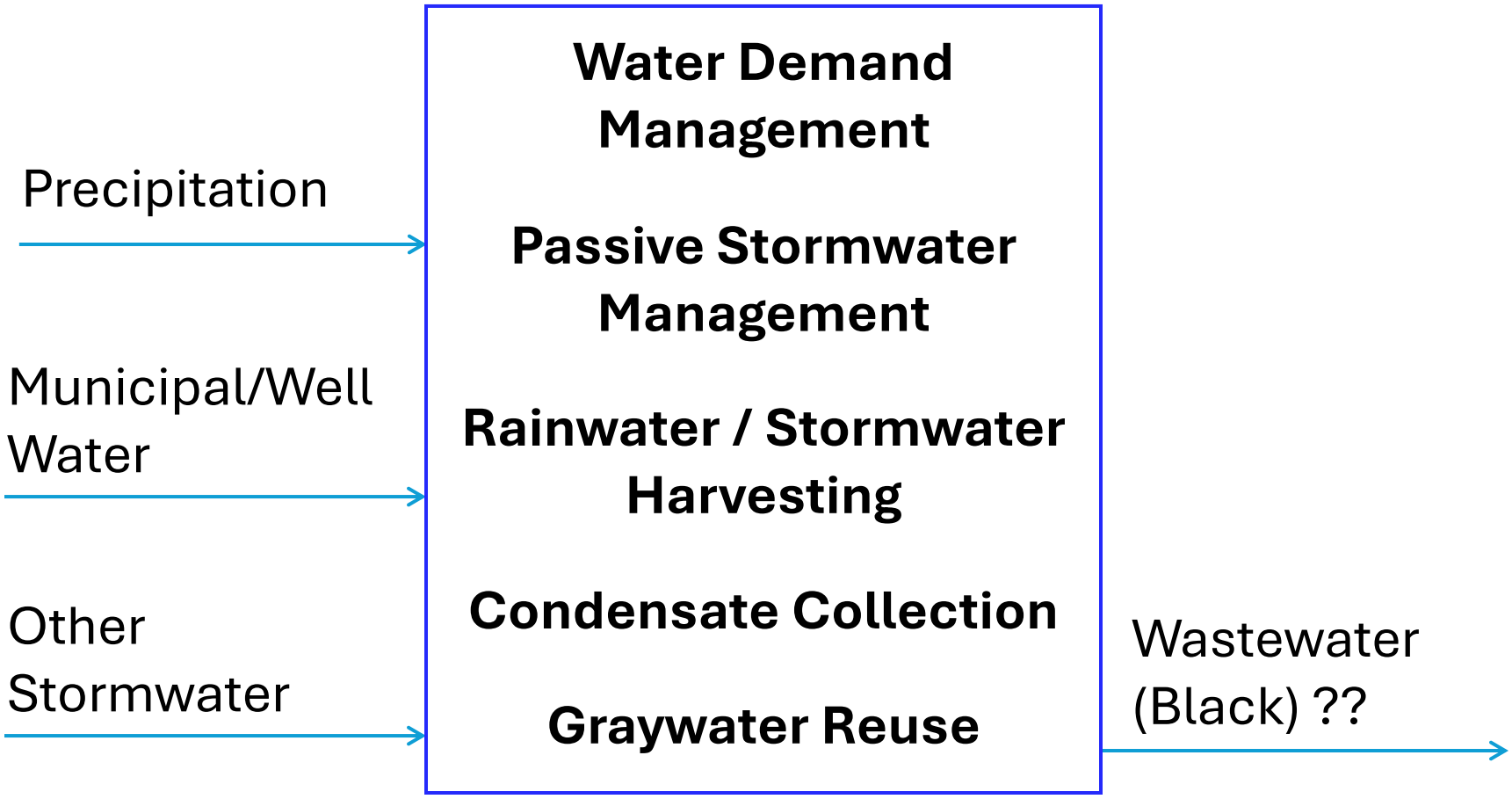
Tomorrow VS. Yesterday



Typical Urban Water Balance Model



Integrated Urban Water Balance Model

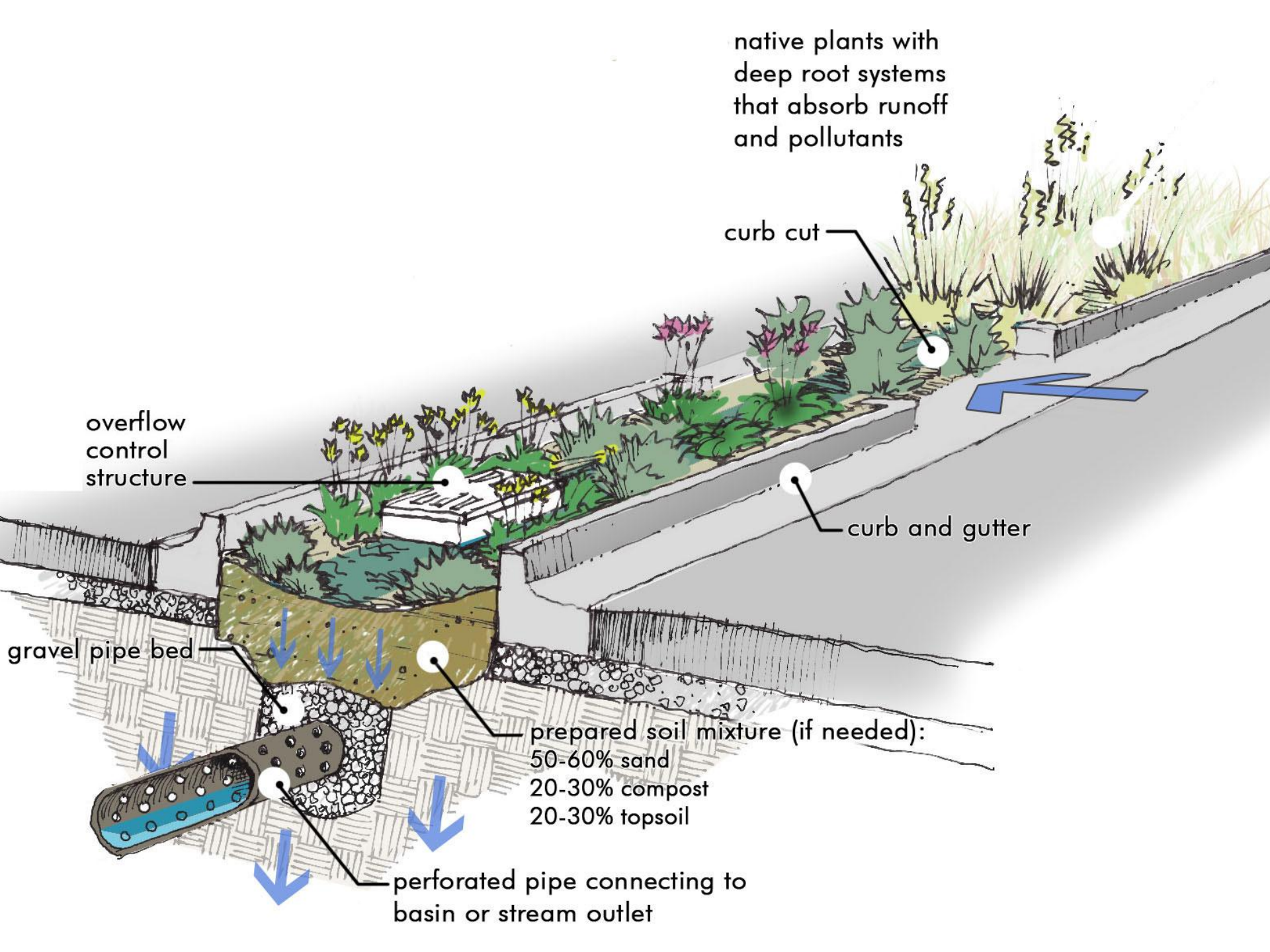


Onsite Stormwater Management

- **Sink it:** holds stormwater and slowly infiltrates it into the ground
- **Slow it:** holds stormwater flow and slowly releases it to the sewer / river system
- **Reuse it:** holds stormwater and uses it to meet building/property water demands

Stormwater Management via Passive Harvesting Systems

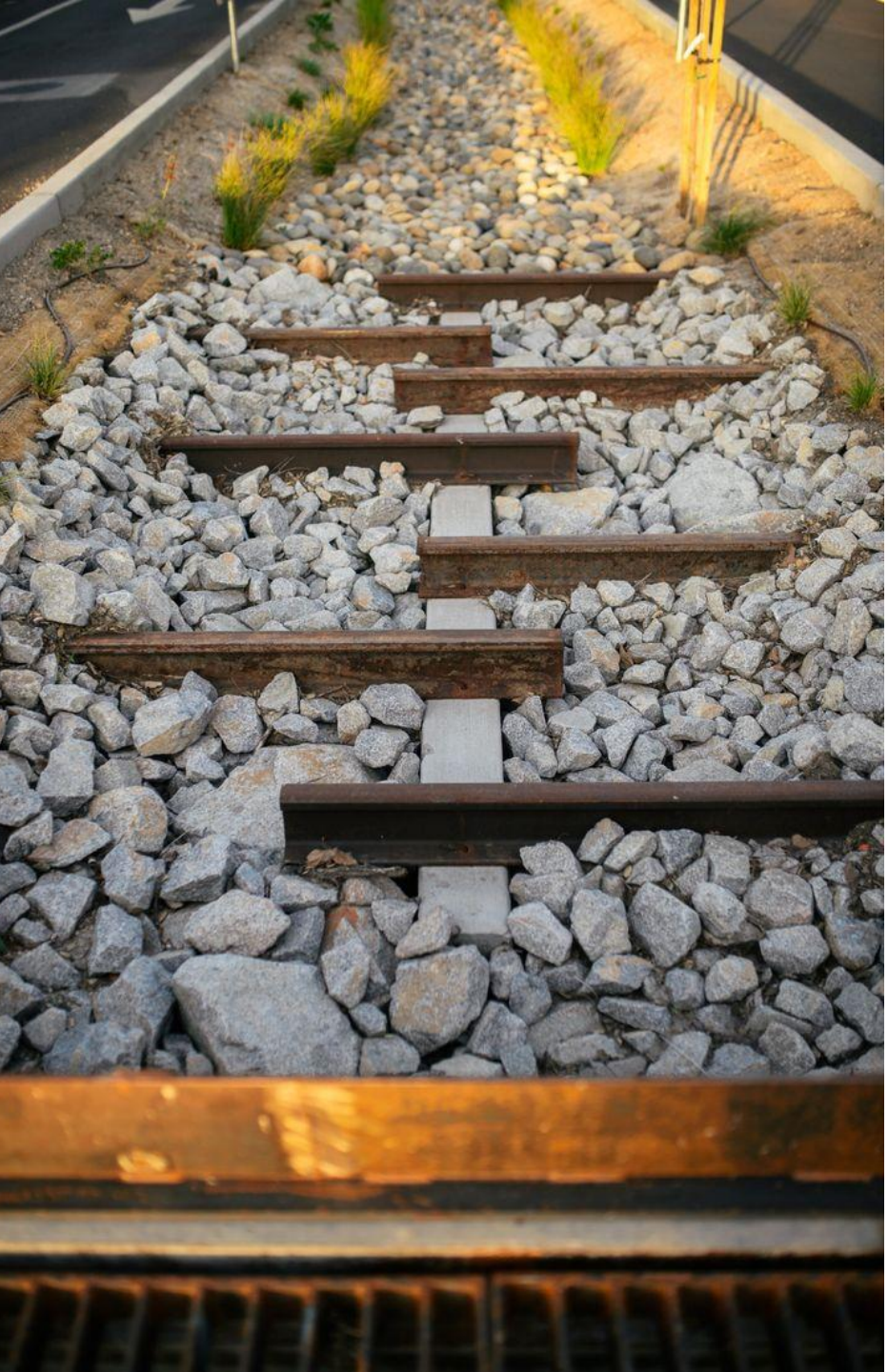
- Groundwater Recharge
- Improved Water Quality
- Flood & Erosion Mitigation
- Supports Biodiversity
- Lower Utility Costs
- Reduced Infrastructure Stress
- Energy Savings


native plants with
deep root systems
that absorb runoff
and pollutants
curb cut
overflow
control
structure
curb and gutter
gravel pipe bed
prepared soil mixture (if needed):
50-60% sand
20-30% compost
20-30% topsoil
perforated pipe connecting to
basin or stream outlet

RiverEast Center in Portland, OR

Missouri Botanical Garden


Water Flow Path



Stormwater Curb Extensions

- Creates stormwater infiltration area in the existing street area
- Easy to retofit
- Traffic calming

NE Siskiyou Street, Portland, OR


Rockwood Lane, Austin, TX

Stormwater Planters

- Reduces both the amount and flow rate of stormwater
- Naturally treats the water stream by capturing and removing pollutants
- Improves the aesthetic appeal of sidewalks
- Requires minimal space
- Provides a cost-effective way to treat runoff
- Offers versatility (can be various shapes and sizes, depending on the location and available space)


STOP
ALL WAY

1st Street & M Street NE, **WASHINGTON DC**


PLANTS FILTER AND TRANSPIRE WATER WHILE ENHANCING THE STREETSCAPE
STORMWATER FROM SIDEWALK FLOWS INTO THE PLANTER
STORMWATER FROM ROADWAY FLOWS INTO THE PLANTER
WATER INFILTRATES THROUGH SOIL
STONE OR OTHER STORAGE MEDIA PROVIDES ADDITIONAL STORMWATER STORAGE

Green Roofs

- Benefits of green roofs
  - Energy conservation in building
  - Water quality
  - Stormwater runoff reduction
  - Biodiversity and wildlife
  - Provides green space
  - Reduce heat island effect


FLIR
151
74
°F

Stormwater Management via Active Harvesting Systems

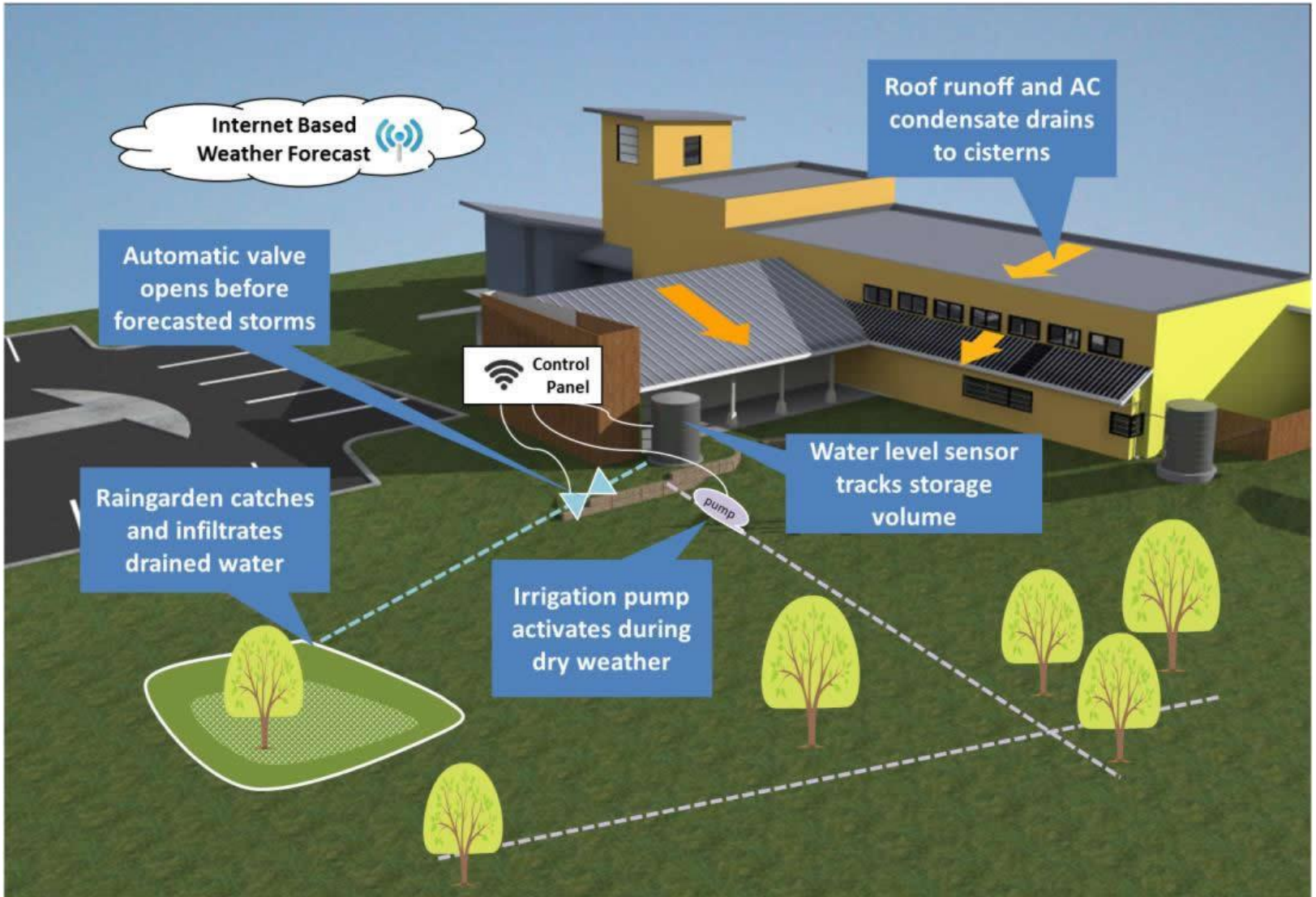
- Time based drawdown to meet stormwater regulations
- Long term storage needs for true water conservation
- Potential to over-size storage volume to meet both
- Technology that solves this problem

Twin Oaks Library
Austin, TX

Twin Oaks Library
Austin, TX

- First testing of Opti-RTC System in 2012
- Batched draining based on rain forecasts

Twin Oaks Library
Austin, TX




POND

Belmont Village Senior Living, Westlake, TX

Completed March 2014

Required 40,000 gallon for WQV

Drawdown must happen in 72 hours

Irrigation of cedar forest

Jacobs Well Elementary School, Wimberley, TX

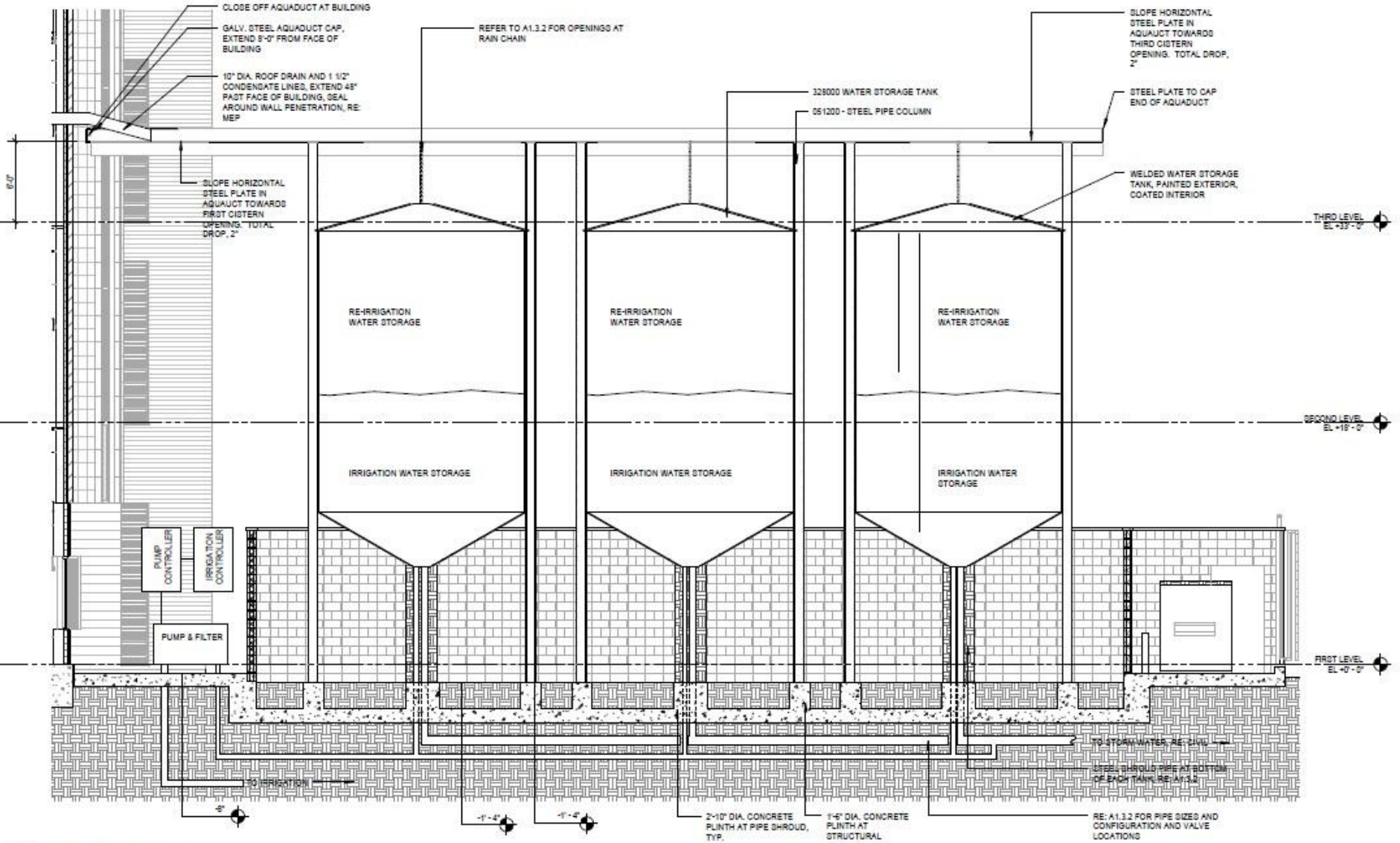
Retrofit a Water Quality Pond with Rainwater Harvesting


DODGE
34Z-SRW


SUPERIOR TANK
COMPANY INC.

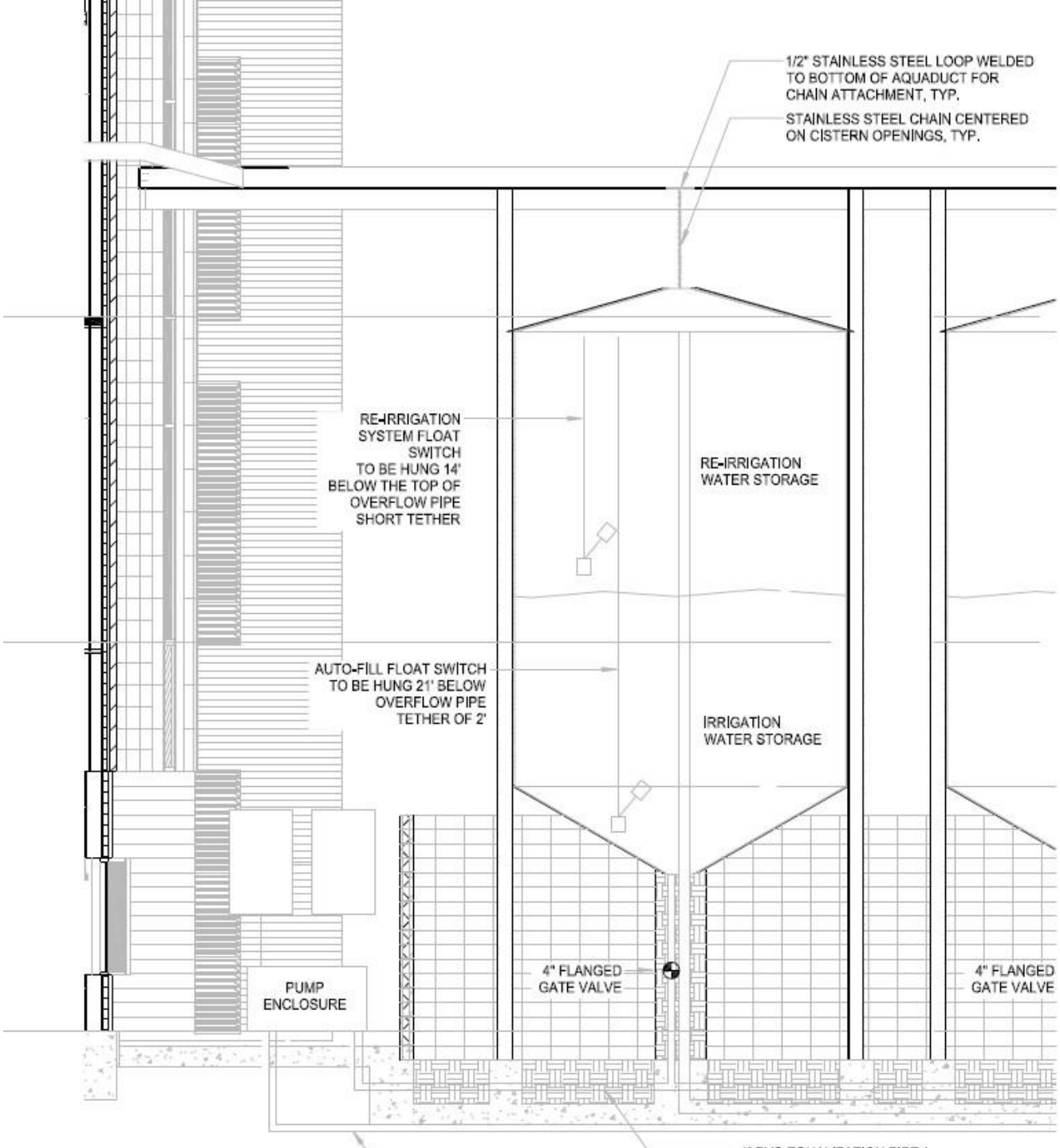
CubeSmart, Fort Worth, TX

Austin Community College, Leander, TX



2 **SECTION CISTERNS**

SCALE: 3/16" = 1'-0"


1/2" STAINLESS STEEL LOOP WELDED TO BOTTOM OF AQUADUCT FOR CHAIN ATTACHMENT, TYP.
STAINLESS STEEL CHAIN CENTERED ON CISTERN OPENINGS, TYP.
RE-IRRIGATION SYSTEM FLOAT SWITCH TO BE HUNG 14' BELOW THE TOP OF OVERFLOW PIPE SHORT TETHER
RE-IRRIGATION WATER STORAGE
AUTO-FILL FLOAT SWITCH TO BE HUNG 21' BELOW OVERFLOW PIPE TETHER OF 2'
IRRIGATION WATER STORAGE
PUMP ENCLOSURE
4" FLANGED GATE VALVE
4" FLANGED GATE VALVE

Why not both?

Active + Passive Water Harvesting

Hyde Park, Austin Project

Rain Garden + Rainwater Collection

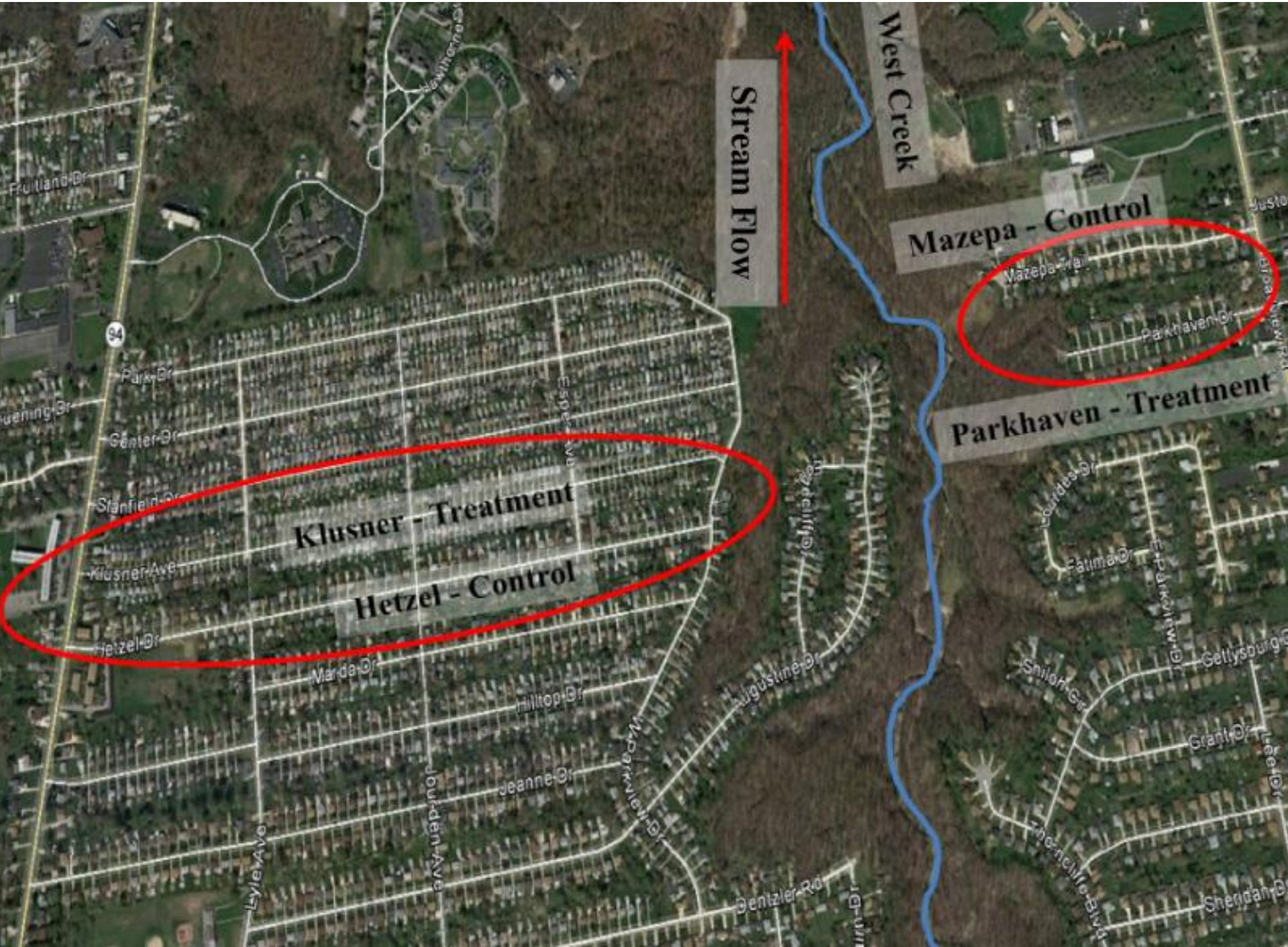
Green Infrastructure Case Studies

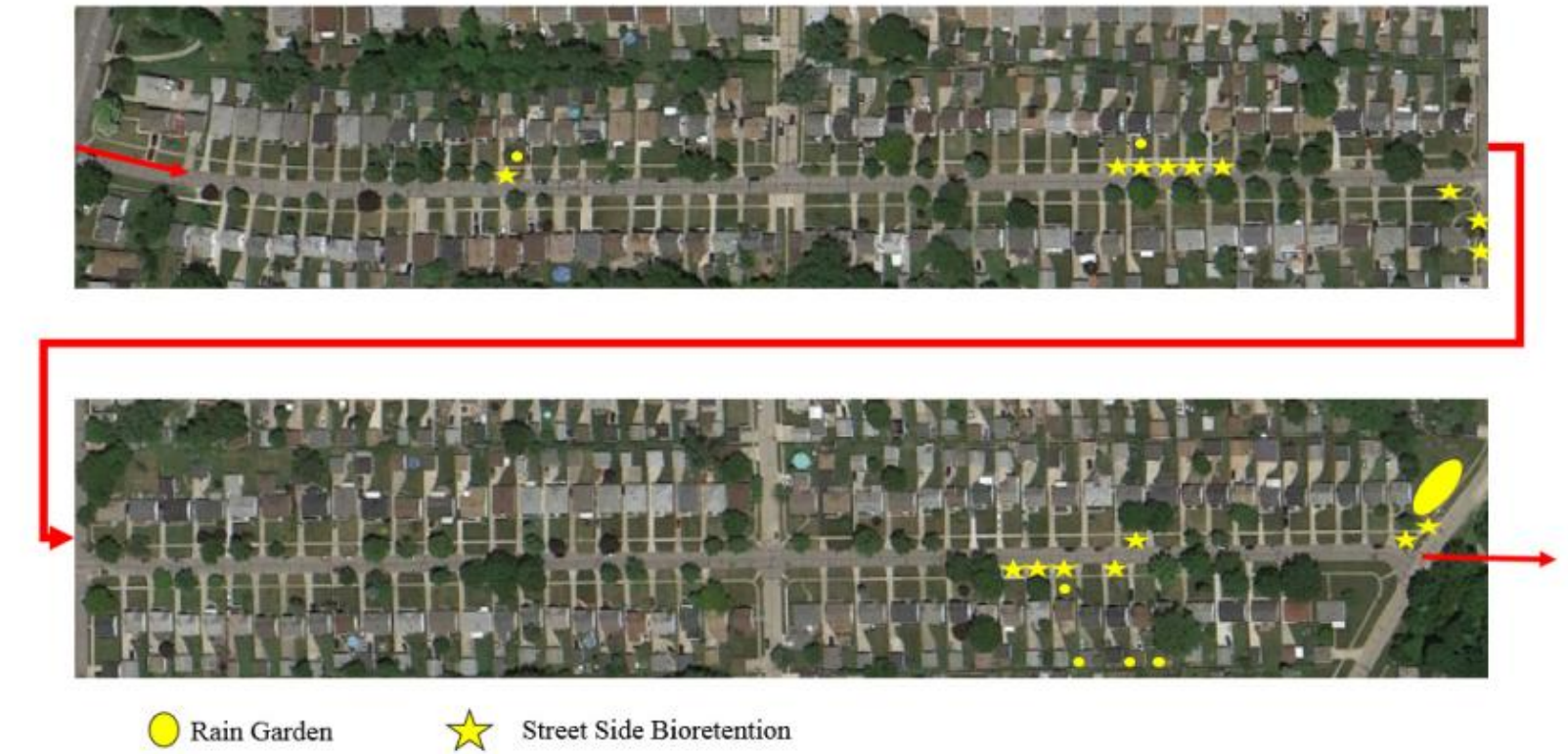
Assessing the effects of catchment- scale urban green infrastructure retrofits on hydrograph characteristics

Jarden, Jefferson, and Grieser
Department of Geology, Kent State University, 2015

- Before and after control-impact assessment, in which streets served as subcatchments, to quantify hydrologic effectiveness of street-scale effectiveness of green infrastructure

- Bioretention cells, rain gardens and rain barrels


West Creek
Stream Flow
Mazepa - Control
Parkhaven - Treatment
Klusner - Treatment
Hetzel - Control
Mazepa Ave
Parkhaven Dr
Park Dr
Center Dr
Stanfield Dr
Klusner Ave
Hetzel Dr
Marda Dr
Hilltop Dr
Jeanne Dr
Lyle Ave
Jourden Ave
Denizler Rd
Augustine Dr
Lourdes Dr
Fatima Dr
Parkview Dr
Shiloh Ct
Grant Dr
Gettysburg
Sheridan
94


Rain Garden
Street Side Bioretention

B


Rain Garden
Street Side Bioretention

Assessing the effects of catchment- scale urban green infrastructure retrofits on hydrograph characteristics

- Voluntary participation resulted in 32.2% (Parkhaven St.) and 13.5% (Klusner St.) of parcels having green infrastructure installed on two streets
- Klusner: Reduced peak discharge by up to 33% and total storm run-off by up to 40%
  - Phase 1: Lag times increased, bioretention cells built with underdrains
  - Phase 2: Lag times not changed bioretention cells built without underdrains
- Parkhaven: No significant reduction in peak or total stormflows

Case Study: Camellia Development, Richmond, TX

- 90-acre community
- Original design intent was to use stormwater canals to manage stormwater while offering 100% of the homes to be built on an amenity
- Canals would be required to manage the 100-yr 24-hours flood event (approximately 13-inches in 24-hours) with detention canals

Source: Construction Ecoservices

Case Study: Camellia Development

- Lot Yield - 224 residential lots
- Cost Per Lot - $34,700
- Total Construction Cost - $7,770,500

Case Study: Camellia Development

- LID concept consisted of placing bioretention basins that use high flow biofiltration inside medians of a public roadway
- Roadway would be designed by an inverted boulevard section so that the storm water run-off would come off the lots, enter the paved street and then continue to drain toward the middle of the boulevard.
- Resulted in a wider right of way section than the typical boulevard but placed a green, parklike area, in front of nearly every single residential lot

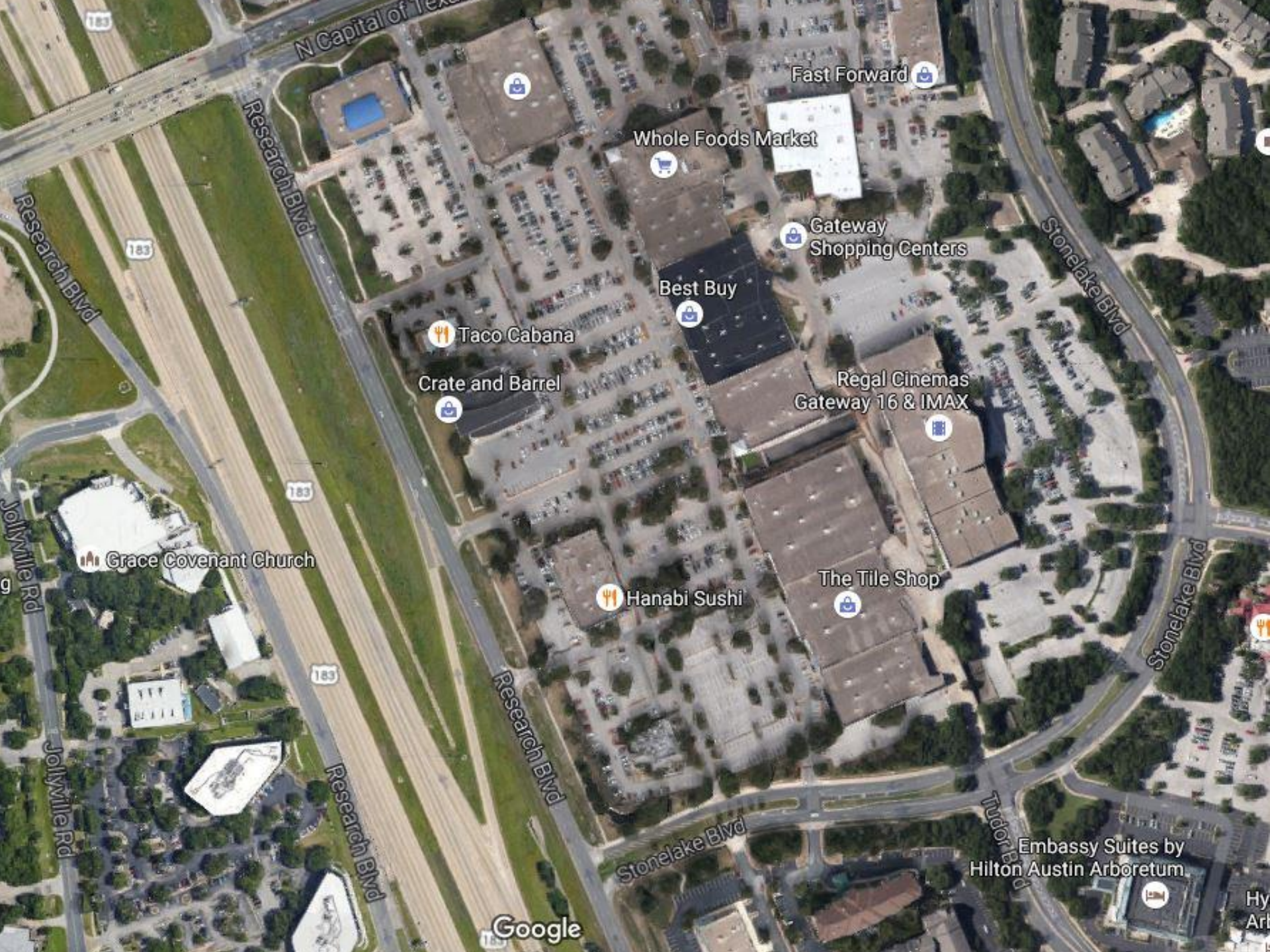

POWERLINE/PIPELINE EASEMENTS
SAND PIT
RESTAURANT
REC
MADDEN ROAD

Case Study: Camellia Development

- Lot yield – 323 (99 more lots)
- Cost Per Lot - $21,156 ($13,543 less than traditional)
- Total Construction Costs - $6,833,400 ($937,100 less than traditional)

Case Study: Missed Opportunity

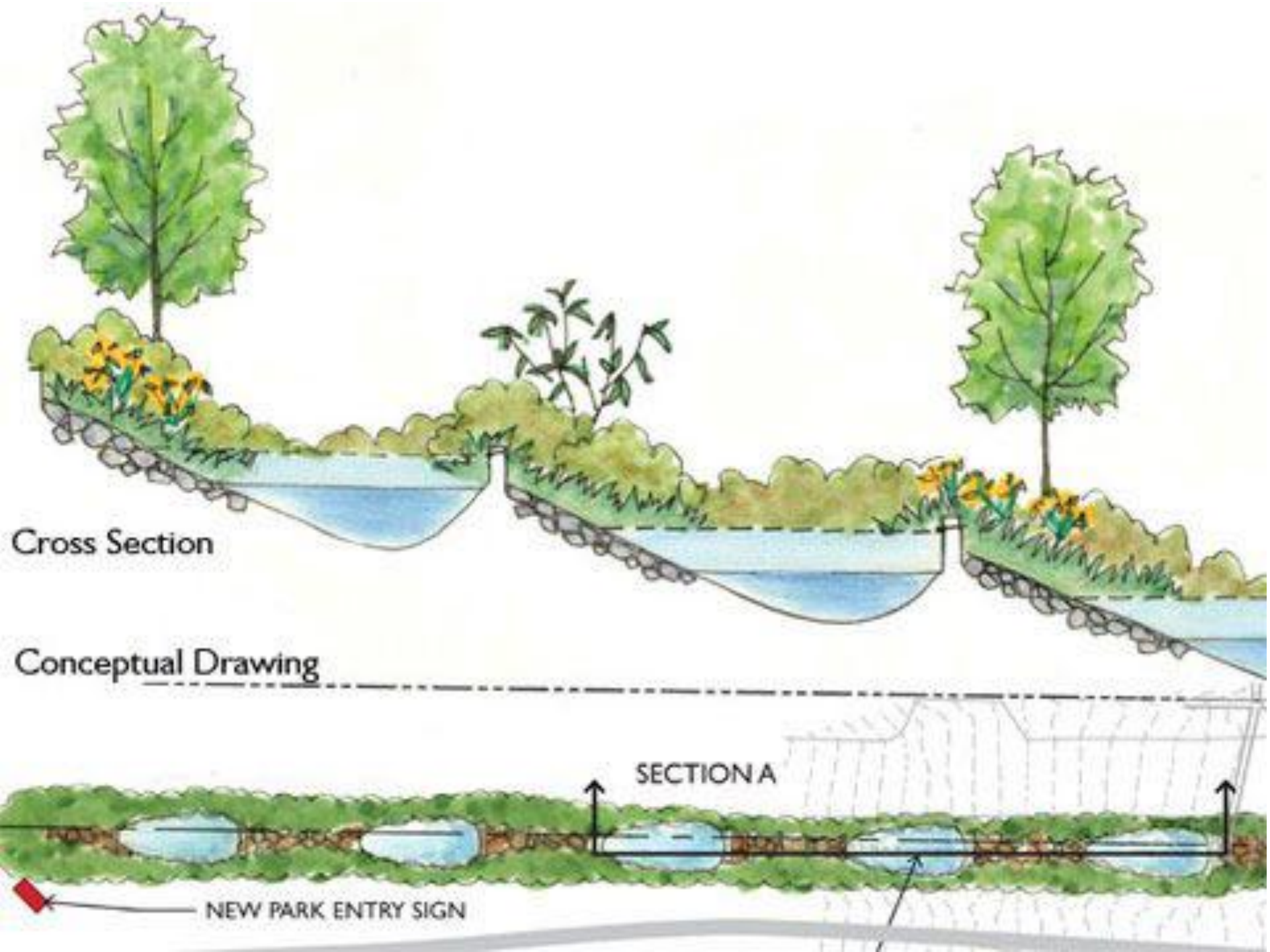
- Drainage ditch that experienced erosion over time was “redeveloped”
- Gray infrastructure was chosen
- Opportunity for a series of terraced rain gardens


N Capital of Texas
Research Blvd
Fast Forward
Whole Foods Market
Gateway
Shopping Centers
Stonelake Blvd
Best Buy
Taco Cabana
Crate and Barrel
Regal Cinemas
Gateway 16 & IMAX
183
Jollyville Rd
Grace Covenant Church
The Tile Shop
Hanabi Sushi
Stonelake Blvd
Tudor Blvd
Embassy Suites by
Hilton Austin Arboretum
Google


END
ROAD WORK
TO
SOUTH
LOOP
1


WARNING


50
TACO CABANA


Cross Section
Conceptual Drawing
SECTION A
NEW PARK ENTRY SIGN

Thank you very much!!

Questions?