

This presentation premiered at WaterSmart Innovations

watersmartinnovations.com



EPIC System Technology

Community Water Harvesting

“Because water is too precious to waste”



A L E G A C Y O F I N N O V A T I O N

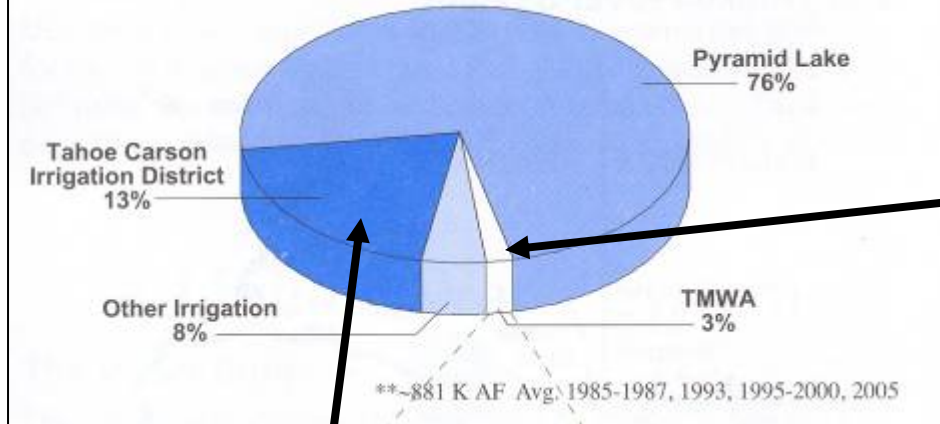
Jonas Z. Sipaila, Director of Innovation
jsipaila@rehbeinsolutions.com



**Fresh water is
constant**

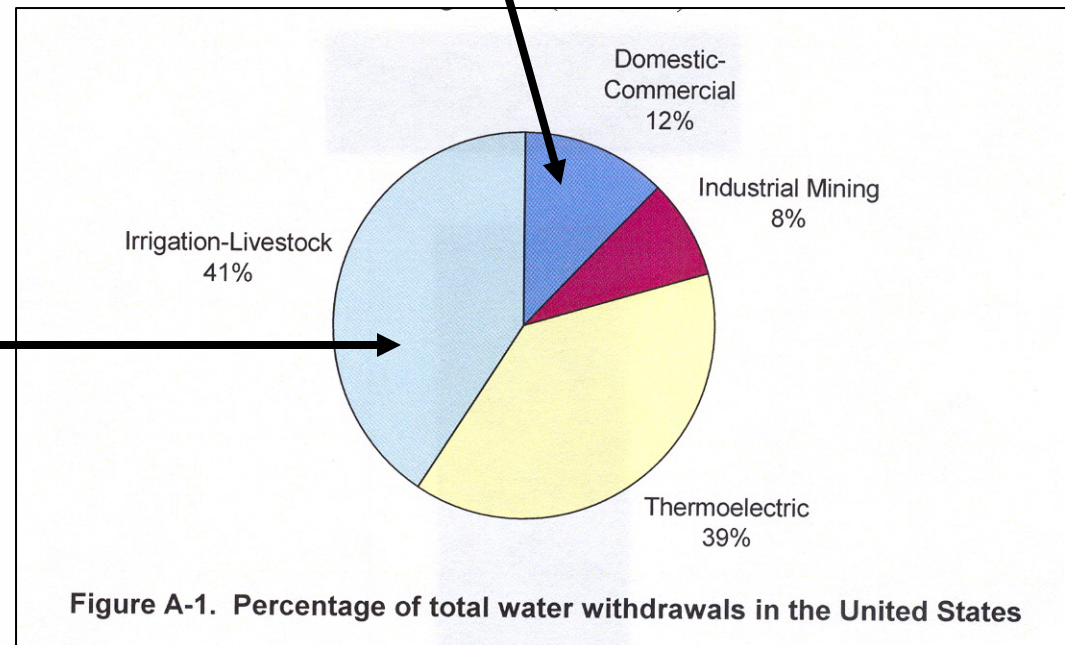
**Distribution
problem**

Uses of the Truckee River in a Normal Year**

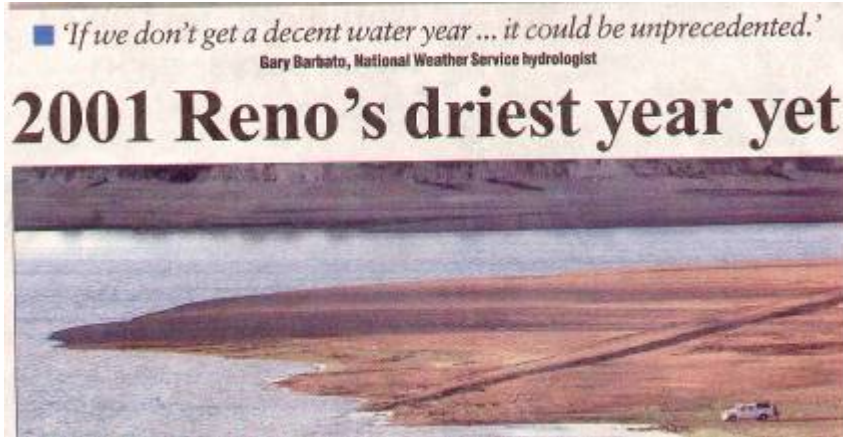


**DOMESTIC USE IS MINOR
IN THE BIG PICTURE**

**IRRIGATION USE
IS PRIME IN ANY
MODEL**



Are we serious about water savings, or do we just talk about it?



Growth pulling plug on water

Report warning: South Meadows supply will fail to meet needs.

ed 20-year regional plan for the entire Truckee Meadows could outstrip water supplies in some areas and overtax existing water distribution systems.
"Water is the lifeblood

More fears flow over future water su

The plan proposes to con-
growth in central

He proposes temporarily
dropping all intensified land
uses in the regional plan un-
less the water supply picture
is improved to re-

The board agreed to hear
from regional water experts
on April 11 and possibly take
action to address the poten-
tial water shortage through
a draft regional plan.
The water is-

Drought shrinks Lake Mead

By Tom Gorman and Julie Cart
LOS ANGELES TIMES

LAKE MEAD, — Jason and Cori Babcock towed their new

heaving their trolling boats over previously submerged boulders to get on the water. Once-vigorous fishing streams in Colorado are puny trickles.

tional parks altogether this weekend, rangers reported.

The Pike and San Isabel forest was at a heightened level of fire alert, scaring away some of the

CURRENT WATER SAVINGS STRATEGIES

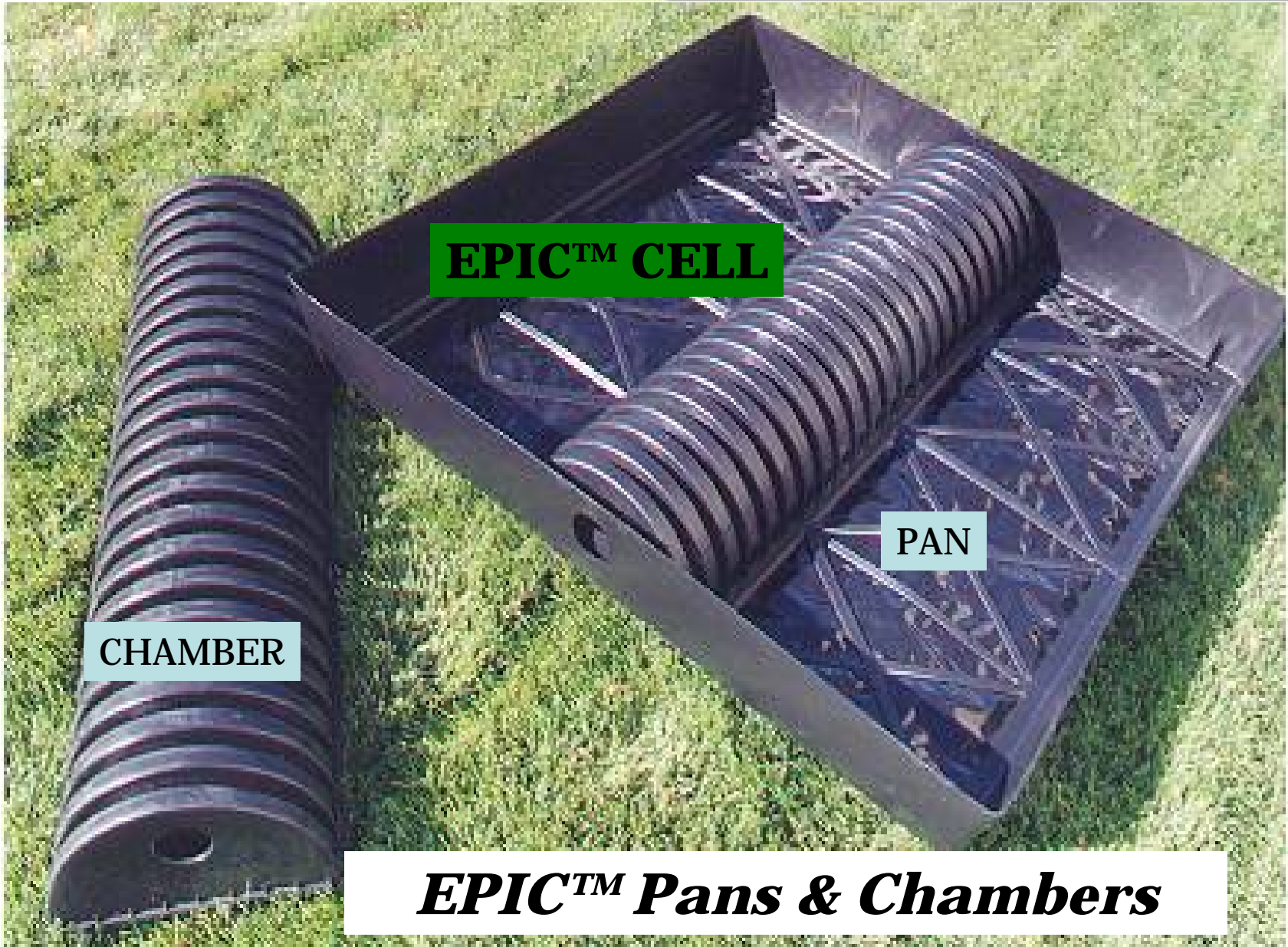
- **Xeroscape landscaping** – “go play in the hot playground”
- **Legislate water saving culture and habits** – “good luck!”
- **“Rob Peter to pay Paul”** – “That’s neighborly”
- **Suck out new groundwater** – “Great future planning”
- **Use misters as shower heads** – “Thank God for right guard”
- **Cloud seed the Sierra** – “Thank you midwest farmers”
- **Move around paper allotments** – “Social engineering”
- **Desalinate** – “use 1 gal of oil to produce 160 gal of water”
- **Computerize Sprinklers** – “Reboot !!!!”
- **Move everyone to Seattle** – “No comment”

0 %

WATER WASTE

100 %

EFFICIENT



EPIC™ CELL

PAN

CHAMBER

EPIC™ Pans & Chambers

4

7 DAYS -

24 HRS -

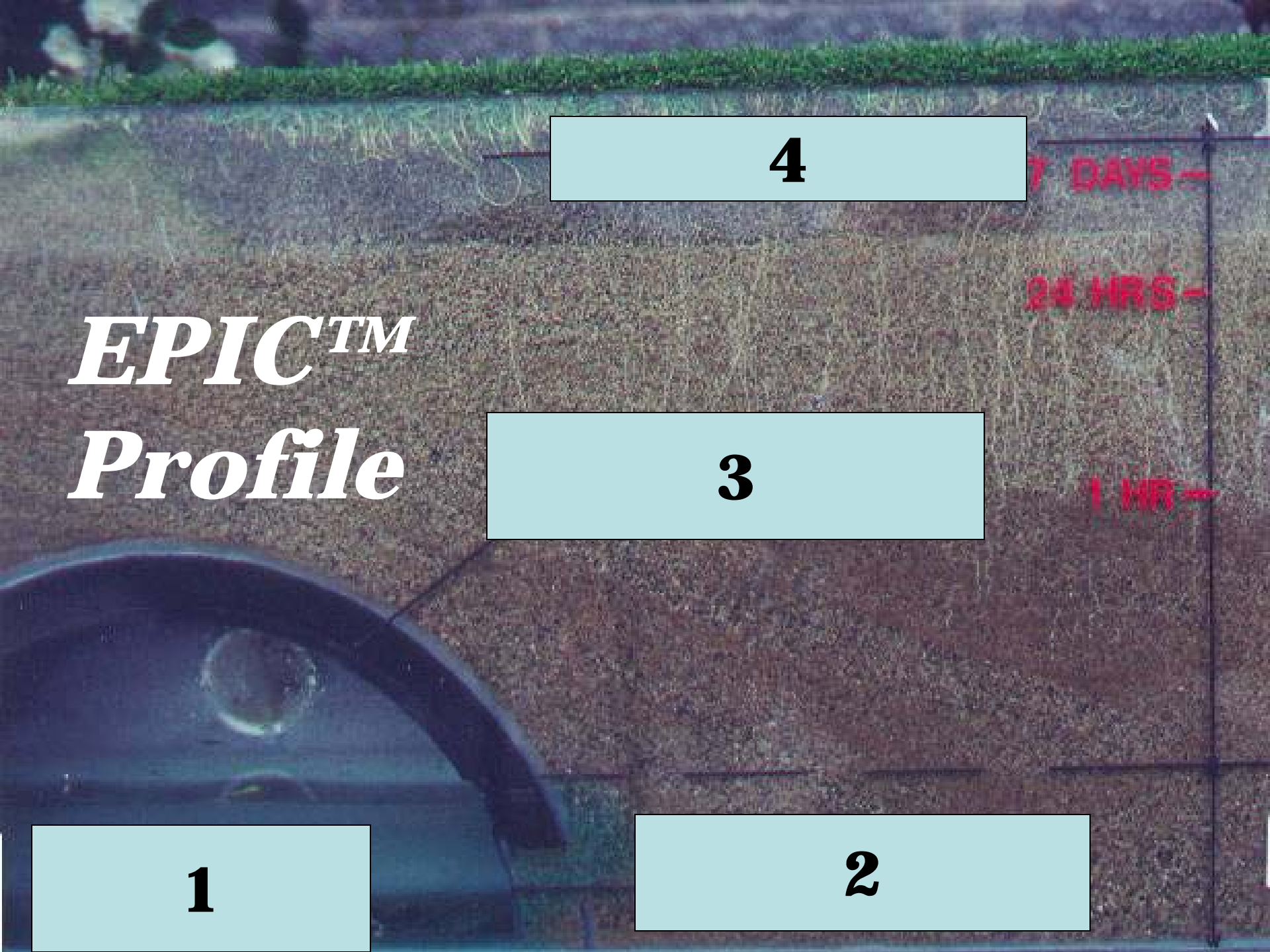
***EPIC™
Profile***

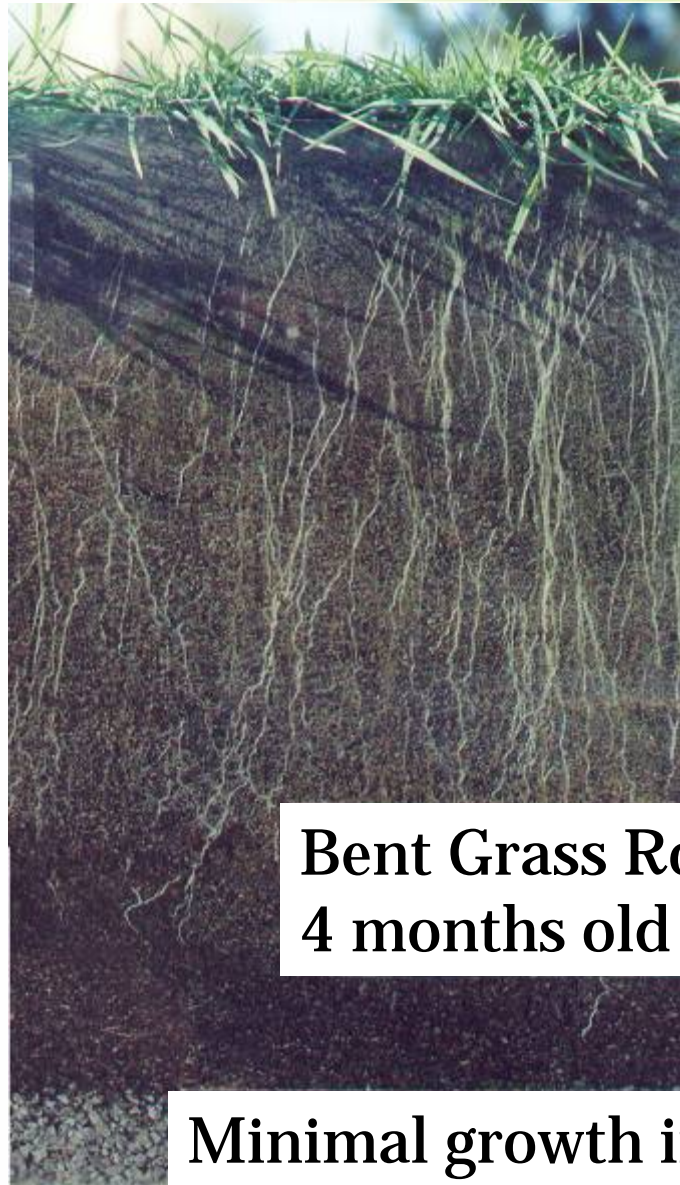
3

1 HR -

1

2





15"

**Bent Grass Roots
4 months old**

Minimal growth into saturated zone of fine gravel



8 day old germination



NON-PRESSURIZED GRAVITY FLOW DISTRIBUTION



**NO EXPOSED
SPRINKLER HEADS**

**NO EXPOSED
DRIP LINE**

ANY SIZE OR SHAPE



CONNECTION TO ROOF DRAIN



Liner, Chambers and Pipes



Downspout feed
into EPIC™ system

***ROOF WATER
REUSE***

Where should we look to save water?

National Average for a family of four

Bathing	80 – 31%
Bathroom Sink	8 – 3%
Cook & Drink	12 – 5%
Dishwashing	15 – 6%
Laundry	35 - 14%
Toilets	100 – 39%
Utility sink	5 – 2%

Force people to use efficiency toilets and then monitor them to flush only once – save **18,000** gal./yr.

Install efficient EPIC™ irrigation and save – **110,000** gallons /yr.

Yearly total **93,075 Gal.**

Reuse shower water and add **29,000** gal/yr

Conventional irrigation on a mere 3000 square foot lot - **203,000** gallons per season

“The Greens With Subsurface
Ground Irrigation (EPIC) used
50 – 70%
Less Water **With Better Turf
Quality**
Than Standard USGA Greens.”

Dr. Bernd Leinauer, Ph D, Assistant Professor and
Extension Turf Grass specialist at NMSU, Las Cruces NM.

GOLFWEEK Super NEWS, September 3, 2004

“Half the water and better grass quality” with EPIC™

USGA Standard

EPIC™

CONSTRUCTION: EUS - Evaporative Control System
(patented for air ingestion and drainage)

ROOT ZONE: Sand

IRRIGATION: subground
(through tile)

WATER USE: May 16 - Sep 14
irrigates 0.7"/day
springing 0.012"/day

Main Sponsor:

The sign is placed on a stand next to a black trash can with a blue water bottle on top. In the foreground, there are black corrugated pipes for the irrigation system.



**Fresh water top-surface irrigation system.
(Conventional)**

Comparison of top surface with sub surface irrigation to determine fresh water usage over the summer of 2007 on Al-Sammaliah Island, Abu Dhabi, UAE.





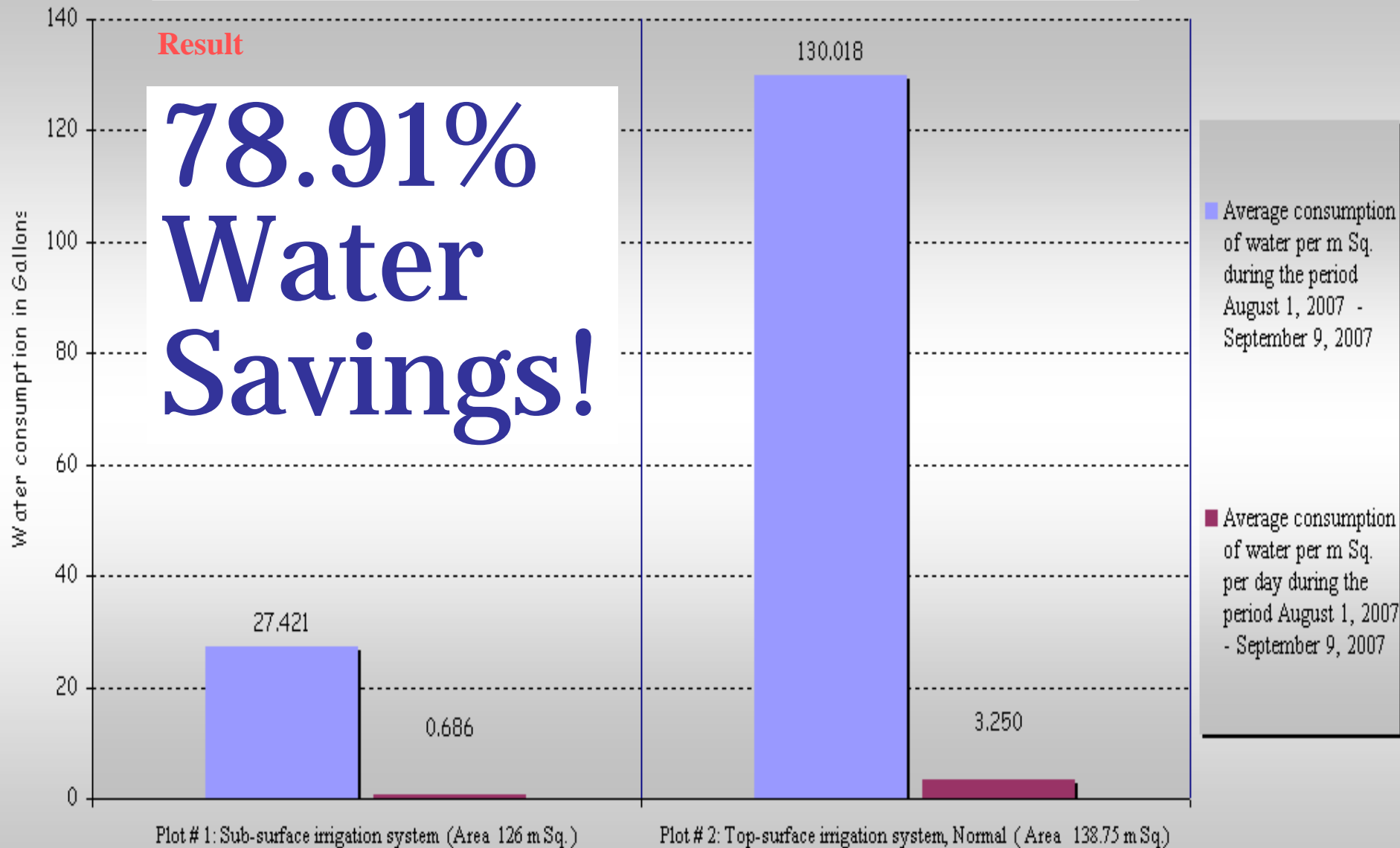
EPIC™ sub surface fresh water irrigation system on Al-Sammaliah Island, Abu Dhabi, UAE, developed for multi use green parking and recreation



Graph illustrates the comparison of water consumption between Sub-surface irrigation system and Top-surface irrigation system (Conventional) at Al-Sammaliah Island, Abu Dhabi.

Result

**78.91%
Water
Savings!**



Plot # 1 saves 78.91 % water consumption per m Sq. compared to Plot # 2 during the period 01-08-2007 - 09-09-2007.

There is NO water Crisis

...Only an inefficient
water management-
Infrastructure
and philosophy.

THE PROBLEM WITH SPRINKLERS



RUN-OFF WASTE !



50%-80% WATER LOSS

due to compacted soils,
wind patterns, and evaporation loss.



**PROBLEMS
WITH
SPRINKLERS**

**THE UNPLANNED,
UNPREDICTABLE
FOUNTAINS OF
WATER WASTE**



WIND LOSS – THE PROBLEM WITH SPRINKLERS



WATERING WHERE THINGS DON'T GROW





Slope away from property

Kinetic energy increases with erosive potential

01/04/2004



City Maintenance works during storm to unclog storm drain.



Clogged storm drain influences neighboring property & residences

Sheet flow not captured at source, increases kinetic energy and temperature, picks up sediments, phosphates, and adds to erosion...



Tainted, dirty sheet flow continues to street, inundates curb gutter system blocks lane of traffic and becomes safety hazard as well as environmental hazard!



AN EXPENSIVE INFRASTRUCTURE

LARGE PIPE



DEEP TRENCHES



**UNPROTECTED –
BLOCKAGE BY DEBRIS**

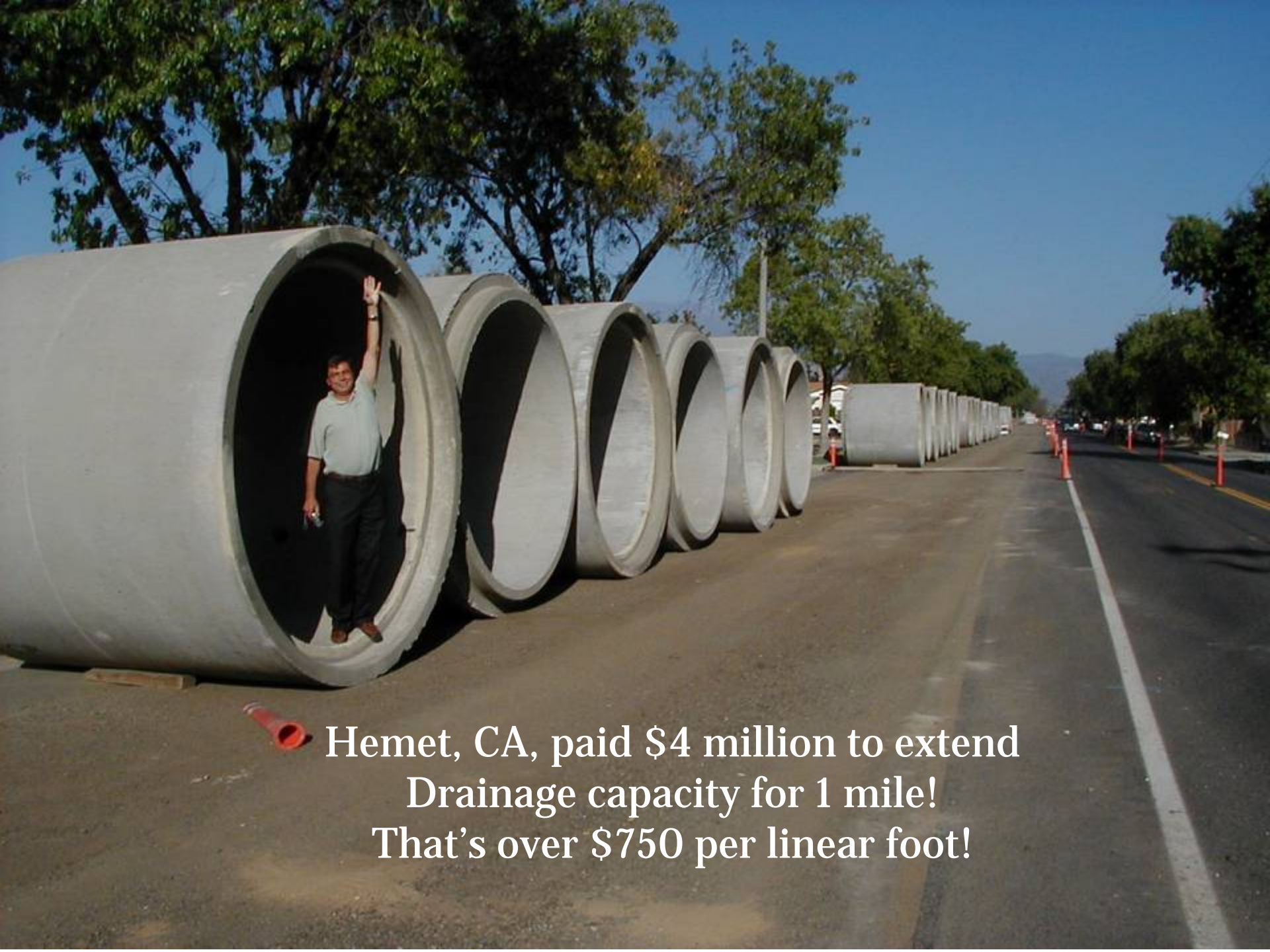


**PROTECTED – BYPASS
SO WHY BUILD THEM?**



Miscalculating storm water events?





Hemet, CA, paid \$4 million to extend
Drainage capacity for 1 mile!
That's over \$750 per linear foot!



Wildlife Habitat?

OR Wildlife Hazard?

Bad Parenting

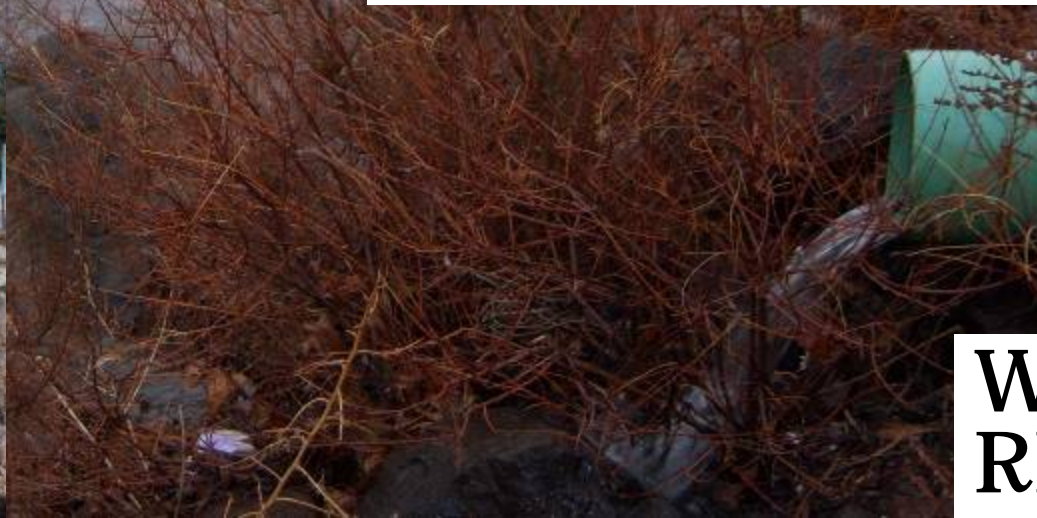




Clean water collected from roof...



...Is simply discharged into dirty contaminated storm system



Why not
REUSE?

IMMEDIATE “ATTRACTIVE NUISANCE” & LIABILITY ISSUE





Associated Problems

Perceived client value - zero

Space - uses up valuable real estate

Liability hazard

Access and cost issues for maintenance

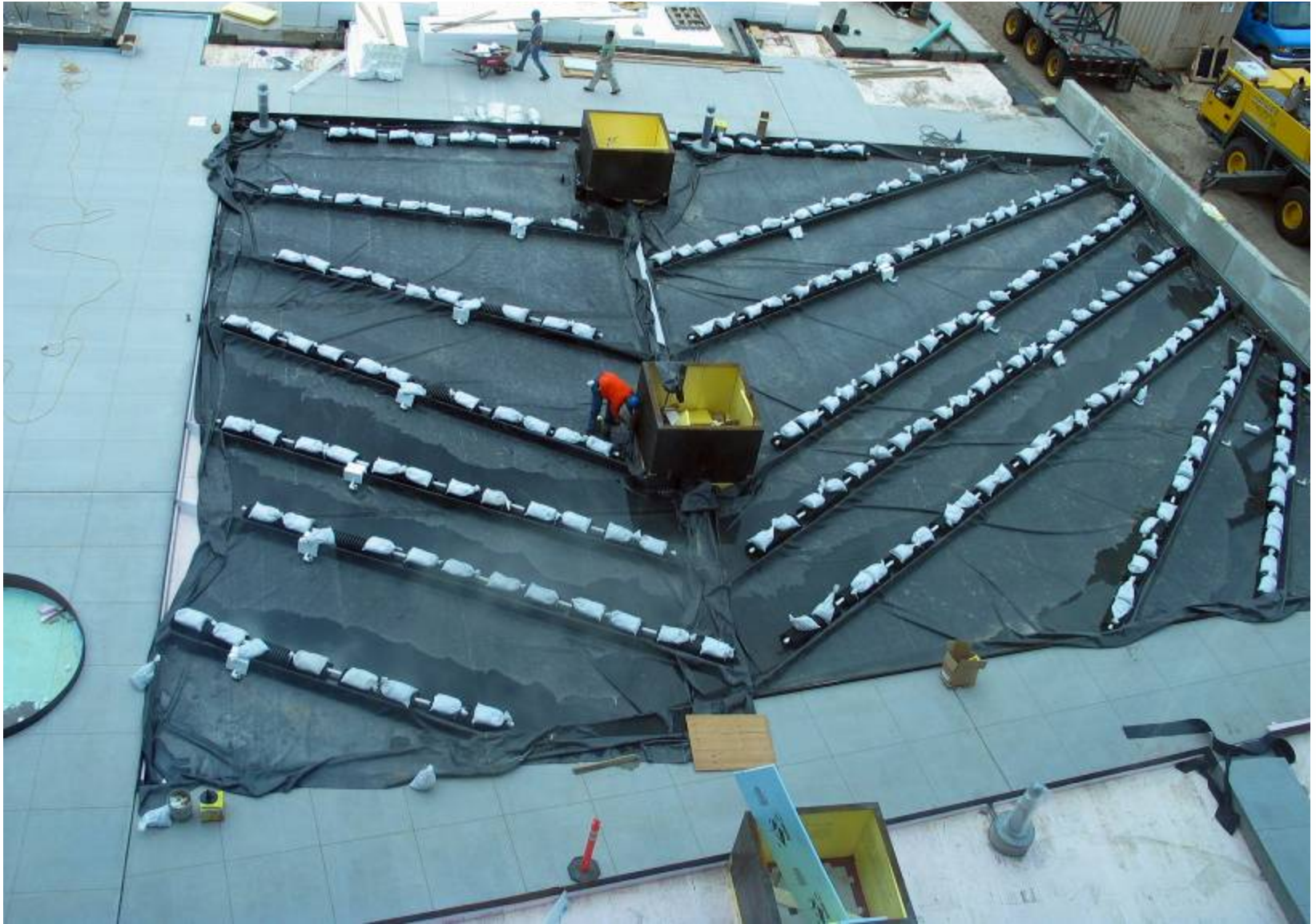
Haven for geese and mosquitoes

Poor performance

EPIC STRATEGY FOR WATER SAVINGS

- **FILTER, COLLECT, STORE AND REUSE STORMWATER**
- **REUSE WASTE WATER WITHOUT THE “YUK” FACTOR**
- **PROVIDE 100% EFFICIENT IRRIGATION**
- **GREEN THINGS UP!**

Parking garage roof top construction







**Second year of growth
Bookman Stacks
Minneapolis, MN**

Santa Barbara, CA

Water Harvesting Courtyard

EPIC™ System now mandated as standard in coastal regions of Santa Barbara County



FEATURES

- Infiltration
- Filtration
- Storage
- Clean water
- Reuse
- Sub-Irrigation
- Load bearing
- 0% Slope
- Biotreatment
- Simple
- Permanent

Challenge

SITE WAS TOO HIGH TO PROVIDE PRESSURE REQUIREMENTS FOR CONVENTIONAL IRRIGATION

COMMUNITY COULD NOT SUPPLY THE VOLUME OF WATER NEEDED FOR IRRIGATION



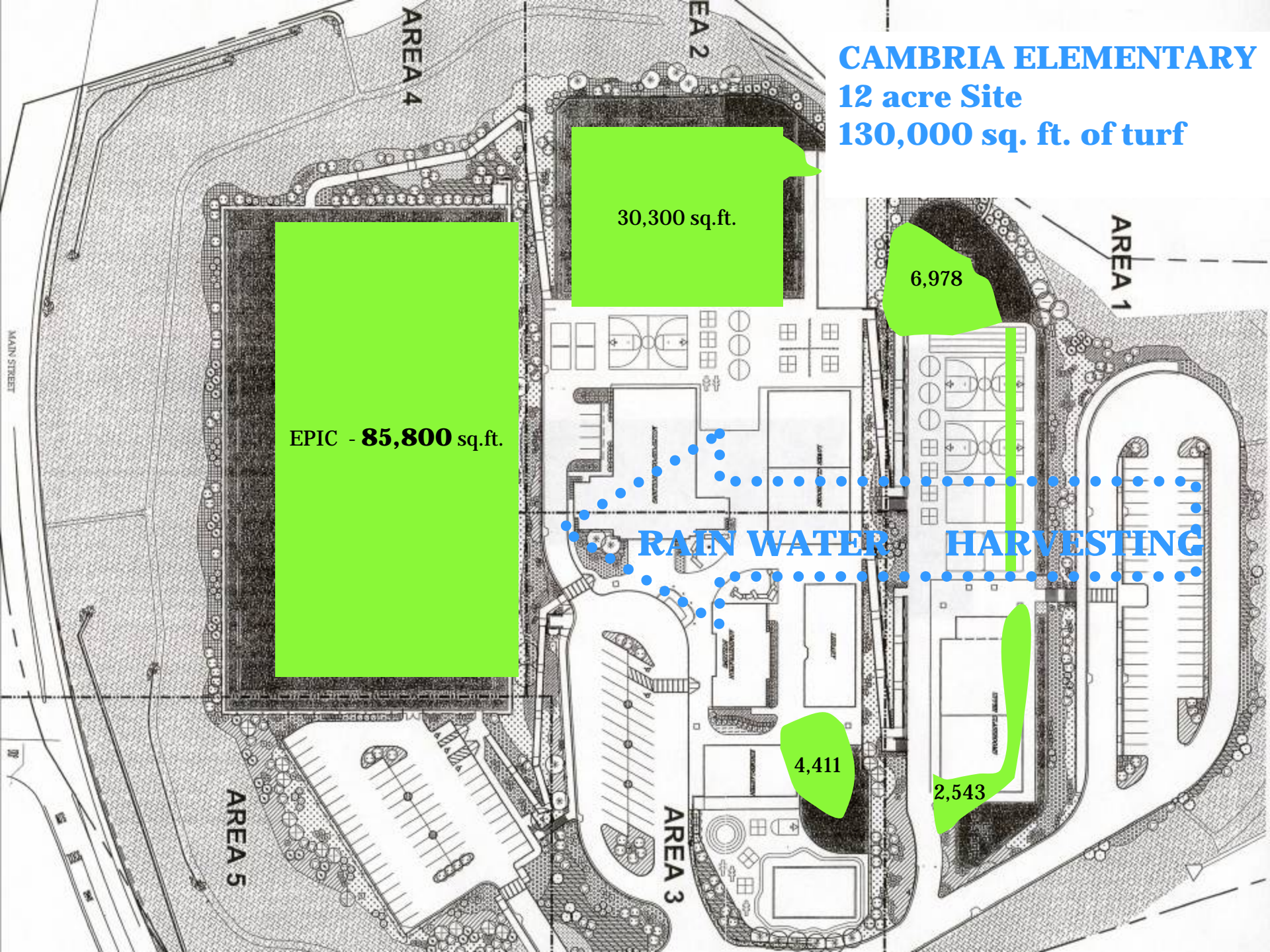
CAMBRIA ELEMENTARY SCHOOL, CA

TOTAL SELF SUFFICIENT LANDSCAPING

**NO EROSION OR STORM WATER
POLLUTION ISSUES**



CAMBRIA ELEMENTARY
12 acre Site
130,000 sq. ft. of turf



30,300 sq.ft.

EPIC - **85,800** sq.ft.

6,978

RAIN WATER HARVESTING

4,411

2,543

AREA 4

EA 2

AREA 1

AREA 5

AREA 3

MAIN STREET



Sheet flow is captured and filtered by EPIC™ System.







**BELOW FIELD
RESERVOIR
40 PIPE X 380 FT.
2,200,000 GALLONS
CAPACITY**

**HIDDEN, NO ALGAE,
NO EVAPORATION,
RETRIEVAL BY SUMP
PUMP TO EPIC AND
DRIP @ 12 GPM/ACRE**



BACKFILL OF RESERVOIR PIPES BECOMES BASE FOR SPORTS FIELD



Proof of Load bearing capacity of below ground Reservoir



BASIC EPIC™ CONSTRUCTION



**4 MAN CREW
8 HOUR DAY
4,000 SQ. FT./DAY**

HIGH SPEED FILL METHOD FOR FILLING EPIC™ PANS



**BRUNDAGE
CONVEYOR SYSTEM
5 MAN CREW
8 HOUR DAY
20,000 SQ. FT./DAY**

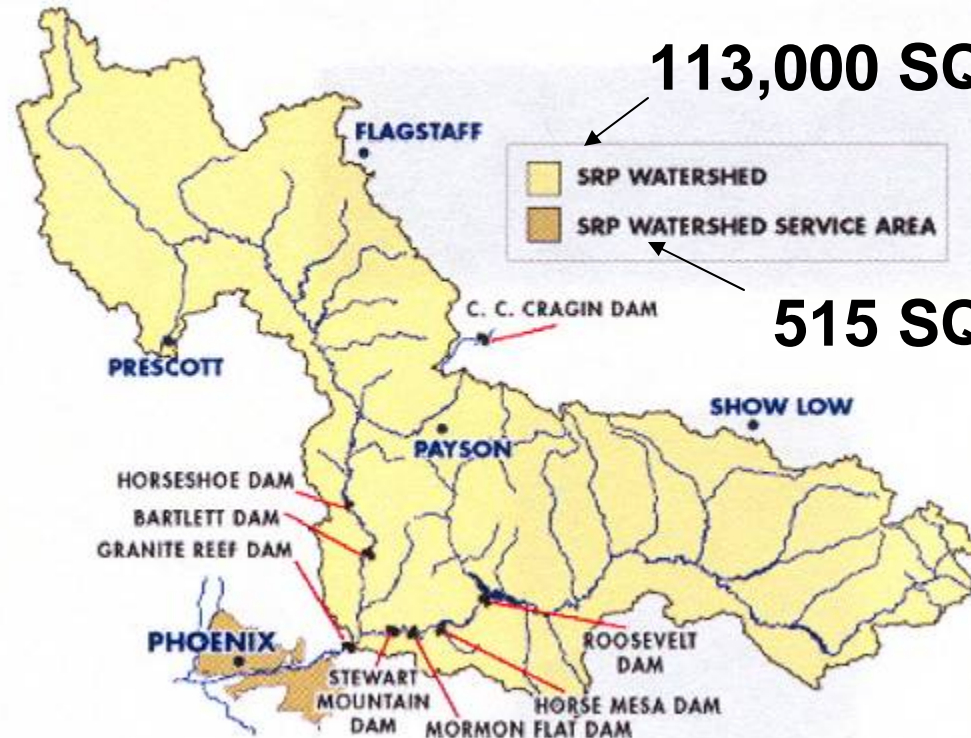
**FREE WATER
FOREVER !**



SQUEEZING WATER OUT OF THE DESERT

SRP is one of a group of agencies involved in water management: It operates the dams to provide water and power; the U.S. Forest Service operates a variety of recreation sites and marinas in the reservoirs created by some of these dams; and the Arizona Game and Fish Department manages the wildlife and county sheriff's offices helps protect these facilities.

- [Bartlett Dam](#) and Reservoir
- [C.C. Cragin Dam](#) and Reservoir
- [Granite Reef Diversion Dam](#)
- [Horse Mesa Dam](#) and Apache Lake
- [Horseshoe Dam](#) and Reservoir
- [Mormon Flat Dam](#) and Canyon Lake
- [Roosevelt Dam](#) and Lake
- [Stewart Mountain Dam](#) and Saguaro Lake



113,000 SQ. MILES

515 SQ. MILES

Water Resources Procurement From a
 113,000 sq.mi. watershed

SITE	CAPACITY	SURFACE AREA
Roosevelt Dam	1,653,043 af	21,493 acres
Stewart Mt. Dam	69,765 af	1,280 acres
Mormon Flat Dam	57,852 af	950 acres
Horseshoe Dam	109,217 af	2,800 acres
Horse Mesa Dam	254,138 af	2,600 acres
C.C. Cragin Dam	15,000 af	246 acres
Bartlett Dam	178,186 af	2,700 acres
Total	2,337,201 af	32,069 acres

CURRENT INEFFICIENCIES IN WATER COLLECTION

113,000 sq. miles with **8"** annual rainfall produce
15,484,439,000,000 gallons

(2,337,201 af) is stored **749,457,000,000** gallons, **(4.8%)**

682,457,000,000 hydro storage

67,000,000,000 gallons lost to evaporation

325,851,000,000 gallons

216,851,000,000 to Agriculture

109,000,000,000 to Phoenix **(0.7%)**

39,000,000,000 outside

70,000,000,000 inside

THE UNUSED PHOENIX POTENTIAL

515 sq. miles of hardscape

In an **7.3"** annual rainfall climate

Can produce

60,886,000,000 gallons of water

CAN WE COLLECT IT?



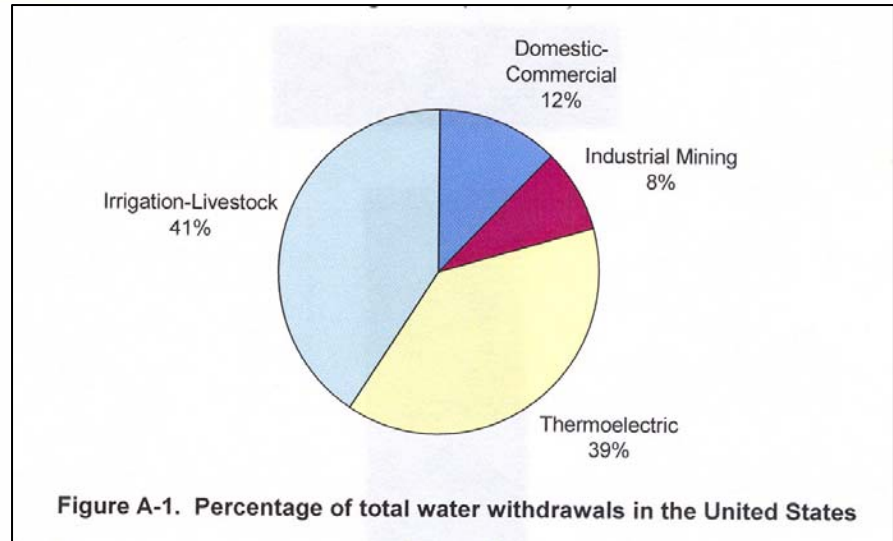


Table 2. Total Consumptive Use of Water for U.S. Power Plants

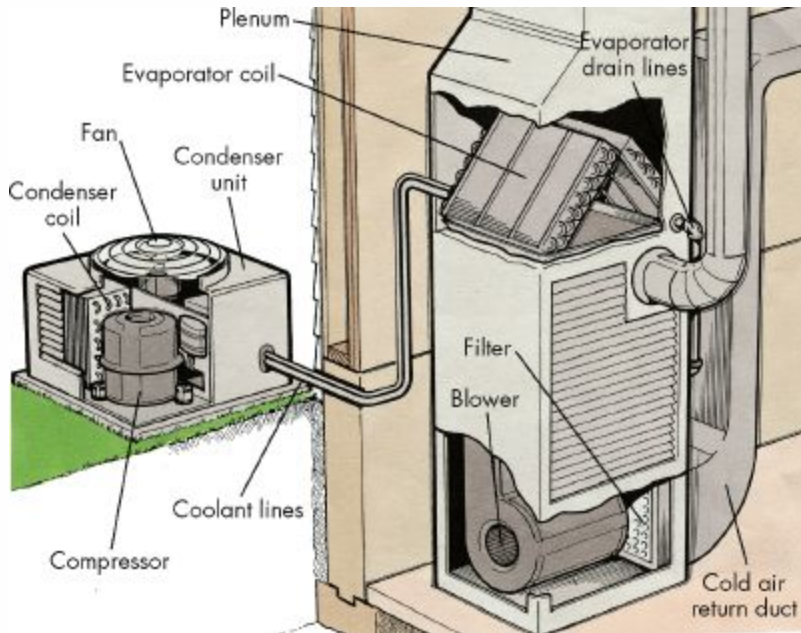
Power Provider	Gallons Evaporated per kWh at Thermolectric Plants	Gallons Evaporated per kWh at Hydroelectric Plants	Weighted Gallons Evaporated per kWh of Site Energy
Western Interconnect	0.38 (1.4 L)	12.4 (47.0 L)	4.42 (16.7 L)
Eastern Interconnect	0.49 (1.9 L)	55.1 (208.5 L)	2.33 (8.8 L)
Texas Interconnect	0.44 (1.7 L)	0.0 (0.0 L)	0.43 (1.6 L)
U.S. Aggregate	0.47 (1.8 L)	18.0 (68.0 L)	2.00 (7.6 L)



Hoover dam's generators
Produce
4 Billion kWh of power/year
126 kWh each second

Average outflow from dam
10,000 cfs or
74,800 gallons per second





A Household with Central A/C in the Western States

Uses

3392 kWh per year

For

2821 Cooling degree days

$(90^{\circ}\text{H} + 70^{\circ}\text{L} / 2 - 65 = 15)$



Vegetated areas
Around Buildings
Can reduce
Temperatures
Significantly

Phoenix study 10° lower T

($80^{\circ} + 70^{\circ}/2 - 65 = 10$ cooling days)
33% reduction on original **3392 kWh** model for
1119 kWh savings



1119 kWh , available for
Other uses as
13,875 gallons is
Evaporated for
Production

1119 kWh =
664,000 gallons
That can be retained
If dam is only used
For electrical production.



**DOES A RETURN FOR CREDIT
POLICY MAKE SENSE?**

**AS THEN WE END UP PUMPING
TWICE!**

1000 FT.

**LAKE MEAD EVAPORATES
80" PER YEAR!**

1,043,000 ACRE FEET OR

326,000,000,000 GALLONS



ADVANTAGES OF STORM WATER COLLECTION AND REUSE

- **USE OF A FREE WATER RESOURCE**
- **ELIMINATION OF FLOODING / EROSION ISSUES**
- **INCREASE IN VEGETATIVE AREAS**
- **DECREASE IN TEMPERATURE**
- **LOWER POWER NEEDS FOR COOLING**

**The Primary Infrastructure for
Storm Water Capture Already
Exists.**



Drainage area – 49' x 400' (19,400 sq. ft.)



Catch basin openings 3 sq. ft./19,400 sq. ft. area

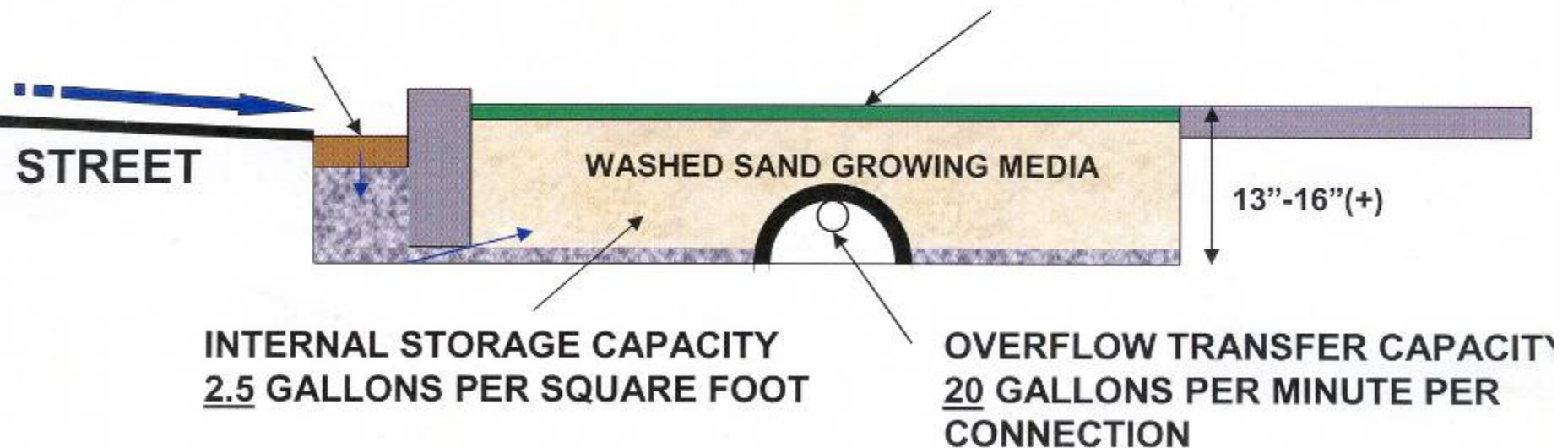


23.6 sq. ft. of open space
Per 19,600 sq. ft. surface
6% (+) per square foot

ABSORPTION DYNAMICS

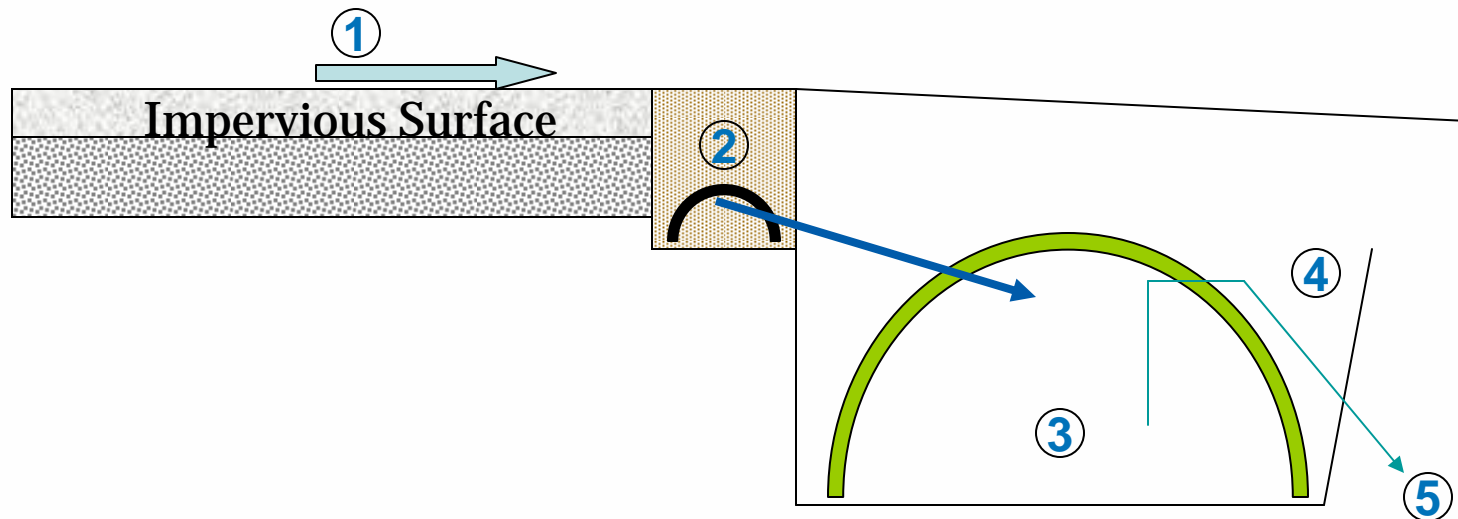
PAVER INFILTRATION RATE
3.6 GALLONS/SQUARE FOOT
PER MINUTE

LANDSCAPE WATER LOSS RATE
0.15 GALLONS PER SQUARE FOOT
PER DAY

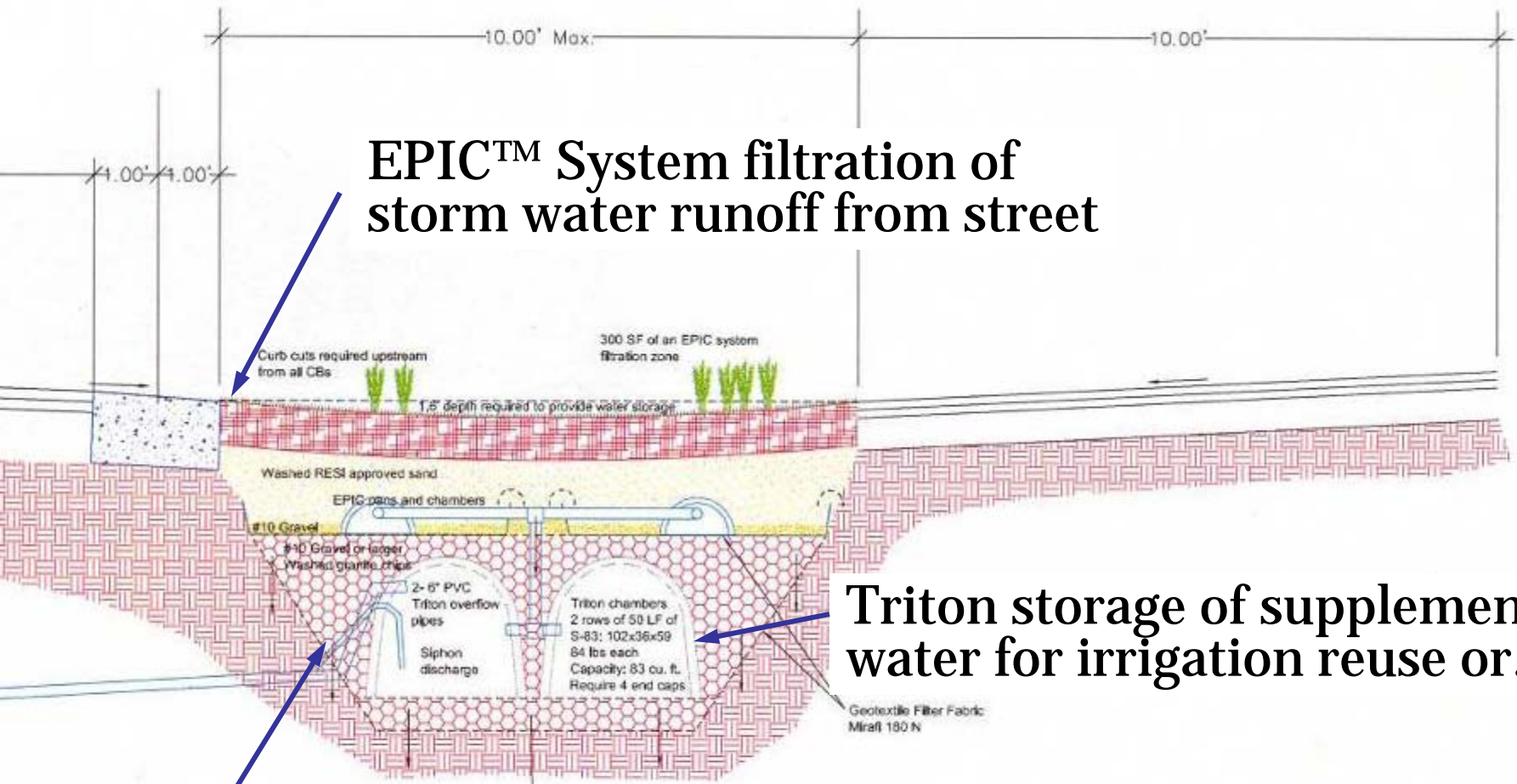


EPIC STORM WATER MANAGEMENT SYSTEM

- (1) Collection, (2) Filtration, (3) Storage,**
(4) Timed (72 hr.) self bailing, (5) Reuse.



EPIC™ System and Triton Chamber Storm water management concept

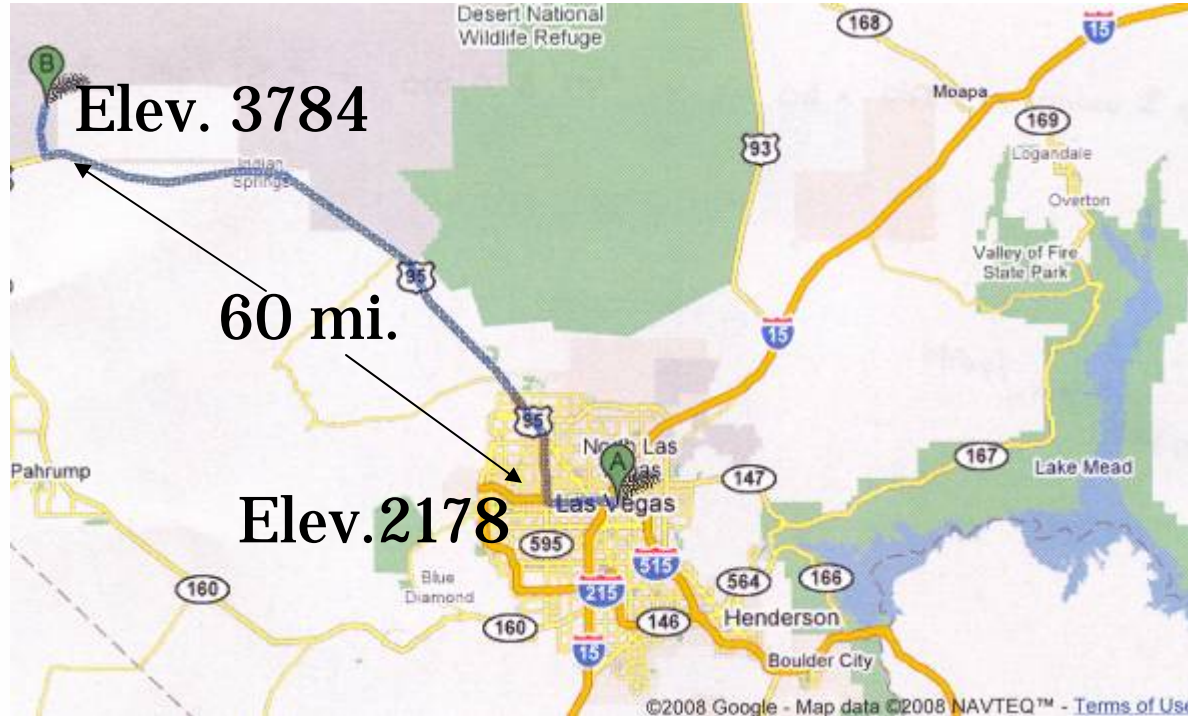


EPIC™ System filtration of storm water runoff from street

Triton storage of supplemental water for irrigation reuse or...

...Siphon and release of stored filtered water at controlled desired rate

***Disclaimer: Detail is for concept purposes only and does not imply any actual design has been completed to determine hydrological or structural requirements. Engineering modeling will need to be completed to determine proper hydrological and structural requirements and components.



100' wide hardscape

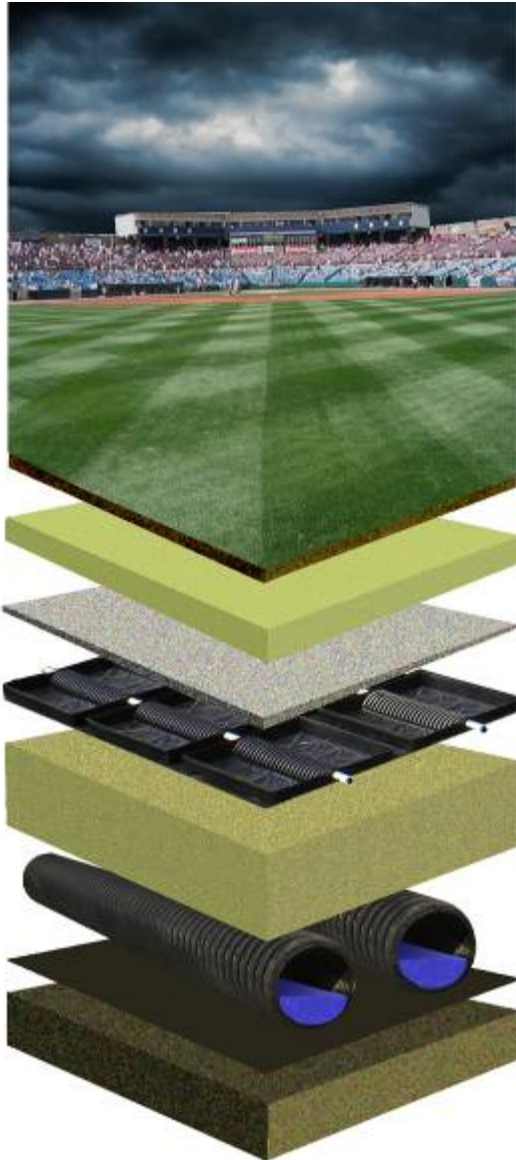
60 mi. long

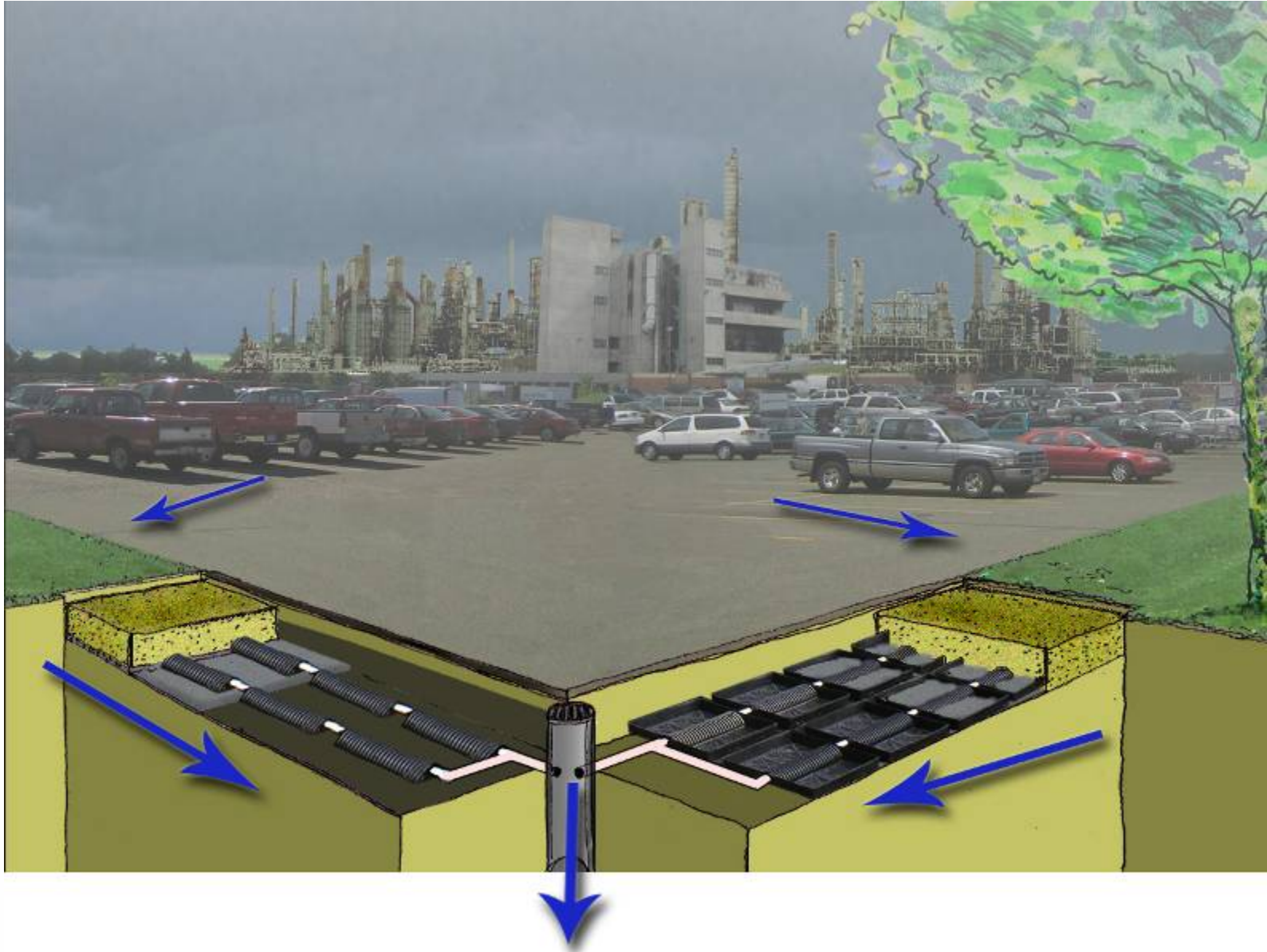
4.7" annual rainfall



92,000,000
gal. of new water / year

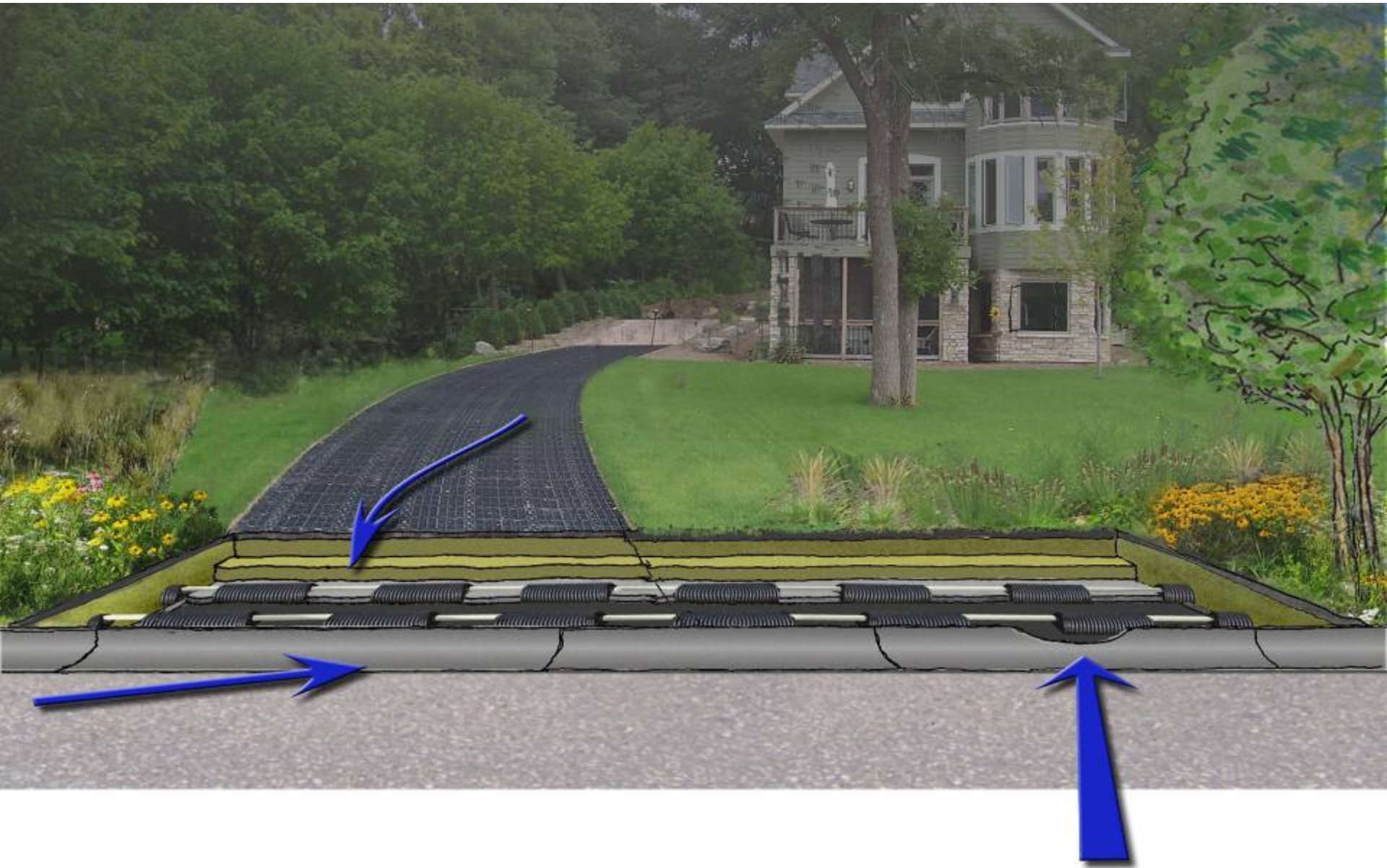
- **Free gravity delivery**
- **No moving parts**
- **No maintenance**
- **Less than \$0.02 / gal after 20 years**

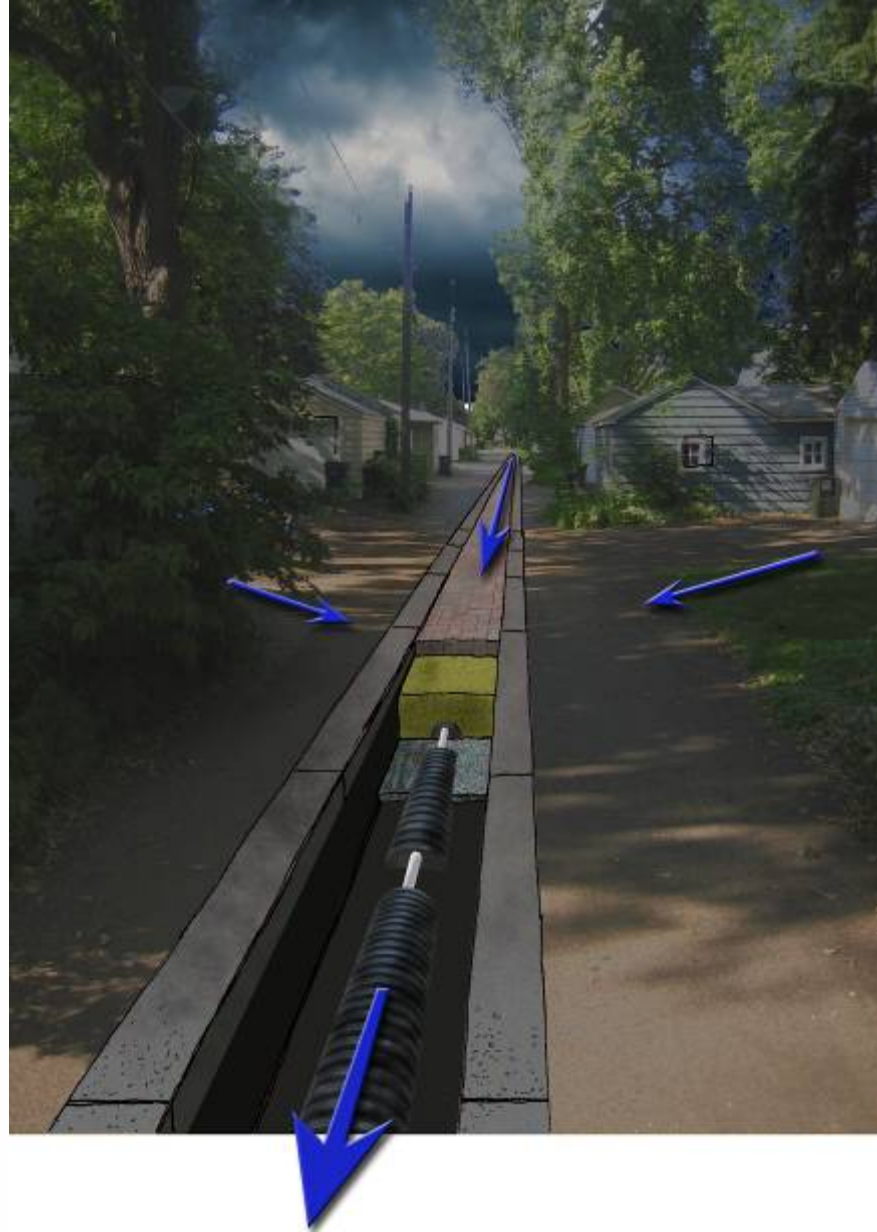








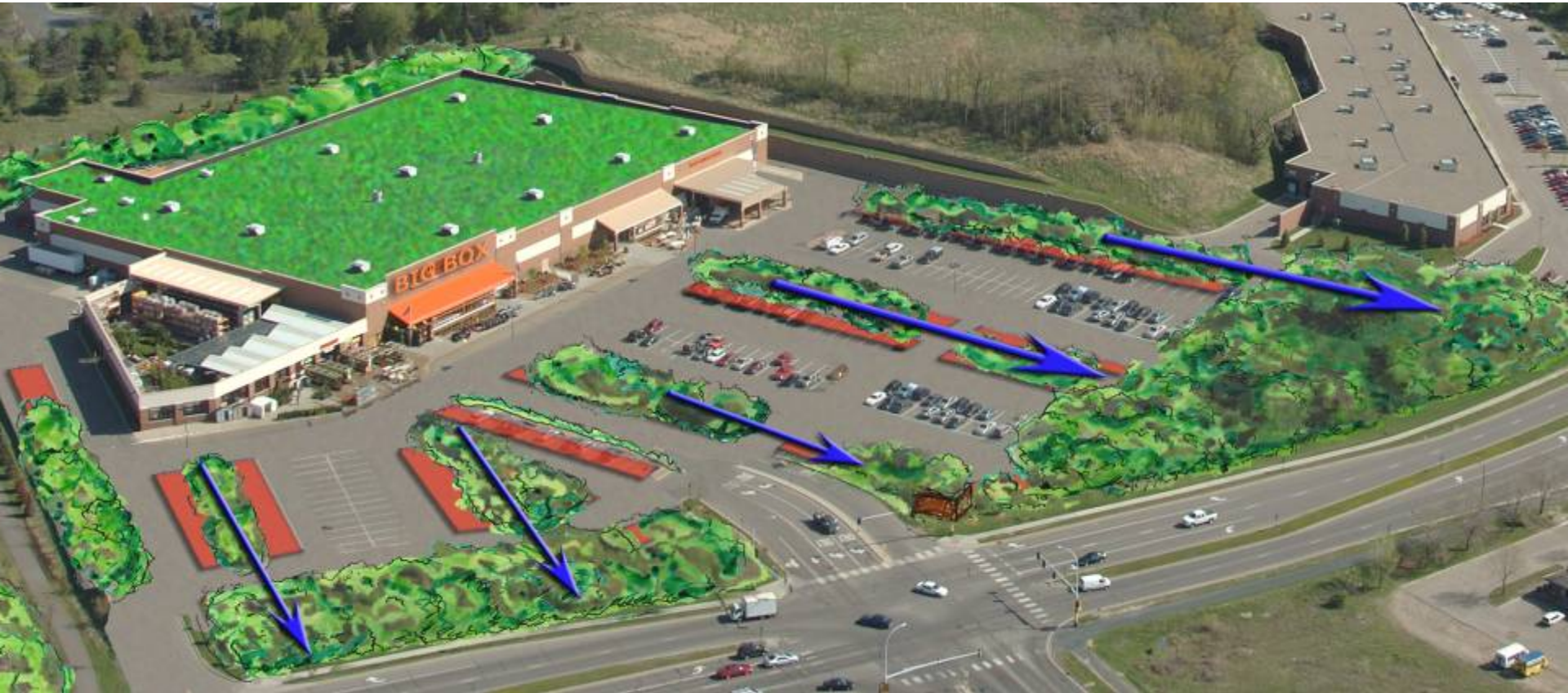












RESI promotes sustainability and hydrological responsibility.

EPIC System Technology

Community Water Harvesting

“Because water is too precious to waste”

Rehbein
ENVIRONMENTAL SOLUTIONS
INTERNATIONAL

A L E G A C Y O F I N N O V A T I O N

Questions?