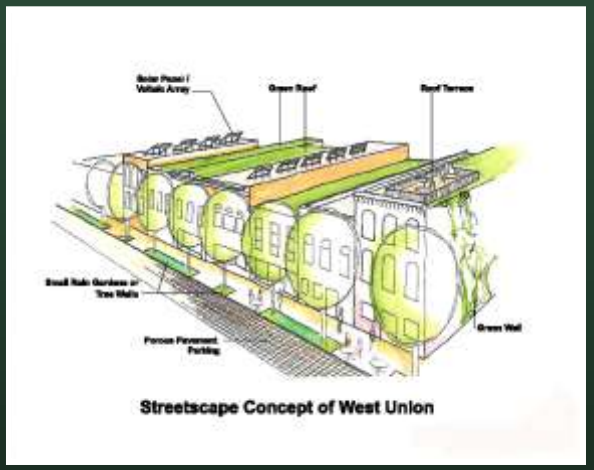
Using Green Infrastructure To Protect Water Quality

CONSERVATION DESIGN FORUM

West Union – Iowa's Green Street Pilot Project

Green Pilot Streetscape Project

A Sustainable Vision for West Union



The City of West Union

Main Street West Union

Iowa Department of Economic Development

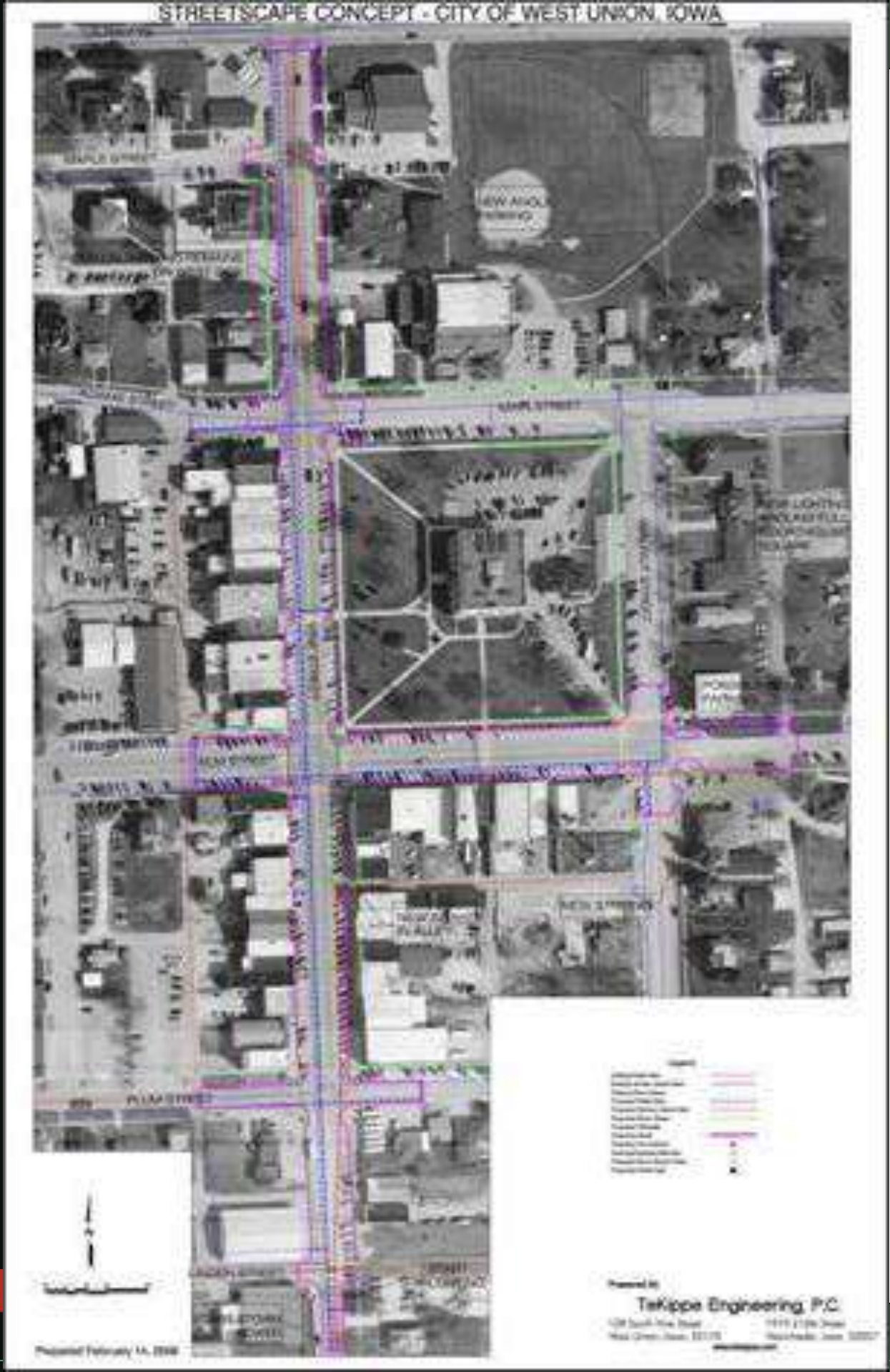
Conservation Design Forum

Main Street West Union


FIRST NATIONAL


EXIT
TRADITION
never graduate


Map
Traffic
150
Roadside Park
Palmer Lutheran Health Center
Co Hwy W42
Harding Rd
Lions Park
W Bradford St
18
E Bradford St
West Union
Golden Rd
West Union Cemetery
150
W Franklin St
West Union Country Club
Echo Valley State Park
56
Filmore Rd
150


STREETSCAPE CONCEPT - CITY OF WEST UNION, IOWA
TeKippe Engineering, P.C.


Hair Hut


Edward Jones
INVESTMENTS
STOP


MICHAEL


FIRST NATIONAL

ORUM

IOWA GREEN STREETS PILOT PROJECT - WEST UNION

CONSERVATION DESIGN FORUM

Charles City, Iowa

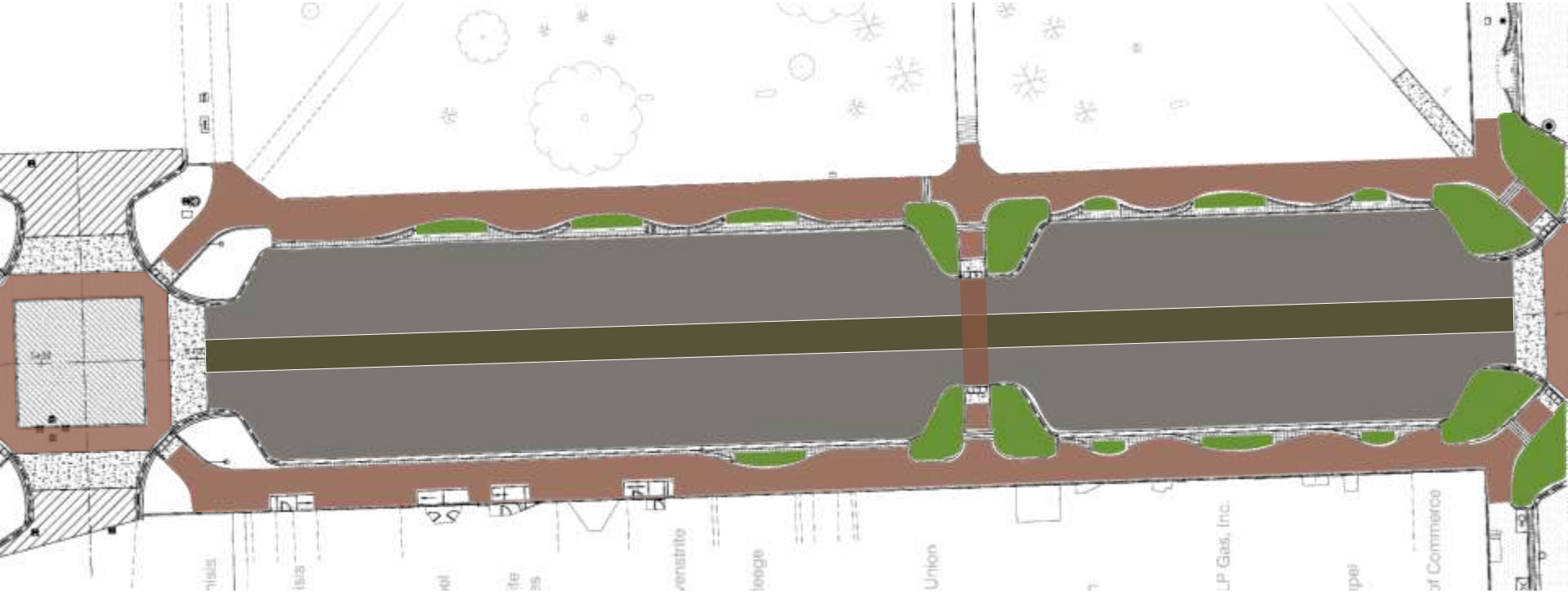
Oelwein, Iowa


Portland, Oregon


STOP


B

Stormwater Materials

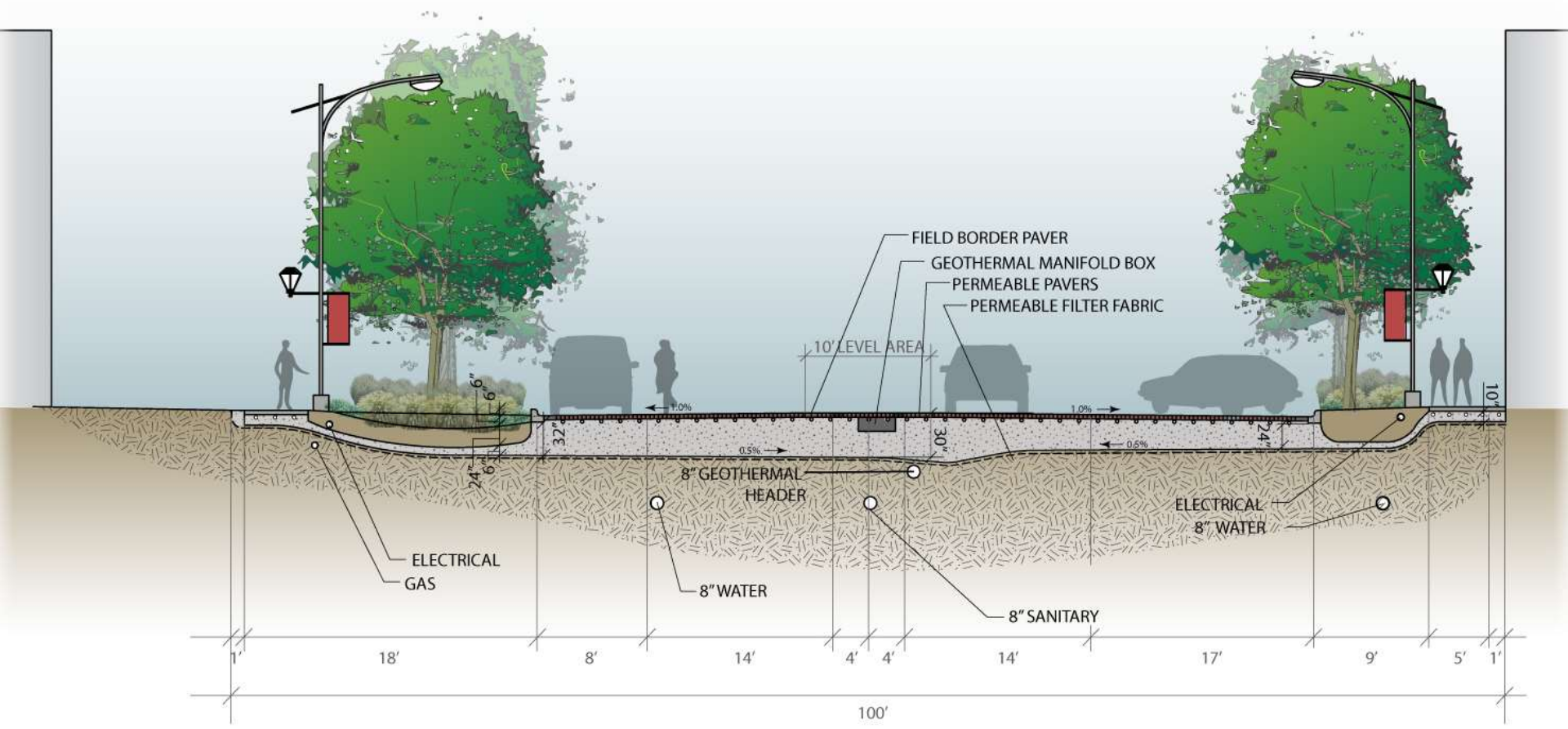


Street Permeable Paver:
Eco-Optilock

Sidewalk Permeable Paver:
Eco-Prioria

Bioretention Areas

Street Section



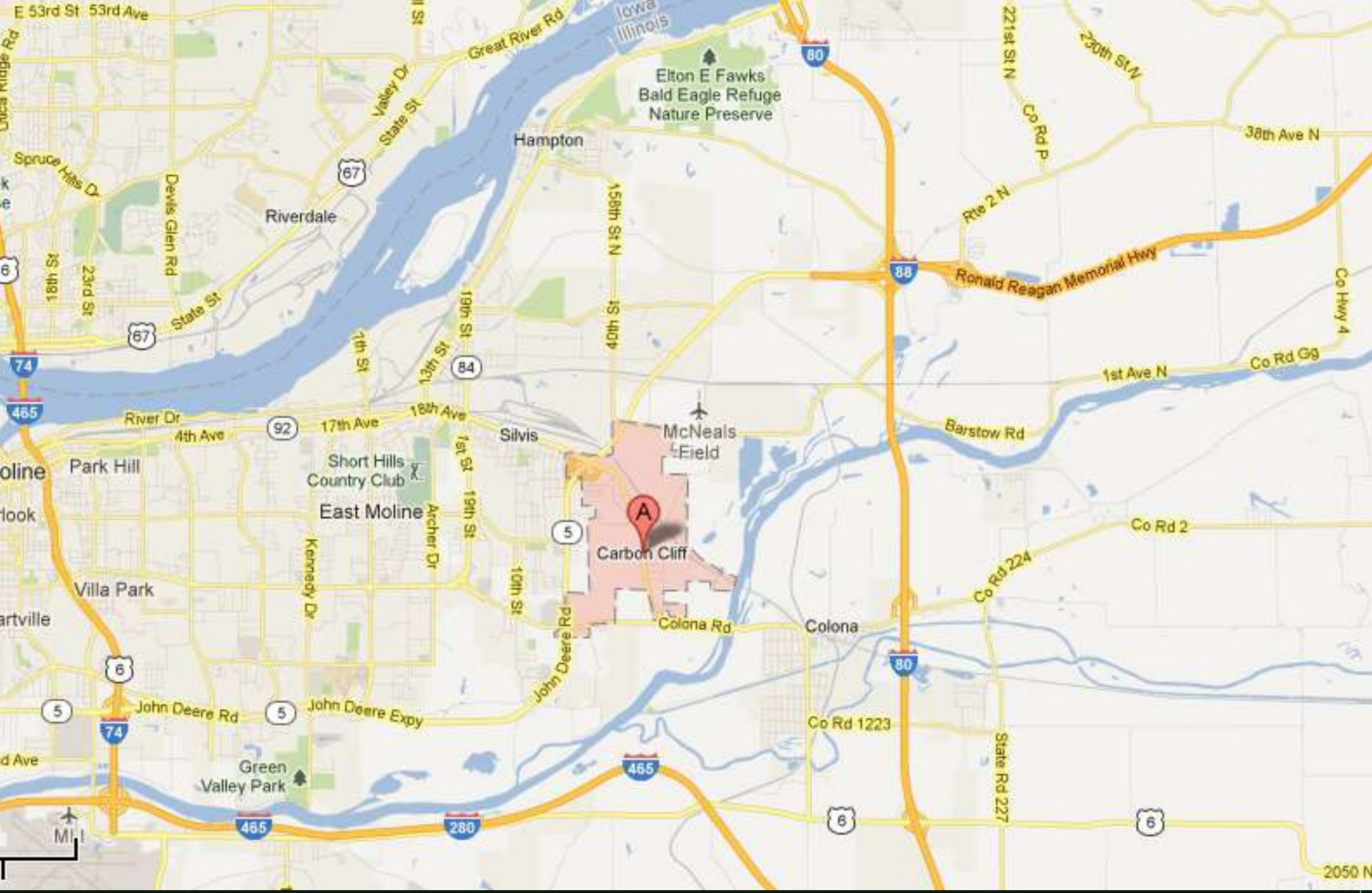

10:08

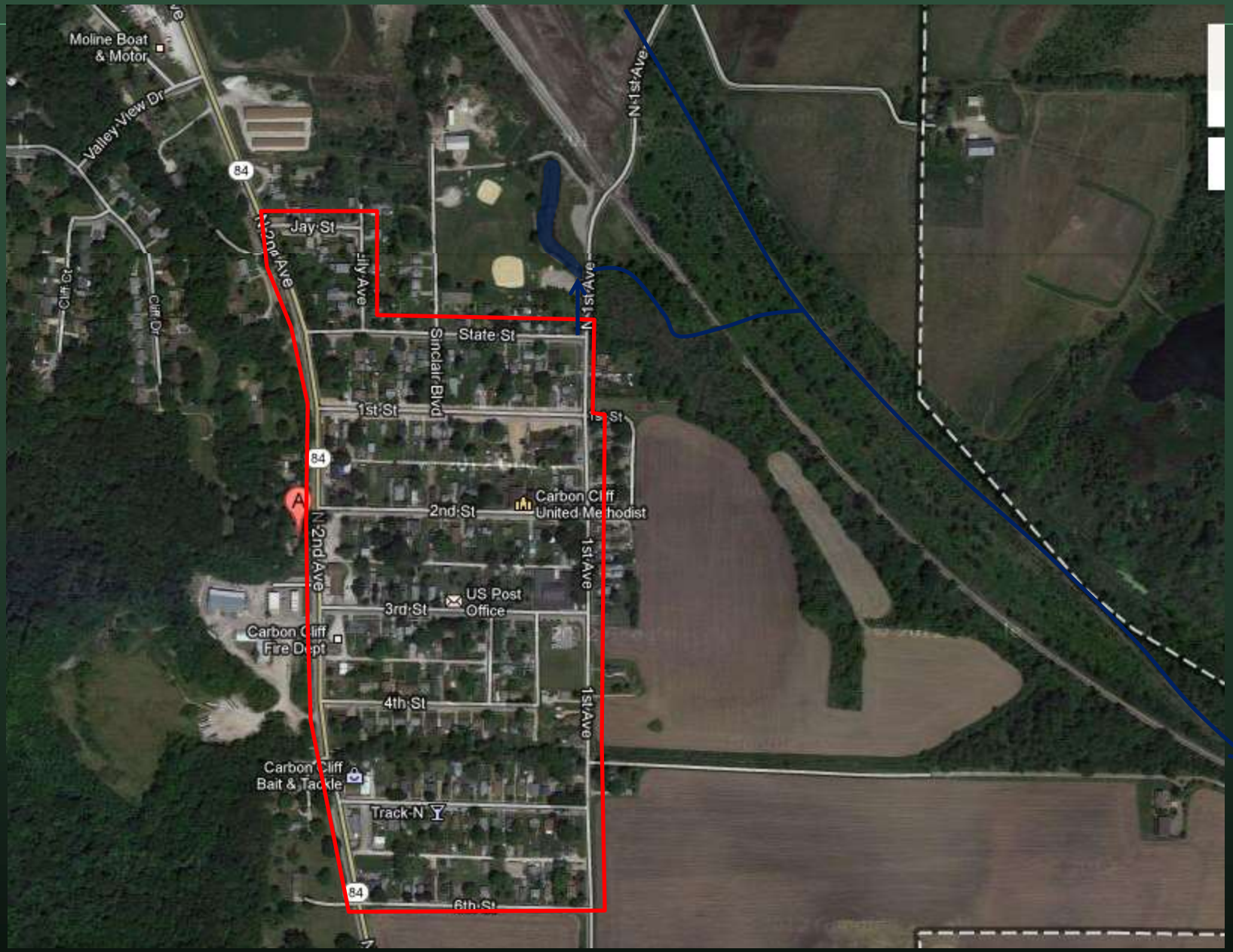
CONSERVATION DESIGN FORUM

Summary of Results

	Pre-Project	Post-Project	% Reduction
Threshold Event	0.05"	1"	-
2-Year Event (2.91" rain)			
Runoff Volume (inches)	2.2	1.38	37%
Peak Flow (cfs)	19.2	3.8	80%
10-Year Event (4.31" rain)			
Runoff Volume (inches)	3.49	2.53	28%
Peak Flow (cfs)	29.8	5.8	81%
100-Year Event (6.36" rain)			
Runoff Volume (inches)	5.44	4.35	20%
Peak Flow (cfs)	45.8	8.3	82%

Carbon Cliff Permeable Streets


A
Carbon Cliff
Colona
Colona Rd
Co Rd 224
Co Rd 2
Co Rd 1223
Co Rd P
Co Rd G9
Co Hwy 4
Barstow Rd
1st Ave N
38th Ave N
221st St N
230th St N
158th St N
Rte 2 N
Ronald Reagan Memorial Hwy
McNeals Field
Silvis
East Moline
Short Hills Country Club
Park Hill
Riverdale
Hampton
Elton E Fawks Bald Eagle Refuge Nature Preserve
Iowa
Illinois
Great River Rd
Valley Dr
State St
Spruce Hills Dr
Devils Glen Rd
23rd St
18th St
River Dr
4th Ave
17th Ave
18th Ave
19th St
13th St
11th St
1st St
10th St
Archer Dr
Kennedy Dr
John Deere Rd
John Deere Expy
John Deere Rd
Villa Park
Green Valley Park
State Rd 227
2050 N
80
88
74
465
280
67
84
92
5
6

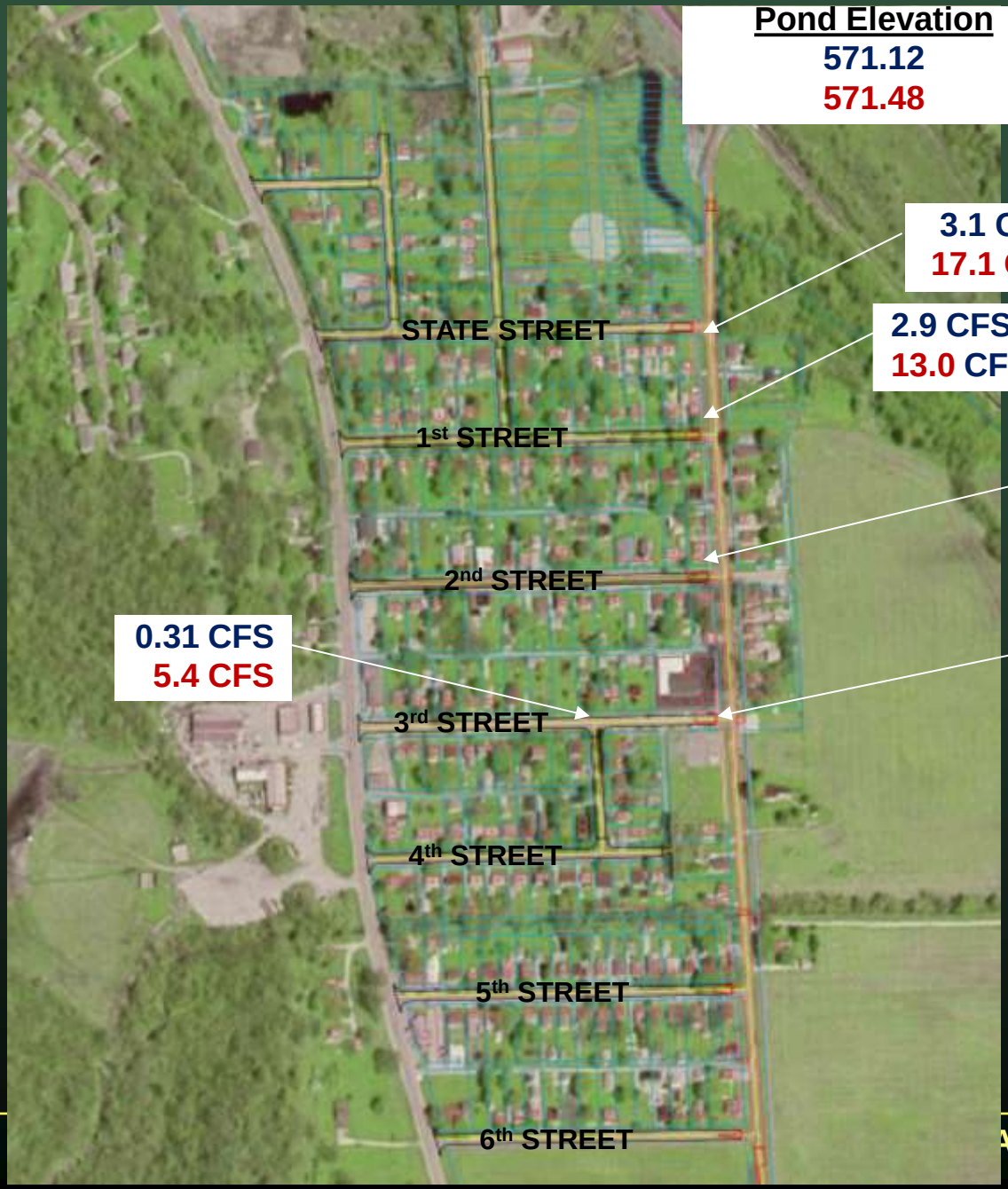

Moline Boat & Motor
Valley View Dr
84
Jay St
N 2nd Ave
Cliff Ct
Cliff Dr
Sinclair Blvd
State St
1st St
N 1st Ave
Carbon Cliff United Methodist
2nd St
3rd St
US Post Office
Carbon Cliff Fire Dept
4th St
Carbon Cliff Bait & Tackle
Track N
6th St


JAY STREET
40' ROW
LILY AVENUE
40' ROW
STATE STREET
50' ROW
SINCLAIR BOULEVARD
60' ROW
1st STREET
60' ROW
2nd STREET
60' ROW
2nd AVENUE
1st AVENUE
66' ROW
3rd STREET
60' ROW
DENHARDT STREET
50' ROW
4th STREET
50' ROW
5th STREET
48' ROW
6th STREET
48' ROW
STUDY AREA


CAT

Charles City, Iowa

2-Year Event

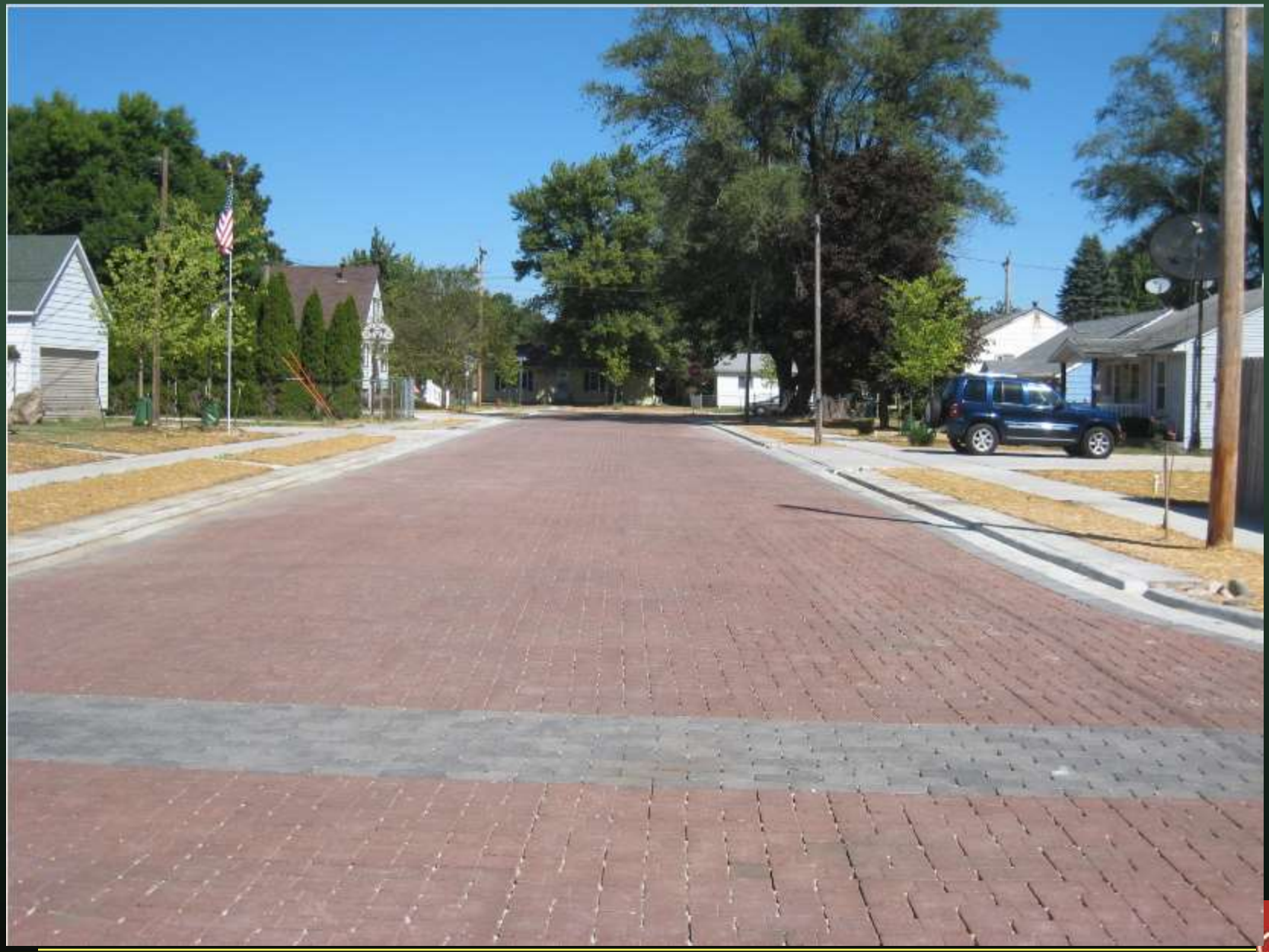

Pond Elevation
571.12
571.48
Permeable Paving Flows
Storm Sewer Flows
3.1 CFS
17.1 CFS
2.9 CFS
13.0 CFS
0.97 CFS
11.1 CFS
0.64 CFS
7.4 CFS
0.31 CFS
5.4 CFS
STATE STREET
1st STREET
2nd STREET
3rd STREET
4th STREET
5th STREET
6th STREET

100-Year Event


JAY STREET
40' ROW
EILY AVENUE
40' ROW
STATE STREET
50' ROW
SINCLAIR BOULEVARD
50' ROW
1st STREET
60' ROW
2nd STREET
60' ROW
2nd AVENUE
1st AVENUE
66' ROW
3rd STREET
60' ROW
DENHARDT STREET
50' ROW
4th STREET
50' ROW
5th STREET
48' ROW
6th STREET
48' ROW
STUDY AREA


Proposed Phase 3
permeable paving, typ.
infiltration channel, typ.
Jay St.
N 2nd Ave.
Lily Ave.
Sinclair Blvd.
Park Ave.
N 1st Ave.
State St.
1st St.
area of permeable paving: 57,000 sf
length of infiltration channel: 3,400 lf


FIRE STATION
NONPOINT SOURCE WATER POLLUTION CONTROL PROGRAM
CARBON CLIFF PERMEABLE STREETS



AMCOL Headquarters

AMCOL Headquarters
Hoffman Estates, IL

KEY NOTES

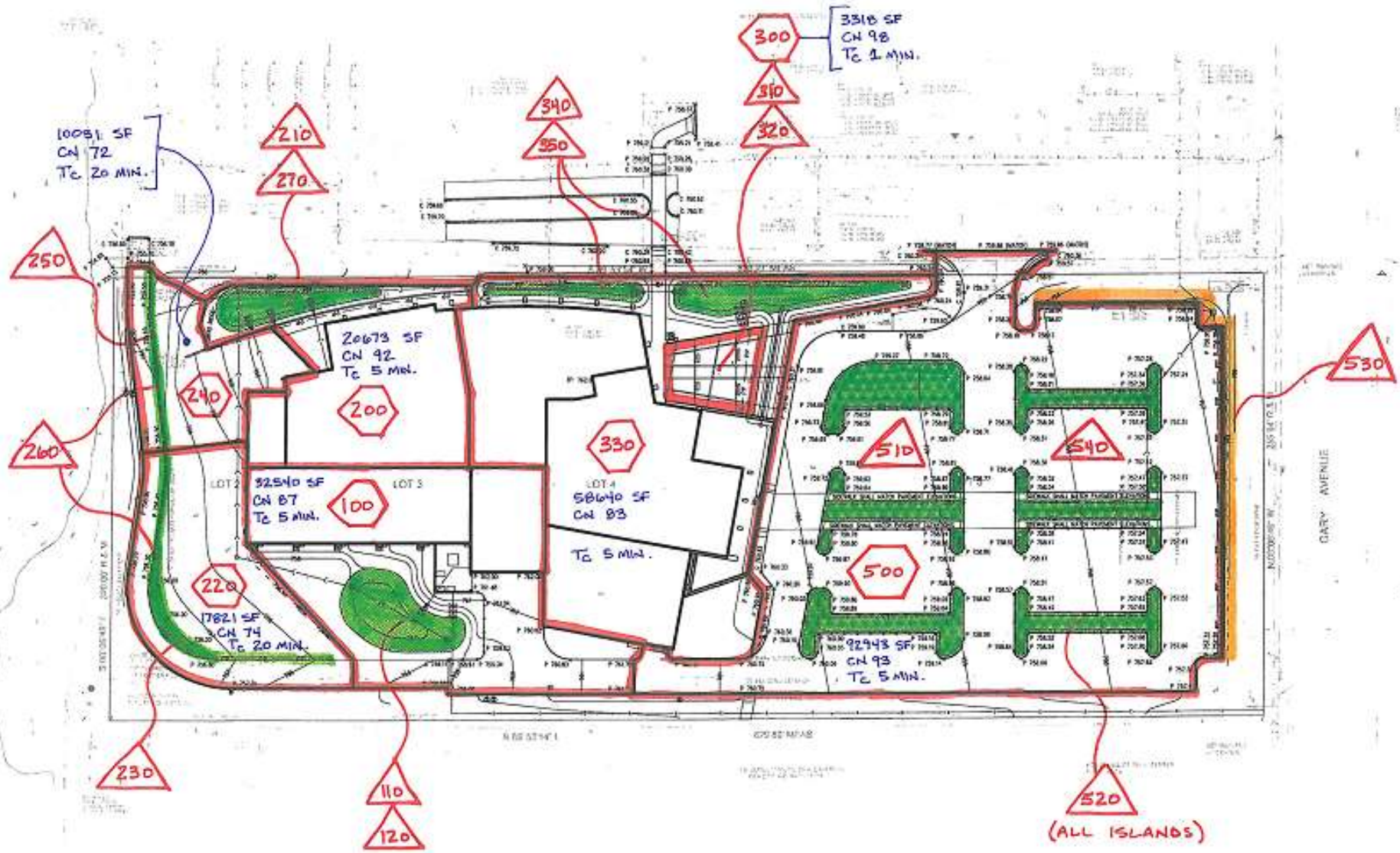
SHEET NOTES


AMCOL
VISITOR
PARKING

Carol Stream Park District: LEED Silver Recreation Center

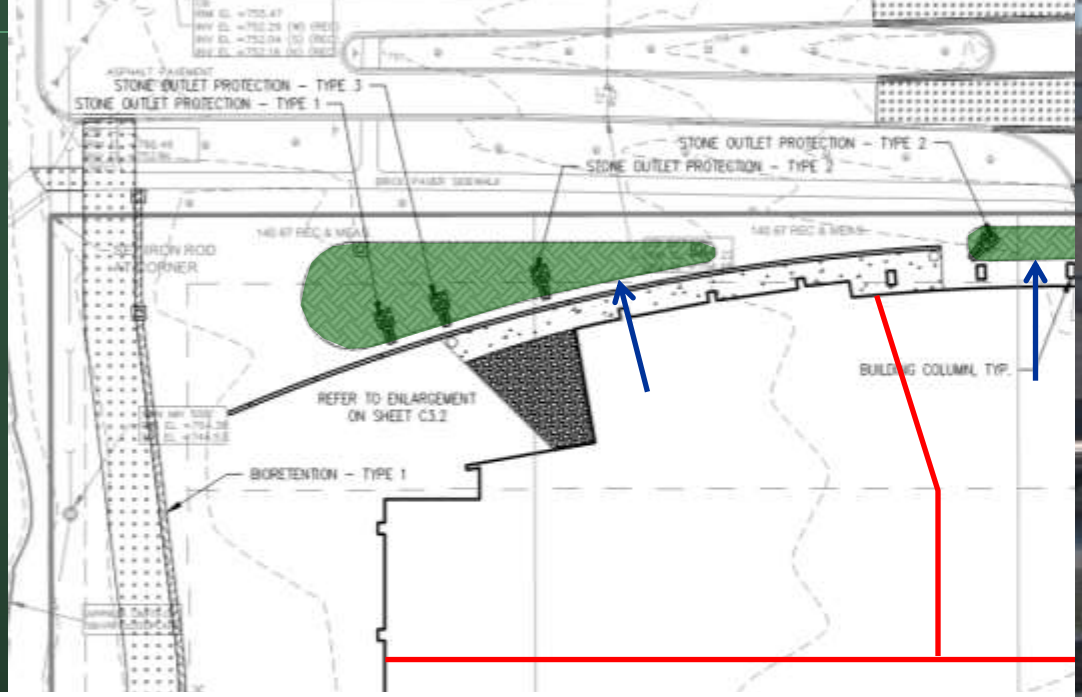
Site Plan

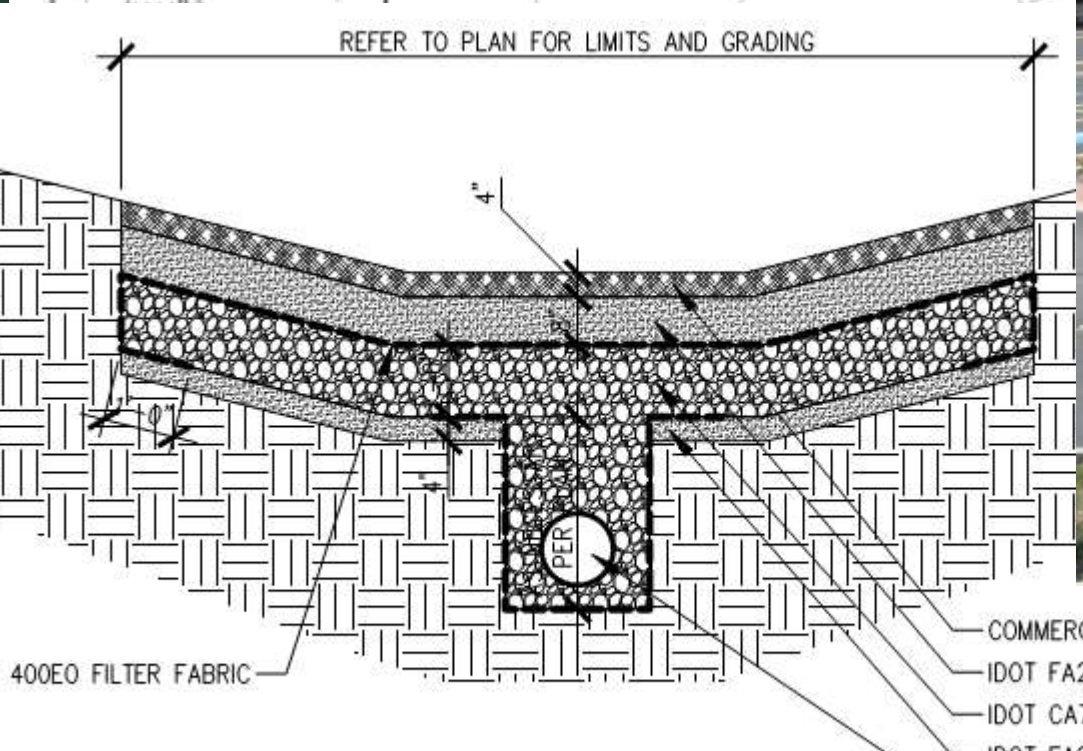
Engineering and Science Based Approach

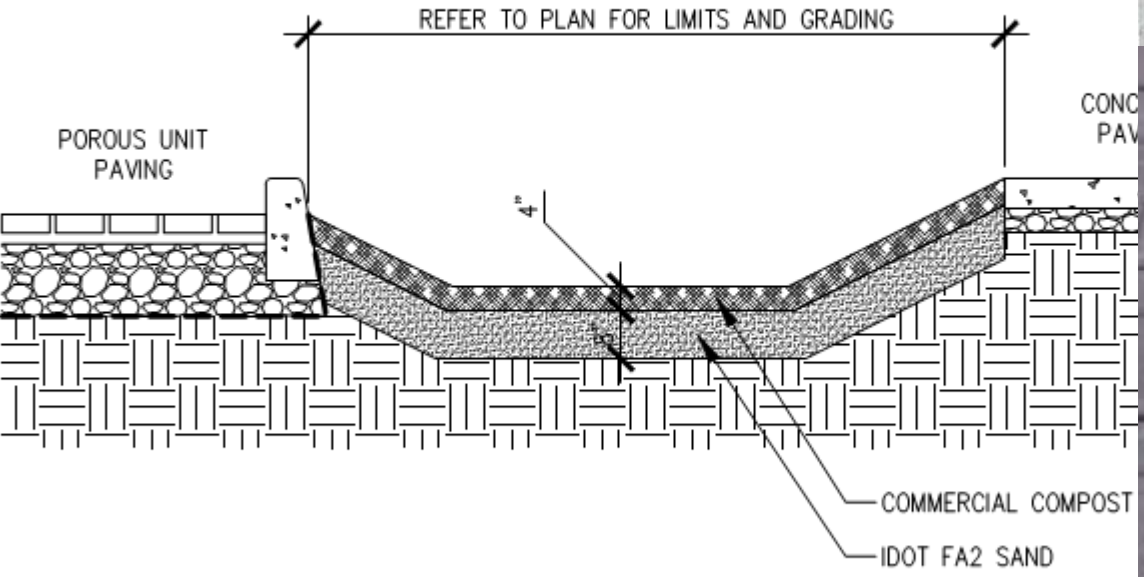


Site Objectives

- LEED Sustainable Sites
- Highest Environmental Performance
- Reduced Irrigation
- Increased Longevity
- Cost Effective


STONE OUTLET PROTECTION – TYPE 3
STONE OUTLET PROTECTION – TYPE 1
STONE OUTLET PROTECTION – TYPE 2
STONE OUTLET PROTECTION – TYPE 2
REFER TO ENLARGEMENT ON SHEET C3.2
BUILDING COLUMN, TYP.
BIORETENTION – TYPE 1


REFER TO PLAN FOR LIMITS AND GRADING
4"
PER
400EO FILTER FABRIC
COMMERCIAL COMPOST
IDOT FA2 SAND
IDOT CA7 AGGREGATE


REFER TO PLAN FOR LIMITS AND GRADING
POROUS UNIT PAVING
CONC PAV
4"
COMMERCIAL COMPOST
IDOT FA2 SAND

Construction

Environmental Performance

- 2-Year Runoff Rate Reduction = 95%
- 2-Year Runoff Volume Reduction = 70%
- Sediment Load Reduction = 90%
- Metals Load Reduction = 90%
- Phosphorous Load Reduction = 65%
- Potential Deicing Salt Reduction = 75%
- Elimination of Asphalt Sealants
- Reduced Irrigation Demand

Economic Considerations

- Cost: ~24% premium for permeable paving system but 11 year ROI
- Longevity: 50 year pavement life
- Safety: Reduced nuisance ponding & icing
- Space efficiency: Integration of stormwater & landscape
- Water Efficiency: Reduced Irrigation
- Aesthetics: Brick paving, lush landscapes
- Environmental performance improvements

DuPage County Water Quality Improvement Program Grant

- Reduces Pollutants of Concern
- Reduces Non-Point Source Pollution
- Reduces Streambank Erosion
- Restores Pre-Development Hydrology
- Educates Community Leaders & Citizens
- Grant = $117,133 (20% of expenses)

Lost Valley Visitors Center in Glacial Park






US Green Building Council

15 August 2013

WILLIAMS ARCHITECTS
Architecture | Planning | Aquatics | Interiors

Featherstone, Inc.

LOST VALLEY

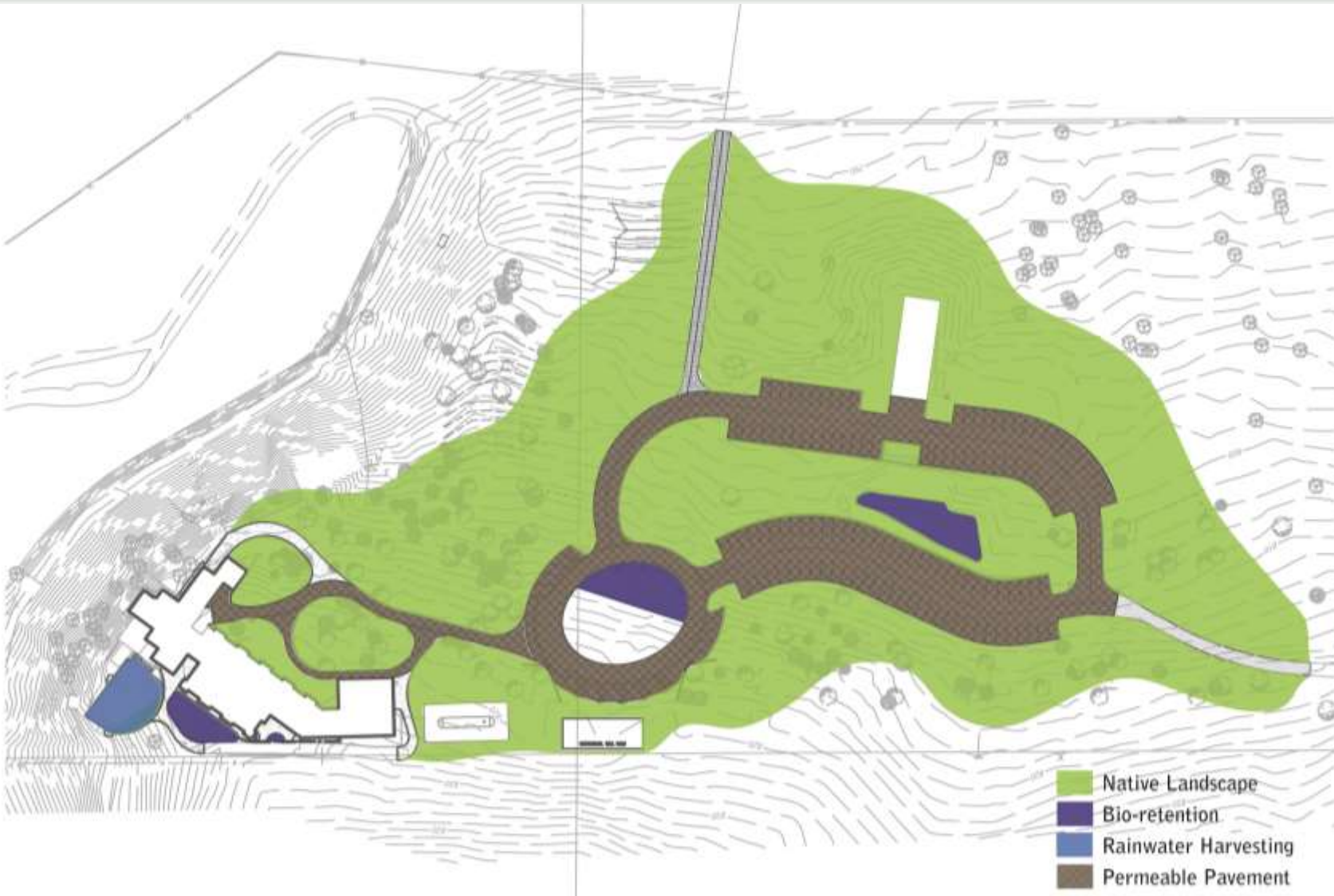
Design Implementation – Sustainable Sites

D. Sustainable Site Practices

1. Replicate natural hydrology on all land use surfaces through the integration of high-performance "green infrastructure" strategies for multiple, stacked benefits:
    a. Porous pavement
    b. Bio-retention
    c. Native landscapes

LOST VALLEY

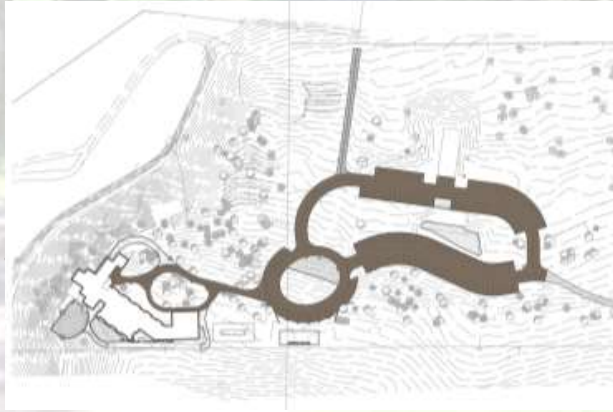
Design Implementation – Sustainable Sites



LOST VALLEY

Design Implementation – Sustainable Sites

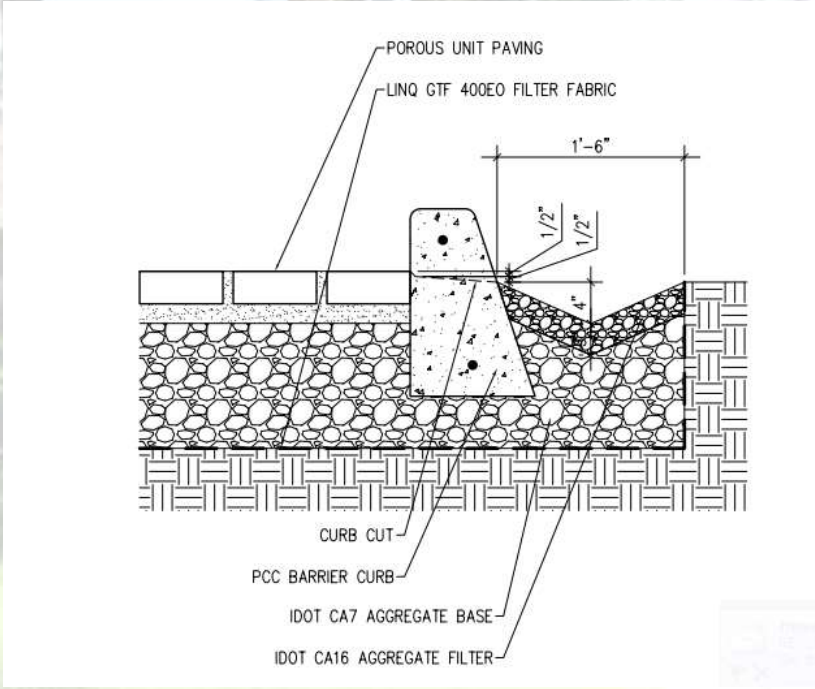
a. Porous Pavement- Interlocking Concrete Unit Pavement System
   i. Slows, cools, cleanses, and infiltrates rainwater
   ii. Durable, longer-lasting
   iii. Reduced maintenance costs
   iv. Improved winter-time characteristics
   v. Traffic calming
   vi. Aesthetic characteristics
   vii. Educational opportunitie



LOST VALLEY

Design Implementation – Sustainable Sites

Permeable Paving



LOST VALLEY

Design Implementation – Sustainable Sites

LOST VALLEY

Design Implementation – Sustainable Sites

Porous Pavement

LOST VALLEY

Design Implementation – Sustainable Sites

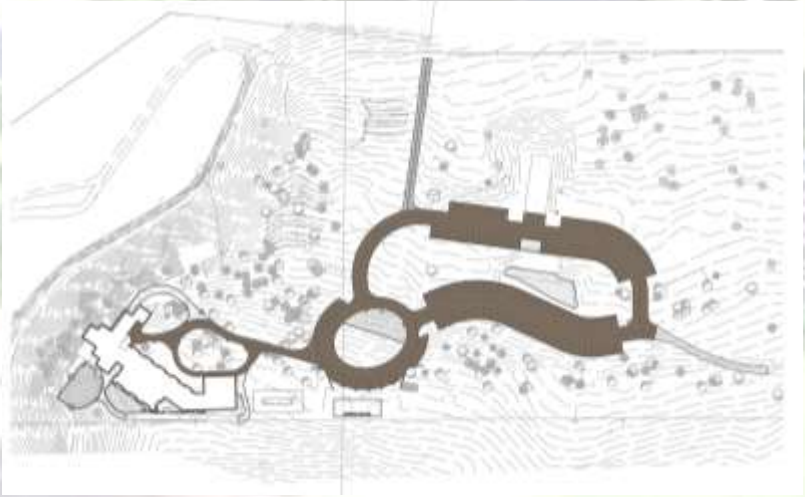
Before

After

LOST VALLEY

Design Implementation – Sustainable Sites

b. Bioretention - Rain Gardens and Bioswales
   i. Slows, cools, cleanses, and infiltrates rainwater
   ii. Improves biodiversity
   iii. Reinforces native landscape character
   iv. Educational opportunities



LOST VALLEY

Design Implementation – Sustainable Sites

LOST VALLEY

Design Implementation – Sustainable Sites

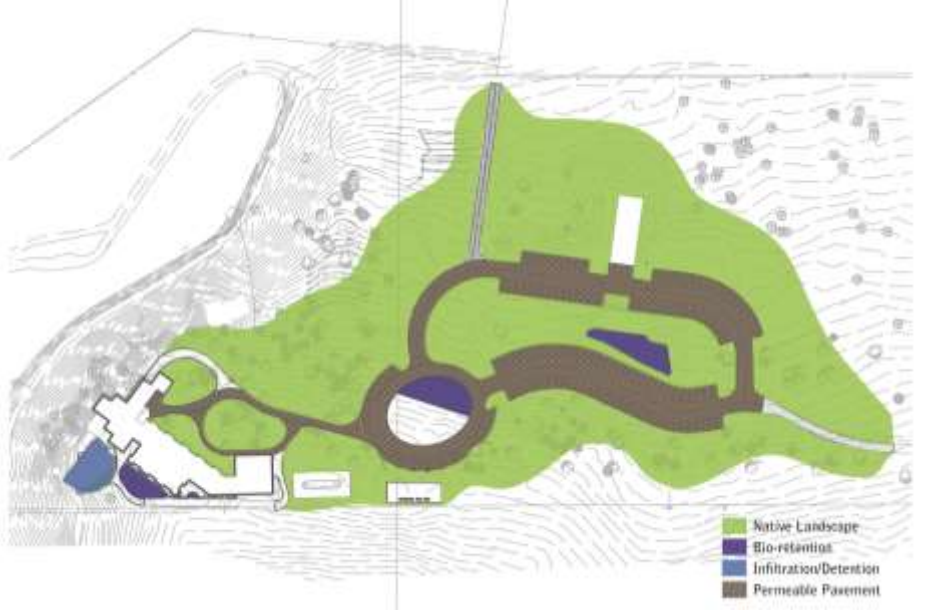
LOST VALLEY

Design Implementation – Sustainable Sites

LOST VALLEY

Design Implementation – Sustainable Sites

2. Detention / Evaporation
   a. Adaptive re-use of pool
   b. Slows, cools, cleanses, and infiltrates rainwater
   c. Expands usable, programmable outdoor space



LOST VALLEY

Design Implementation – Sustainable Sites

Detention / Evaporation

LOST VALLEY

Design Implementation – Sustainable Sites

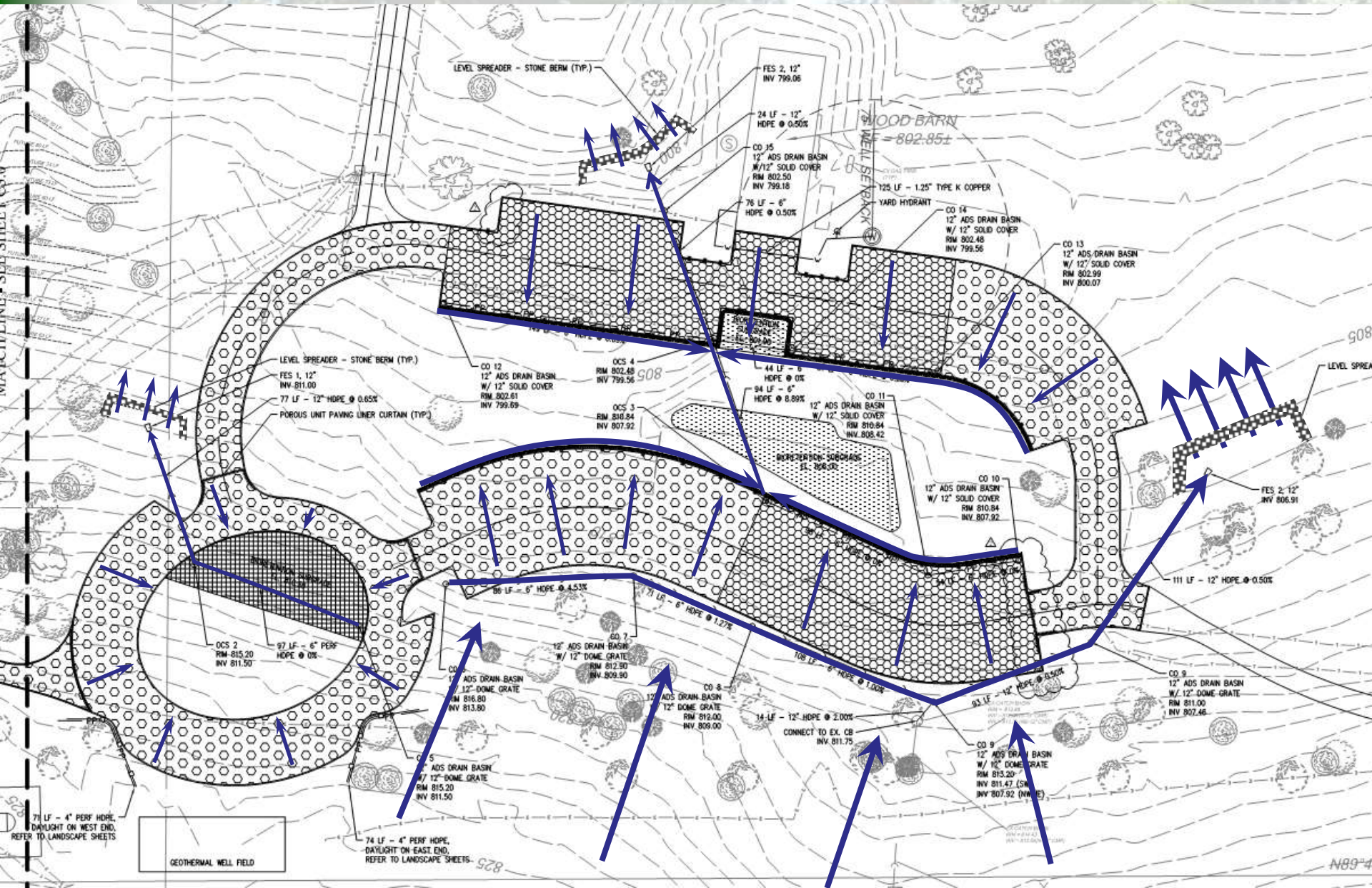
Detention / Evaporation

LOST VALLEY

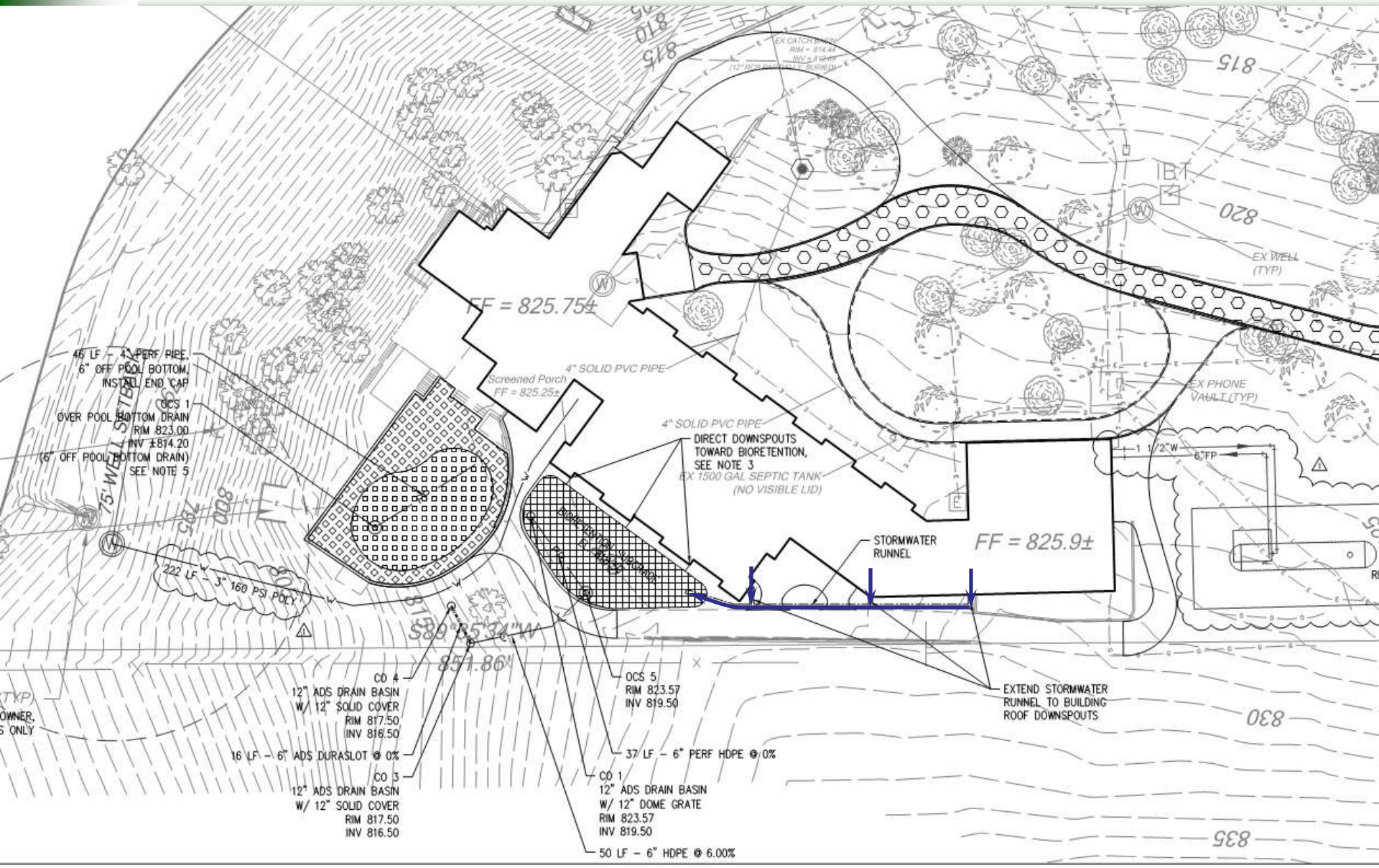
Design Implementation – Sustainable Sites

Make all water a visible element

Water Management Plan



Water Management Plan



LOST VALLEY

Design Implementation – Sustainable Sites

Project Performance

Table 3 - Estimated Runoff Rates & Volumes

Event	Pre-Development		Post Development	
	Peak Discharge (cfs)	Runoff Volume (ac-ft)	Peak Discharge (cfs)	Runoff Volume (ac-ft)
1-yr	4.05	0.28	0.06	0.07
2-yr	7.07	0.44	0.10	0.14
100-yr	42.90	2.44	0.84	0.98

LOST VALLEY

Design Implementation – Sustainable Sites

3. Native Landscapes – Adapted prairie grasses and forb species
   a. Slows, cools, cleanses, and infiltrates rainwater
   b. Improves biodiversity
   c. Reinforces authentic landscape character
   d. Improves habitat
   e. Educational opportunities

LOST VALLEY

Design Implementation – Sustainable Sites

Native Landscapes