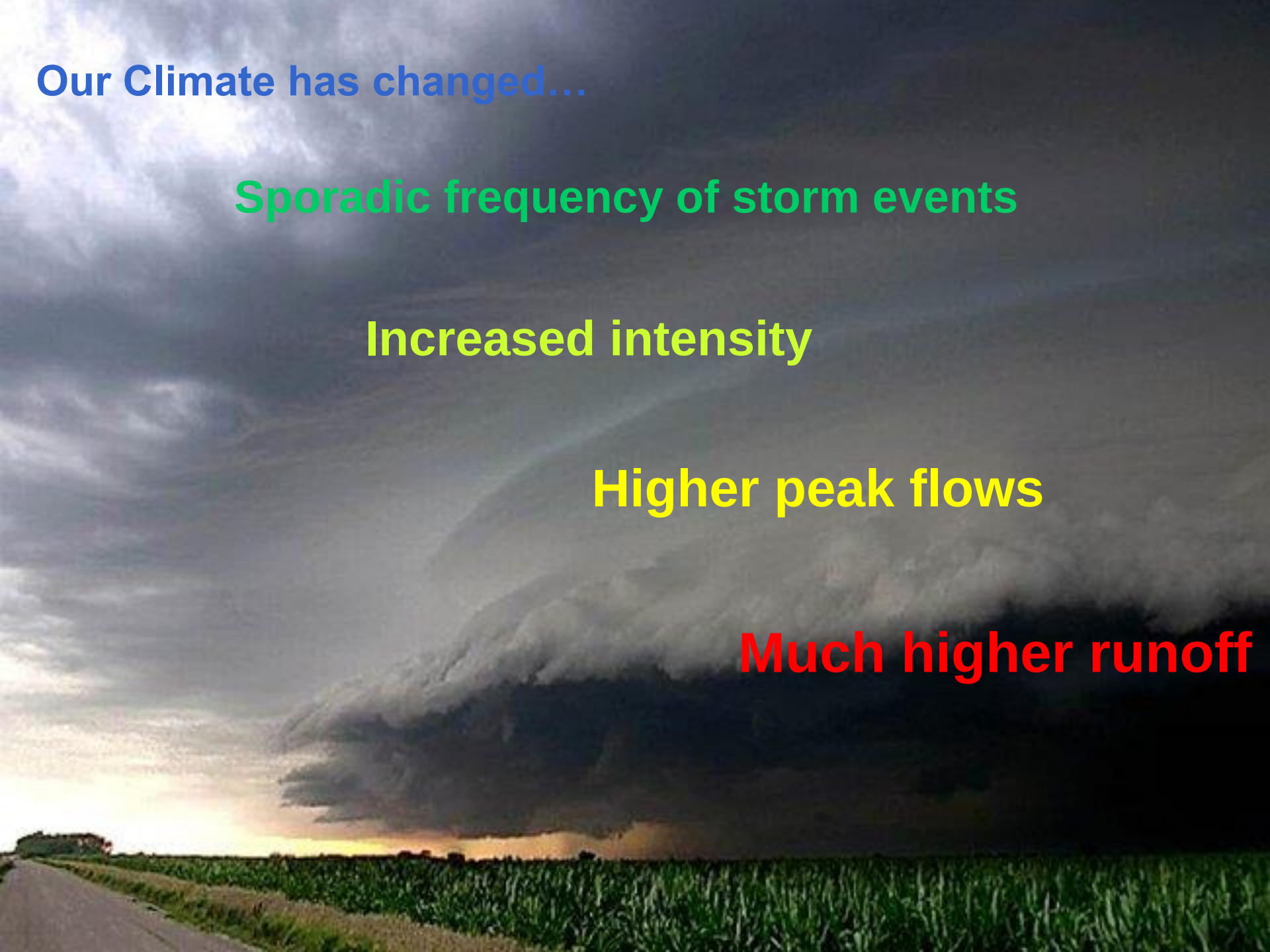

Our Climate has changed…
Sporadic frequency of storm events
Increased intensity
Higher peak flows
Much higher runoff

Sustainable Urban Stormwater Volume Reduction

Bryan Miko, P.E.
Regional Engineer
Bryan.miko@ads-pipe.com
630-945-7189

Sustainability: the ability to be *maintained* at a certain rate or level


Environmental
Sustainability
Social
Economic

●●○○○ Verizon 10:34 AM 86%

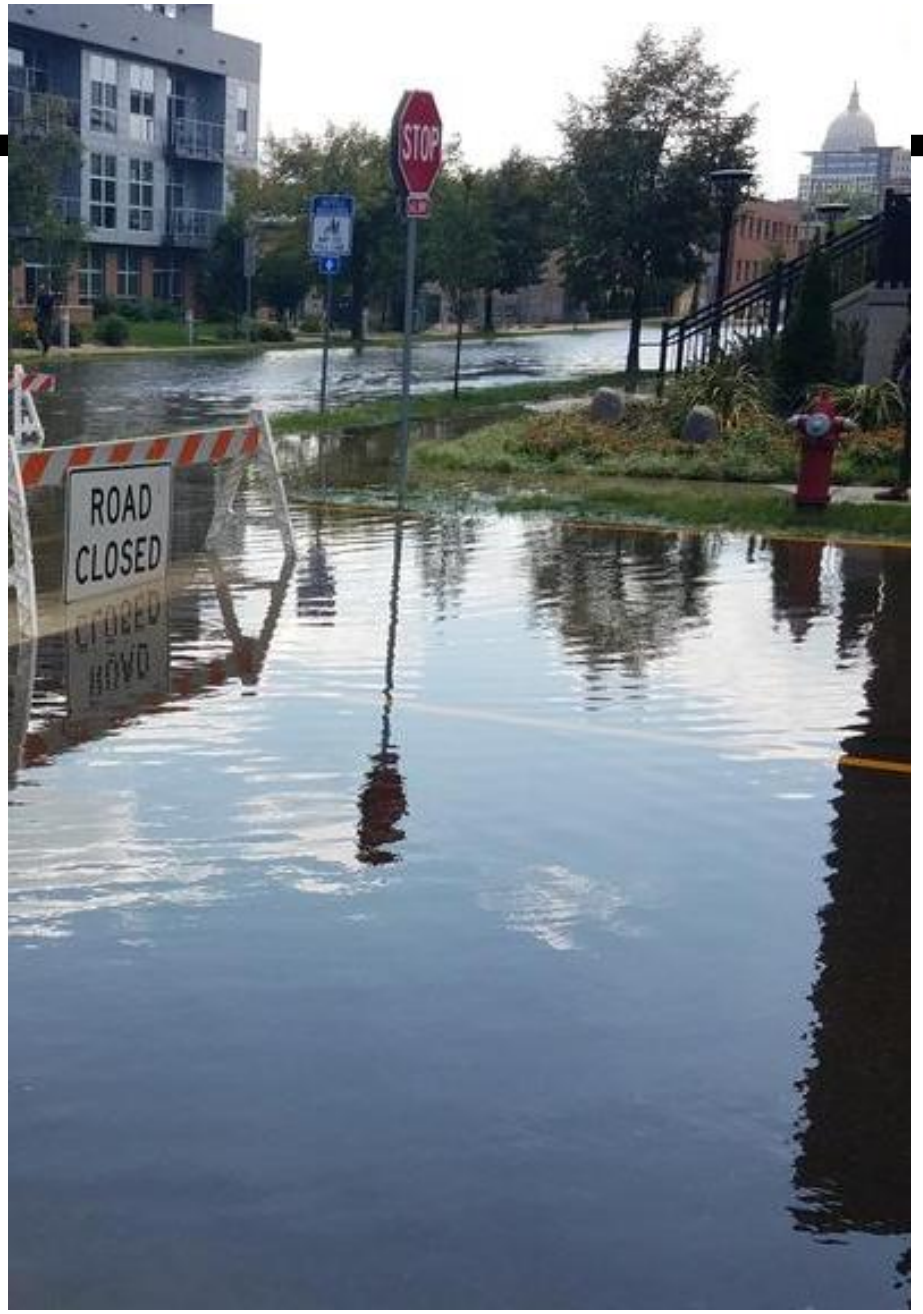
news-gazette.com Share

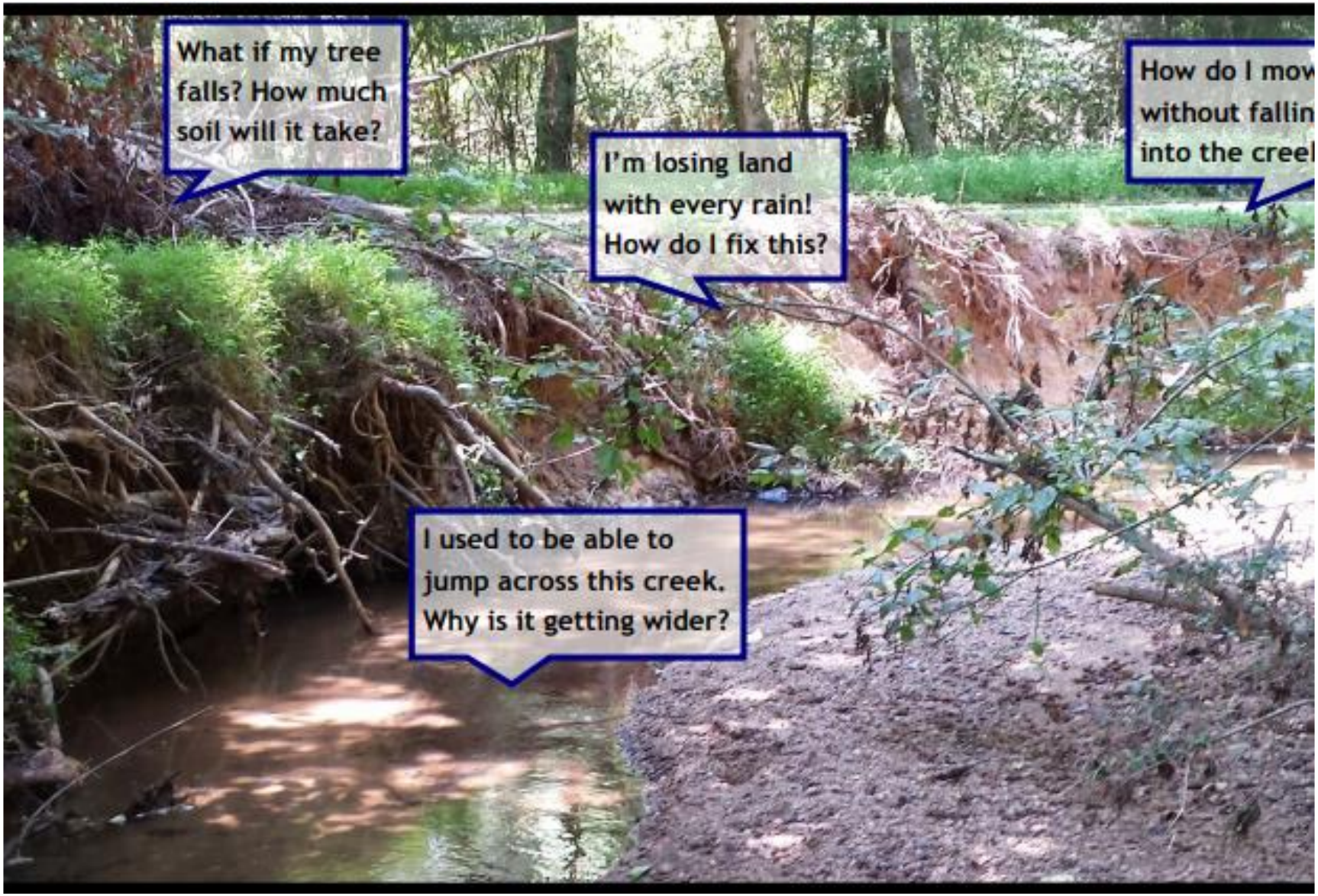
NG DWS | SUBSCRIBE

Wed, 06/22/2016 - 8:59am | Tom Kacich

Photo by: John Dixon/The News-Gazette

Champaign police respond to an emergency call through standing water on Bradley Avenue, west of Prospect Avenue, on Wednesday morning, June 22, 2016. Heavy thunderstorms early Wednesday




What if my tree falls? How much soil will it take?
I'm losing land with every rain! How do I fix this?
How do I mow without fallin into the creel
I used to be able to jump across this creek. Why is it getting wider?

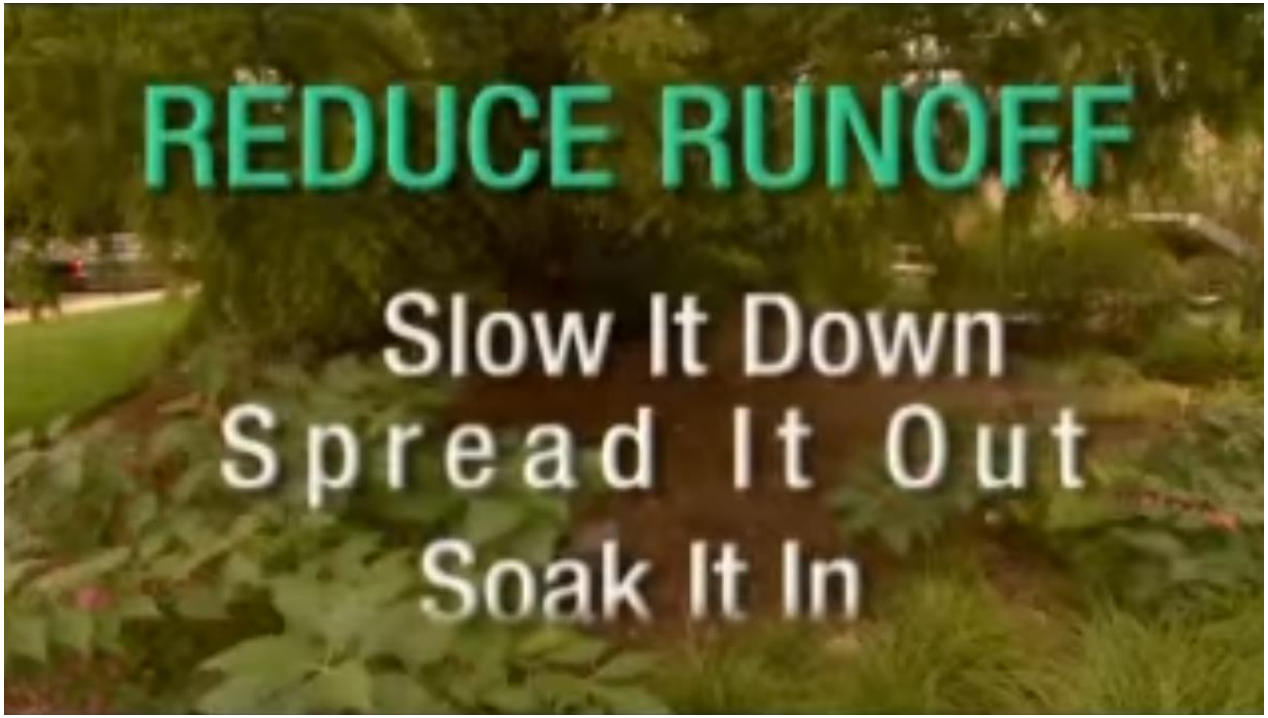
Concept – A General Notion

Design – Functional Plan

Performance – Accomplishment

Green Infrastructure

Green infrastructure is practices or facilities that reduce the volume, rate or pollutant load of stormwater runoff before it goes into the sewer system and creeks. They do this by capturing stormwater and diverting it to where it can be detained, infiltrated into the ground, evaporated, taken up by plants, or reused.

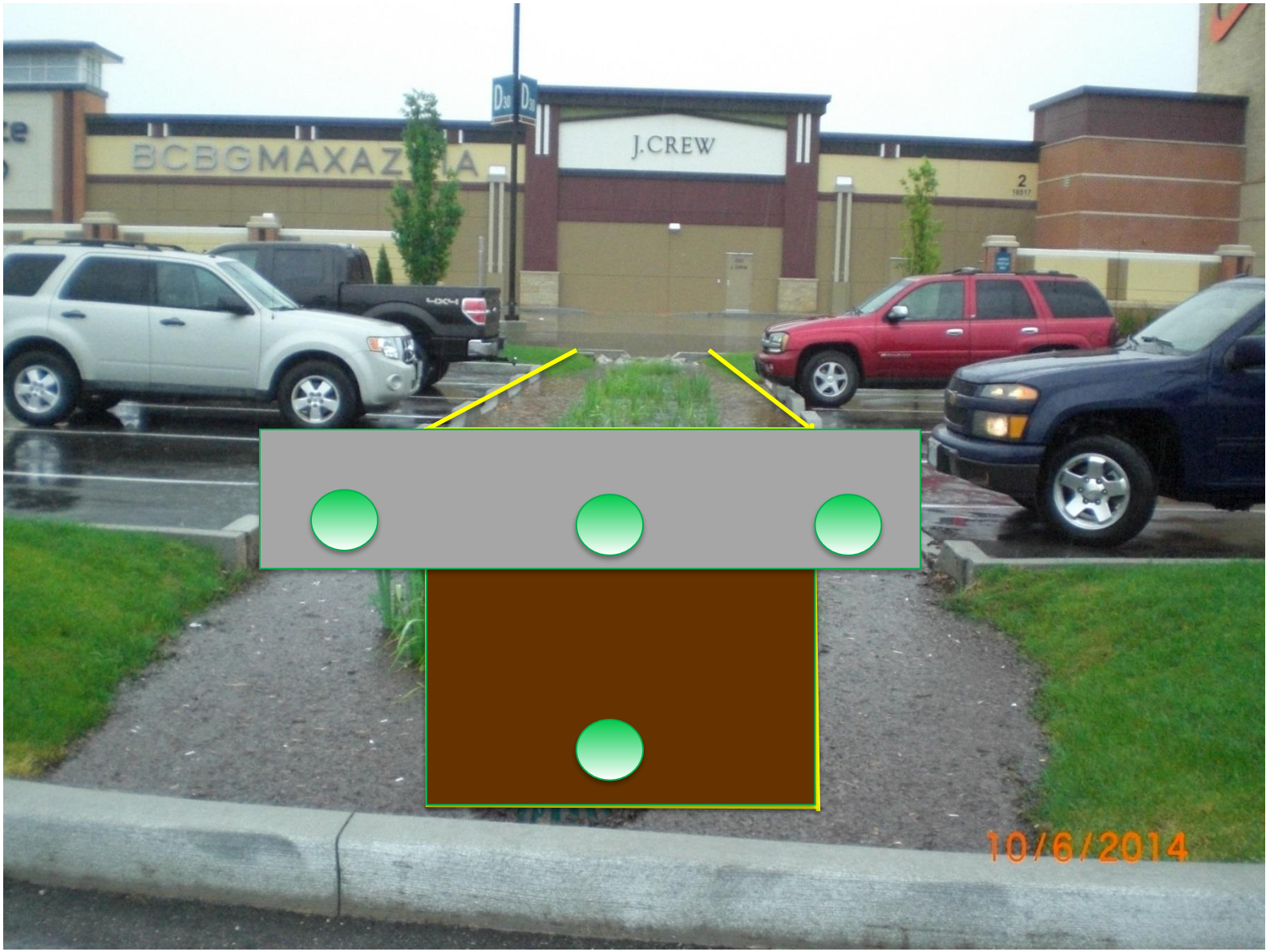


USEPA Video 2009

Typical GI Options

Pervious Pavement

Bioretention


J.CREW
10/6/2014

Design Considerations

Land Use

Value of Land

Linear Constraints

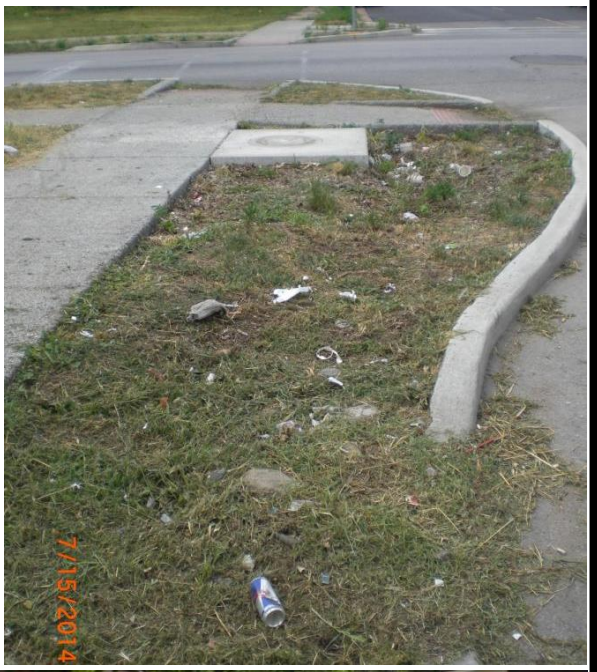
Safety Concerns

Construction Timing

Maintenance

Aesthetics

Performance Challenges



Mt. Calvary Church, St. Louis

1.2. NOTICE TO CONTRACTOR

Notice is hereby given that The Metropolitan St. Louis Sewer District will receive sealed bids for **Mt. Calvary Bioretention Rehabilitation (IR)** under Letting No. **12863-015.1** at its office, 2350 Market Street, St. Louis, MO 63103, until **02:00 PM on Tuesday, June 20, 2017**. **All bids are to be TIME STAMPED and deposited in the bid box located on the 1st Floor Main Entrance prior to the 02:00 PM bid deadline. No bids will be accepted after the 02:00 PM bid deadline.** All copies of the Bid, the Bid Bond and any other documents required to be submitted with the Bid are to be enclosed in a sealed envelope. The envelope is to be identified with Mt. Calvary Bioretention Rehabilitation (IR), 12863-015.1, along with the Bidder's name and address. If the Bid is sent by mail or any other courier type service, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED, ATTENTION: Abby Meyer, Purchasing Department, on the face thereof. **Bids may, however, be withdrawn prior to the opening of the first bid. BIDS WILL BE PUBLICLY OPENED AND READ IMMEDIATELY AFTER THE BID DUE DATE/TIME AT 2350 MARKET STREET, AT A PLACE DESIGNATED.**

CONTACT THE PROJECT ENGINEER, SUSAN MCCRARY, AT 314-768-6306, REGARDING TECHNICAL QUESTIONS. PLEASE CONTACT ABBY MEYER IN THE PURCHASING DEPARTMENT AT 314-768-6250 FOR BIDDING INFORMATION ON THIS PROJECT. IF YOU HAVE QUESTIONS OR RECOMMENDATIONS CONCERNING THE DISTRICT'S MWBE PROGRAM, PLEASE CONTACT SHONNAH PAREDES, MANAGER OF DIVERSITY PROGRAMS, AT (314)768-6395 OR BY EMAIL AT SPAREDES@STLMSD.COM.

1.3. GENERAL:

A. Bids will be received only from companies that are prequalified by the District's Engineering Department for **Green Infrastructure and Bio-Retention**.

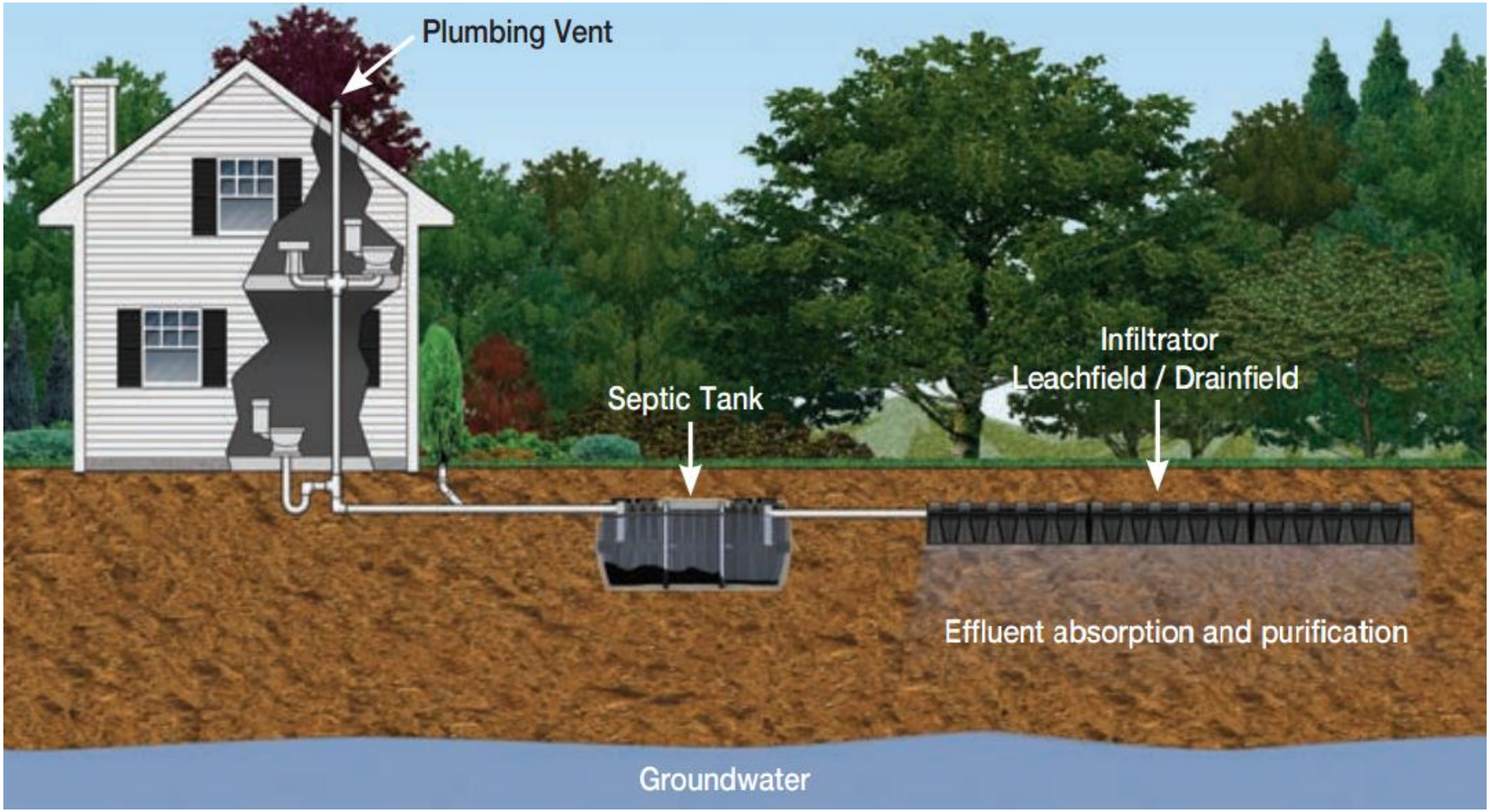
B. The Bid Proposal shall be prepared on a Proposal Form, provided by the District, in accordance with Section 2.3, FORM OF PROPOSAL, of the General Project Specifications. Bids not submitted

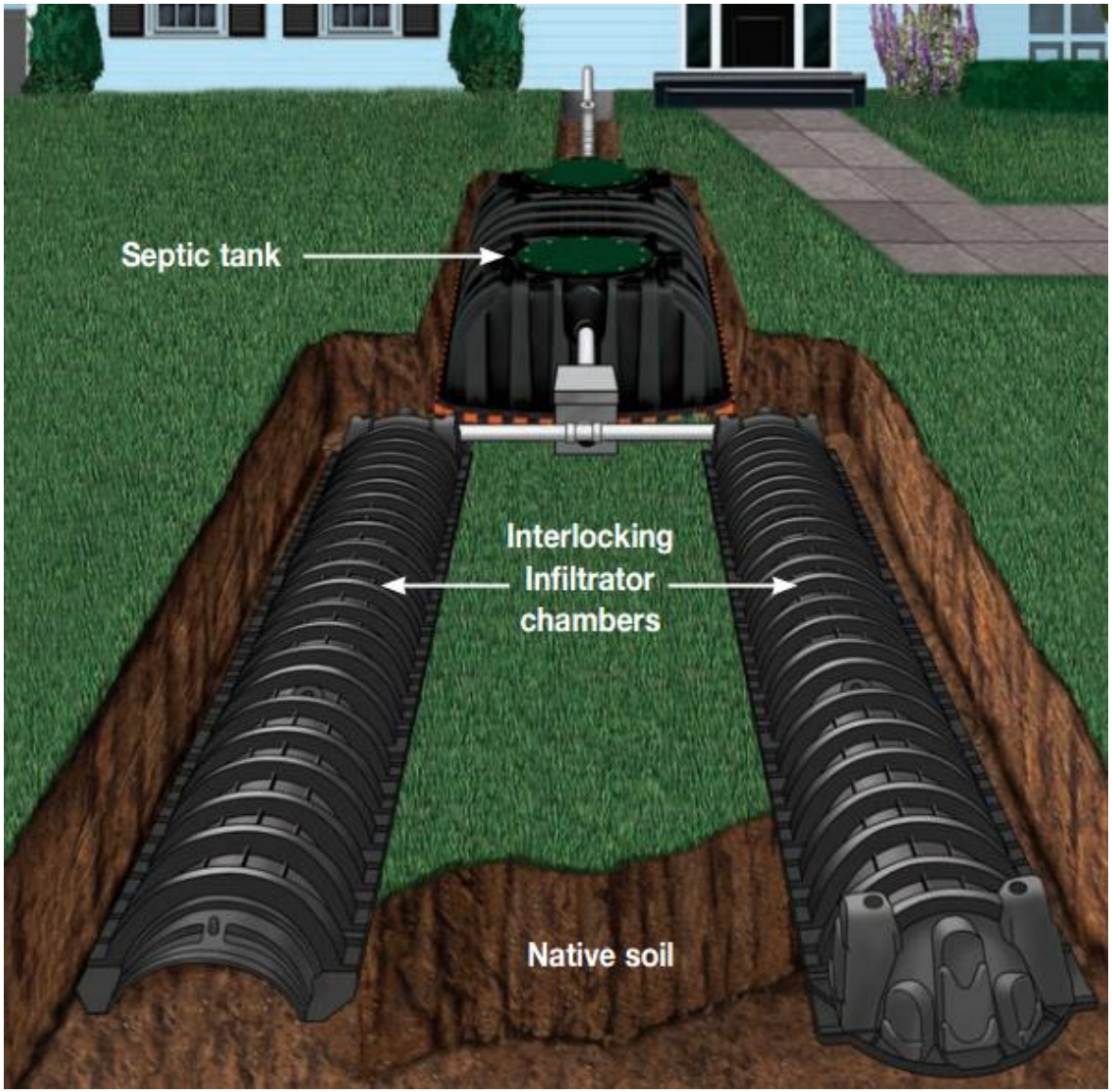
17 of 10/14/10

grouted to stop the flow of water and seal the sinkhole. The contractor performed this work on a time and material basis for a total cost of $173,000.

After this project was bid, it was decided than an additional scope of work would be added to include a rain garden and bioretention cell behind Mt. Calvary Church at 9321 Litzsinger Road. This work is being performed in conjunction with the Missouri Botanical Gardens and Washington University. This work will include grading, soil replacement, required plantings, and installation of approximately 2,870 square feet of bioretention cell and under drains. The cost to perform this work is $150,000.

What About A Sustainable Partner Underground?


Plumbing Vent
Septic Tank
Infiltrator
Leachfield / Drainfield
Effluent absorption and purification
Groundwater

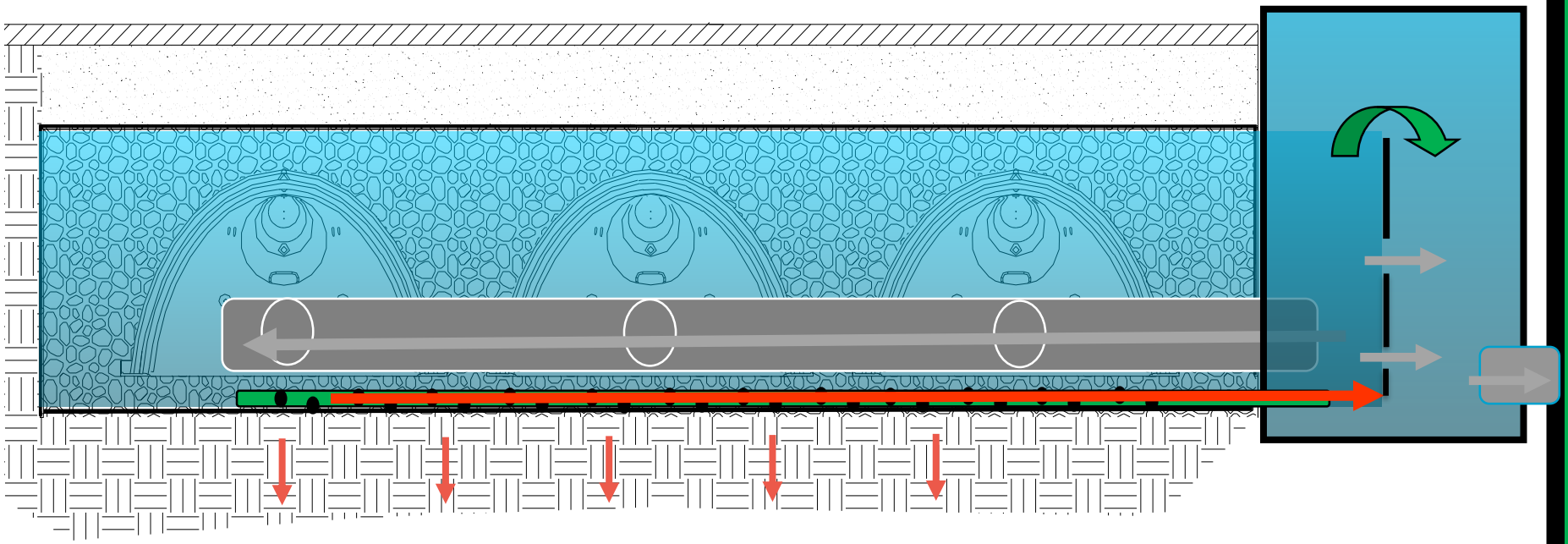

Septic tank
Interlocking
Infiltrator
chambers
Native soil

STORMWATER CHAMBERS

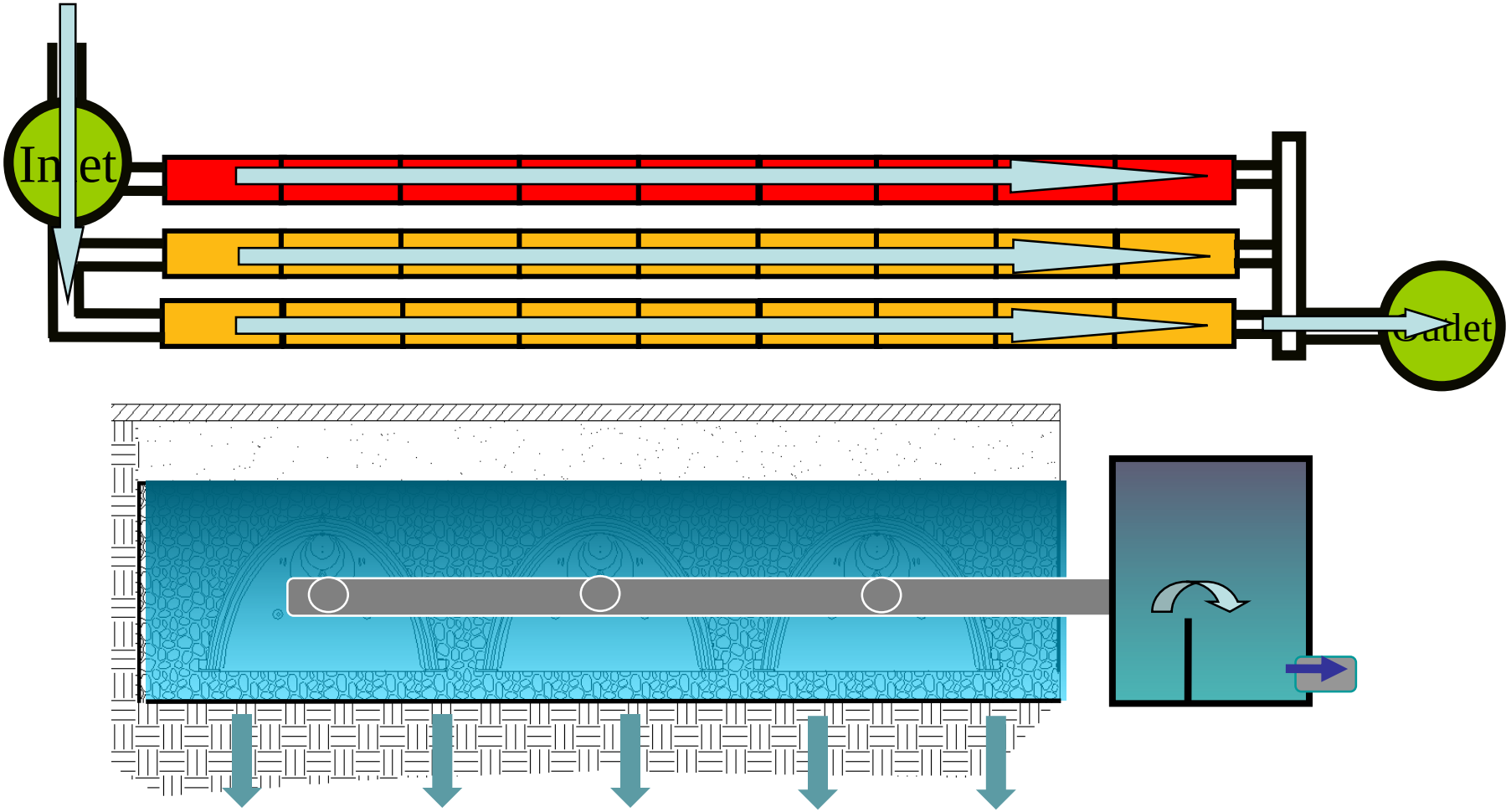
Sustainable Capacity & Control

Discharge to downstream conveyance & some infiltration

<u>Orifice control of post-development release</u>



Forced Infiltration



Water Quality Volume (WQv)

Metropolitan St. Louis Sewer District

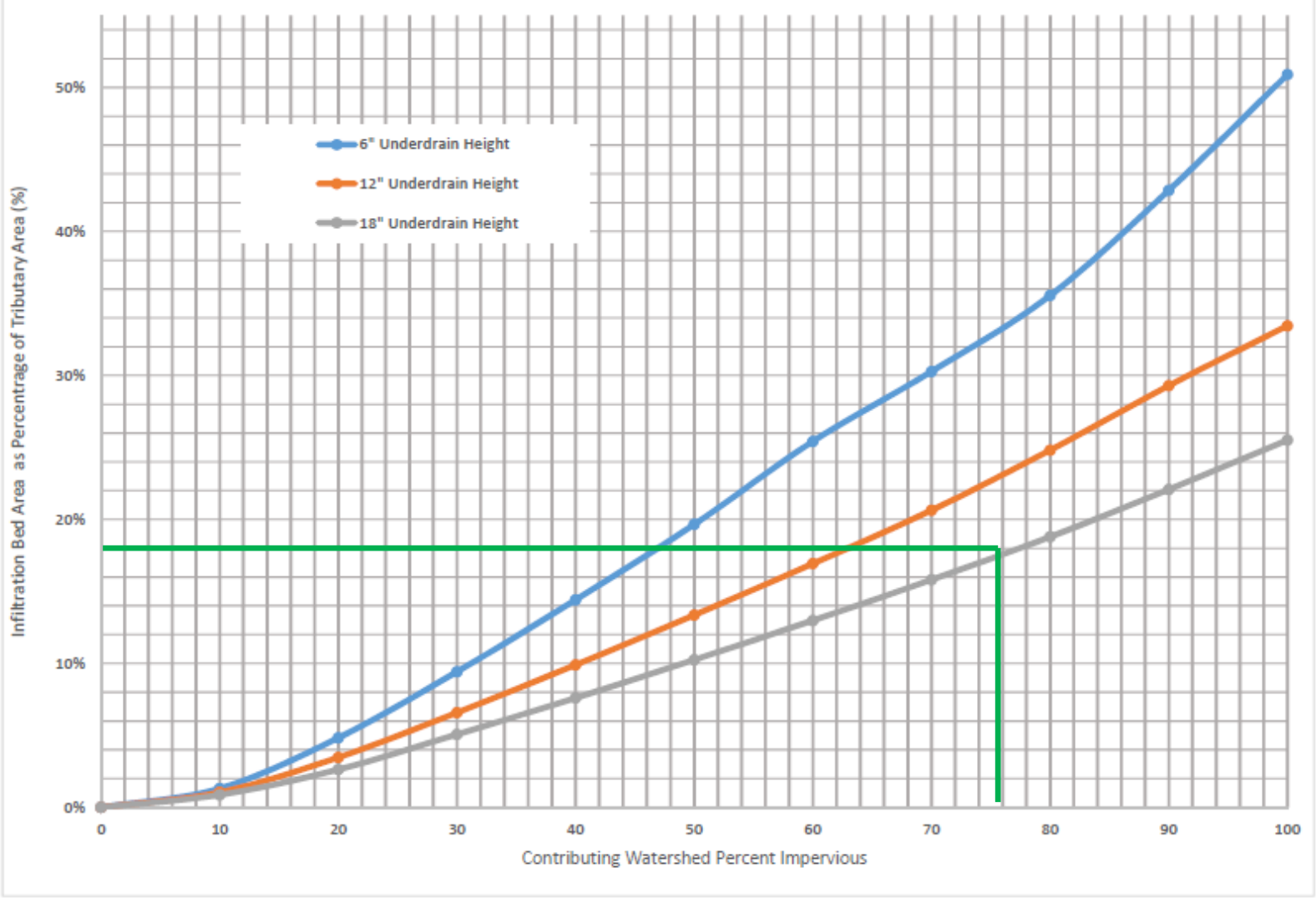
Metropolitan
St. Louis Sewer
District

2350 Market Street
St. Louis, MO 63103-2555
(314) 768-6200

The Metropolitan St. Louis Sewer District (MSD) has reviewed your July 5, 2016 analysis of the ADS Stormtech/Isolator Row system as a standalone post-construction stormwater Best Management Practice. MSD hereby grants approval of the Stormtech/Isolator Row system for use on new development, redevelopment and highway/roadway improvement projects of any size under the following conditions:

accordance with the attached Figure 1. With a perched outlet, and when sized in accordance with Table 1 and Figure 1, the Isolator Row and Stormtech Chambers provide sufficient water quality treatment for its tributary area. A runoff volume reduction credit of 0.45 may be entered into "Item 11, Site Specific BMP" in the MSD MEP spreadsheets.

0.05”/hr Infiltration Rate



DESIGN COMPONENTS

BLUE PRINT COLUMBUS

6.3—PREFABRICATED BURIED INFILTRATION STRUCTURES

DESCRIPTION: Prefabricated buried infiltration structures can be used to provide void space for water storage. These structures may be installed as stand-alone storage or in combination with bioretention basins, permeable pavements and other green infrastructure practices. Systems vary greatly by manufacturer, but generally can be open bottom arch shapes or rectangular shapes and made of plastic or concrete material. Systems should be designed to promote infiltration where underlying soils allow. This specification does not [illegible]d wall storage structures such as pipes and box culverts. Buried infiltration structures are generally [illegible]ered injection wells if the length of the system exceeds the depth.

[illegible]O USE: May be applied in parking lots, parks or other private property settings with the permission [illegible]erty owner, but are not permitted for use within the ROW. Use for greater water storage capacity [illegible]e provided by stone aggregate. Void space in prefabricated materials can often be greater than 90%. [illegible]son, the void space available in stone aggregate ranges from 30 to 40%. Can be used under [illegible] pavement as a mechanism to transfer water from the stone storage bed to an outlet structure and [illegible] of perforated underdrains. These types of systems have been approved by Ohio EPA as an [illegible] stand-alone BMP when standard BMPs are not feasible due to various constraints. Ohio EPA [illegible]proven pretreatment mechanism and maintenance plan to protect the long term function of the

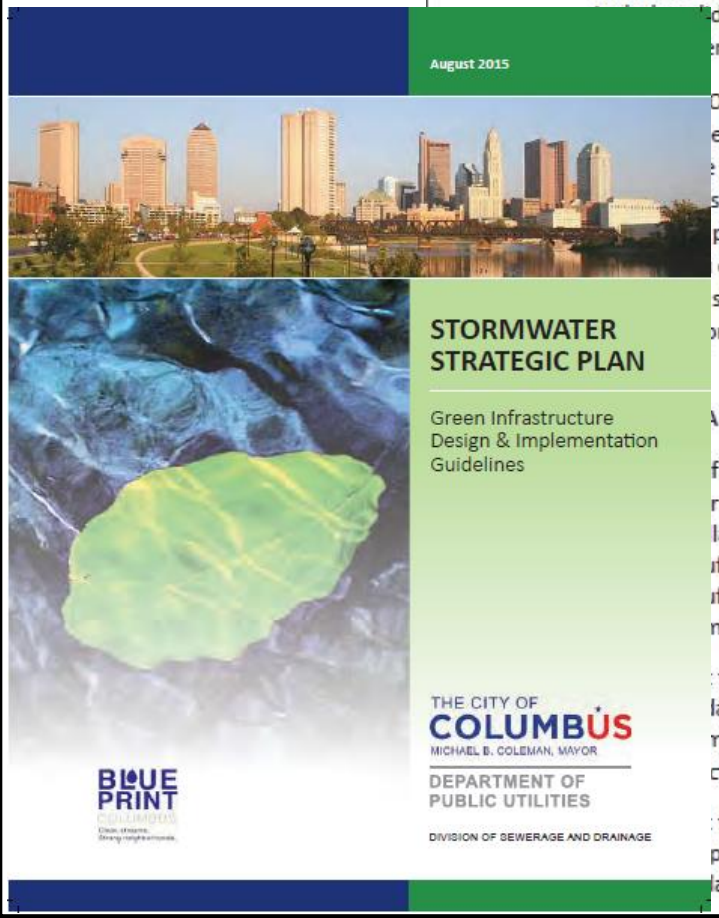
[illegible]ATIONS:

[illegible]fications and details related to [illegible]rials, aggregate, geotextiles, sizing, [illegible]lation and maintenance are [illegible]facturer specific. Follow all [illegible]facturer specifications, details and [illegible]mmendations for use.

[illegible] the ASTM requirements of F 2787, [illegible]lard Practice for Structural Design of [illegible]noplastic Corrugated Wall Stormwater [illegible]ction Chambers

[illegible] the ASTM requirements of F 2418 [illegible]propylene chambers) and F 2922 (polyethylene chambers) Meet the soil-structure interaction design [illegible]ards of the AASHTO LRFD Bridge Design Specification, Section 3 and Section 12.

Prefabricated Buried Infiltration Structures (Source: CDM Smith)



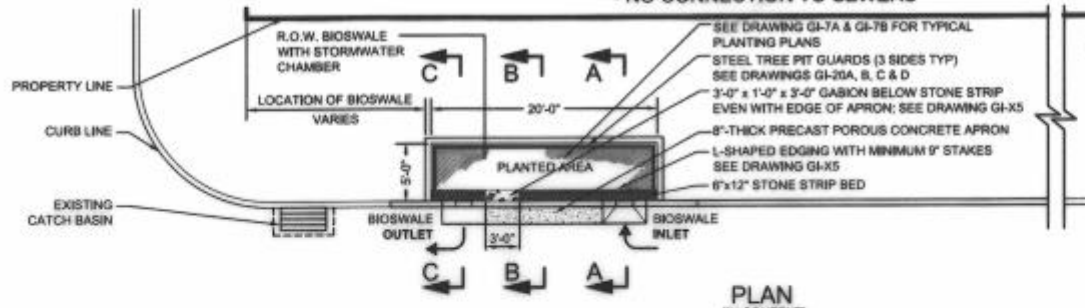
New York City

GI–X1

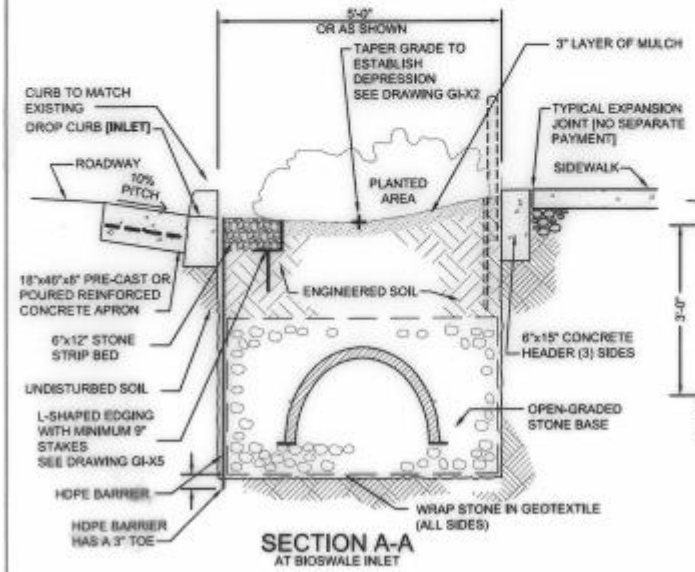
CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF GREEN INFRASTRUCTURE

STANDARD FOR 20'x5' R.O.W. BIOSWALE WITH STORMWATER CHAMBER

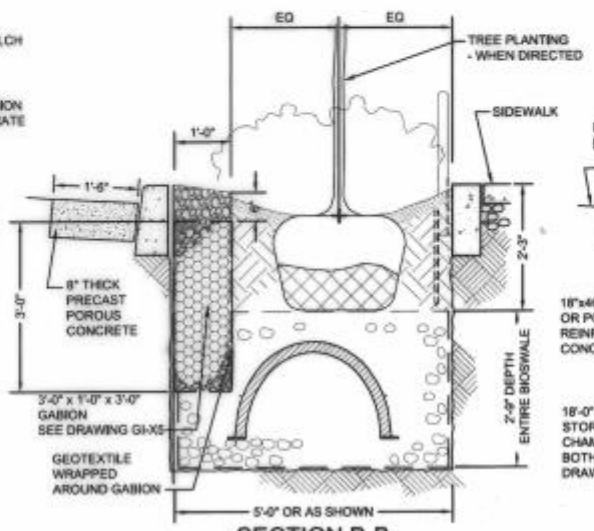
- NO CONNECTION TO SEWERS



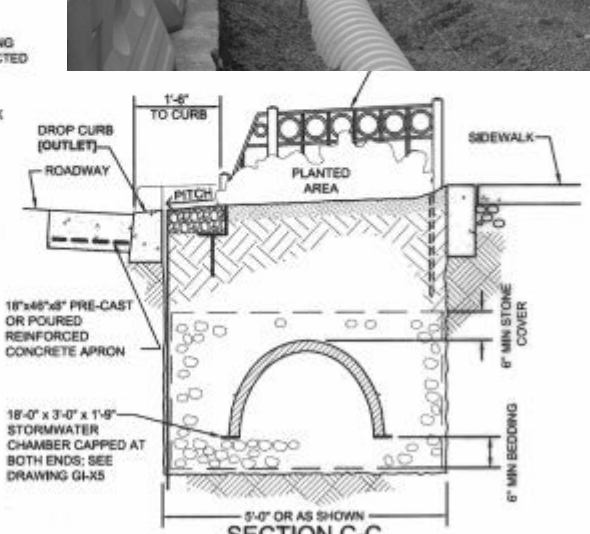
PLAN
(IN CONTEXT)



SECTION A-A
AT BIOSWALE INLET



SECTION B-B
AT MIDSECTION (LOWEST POINT)



SECTION C-C
AT BIOSWALE OUTLET

P.E.
ASSISTANT COMMISSIONER, OFFICE OF GREEN INFRASTRUCTURE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

1/21/2013
DATE

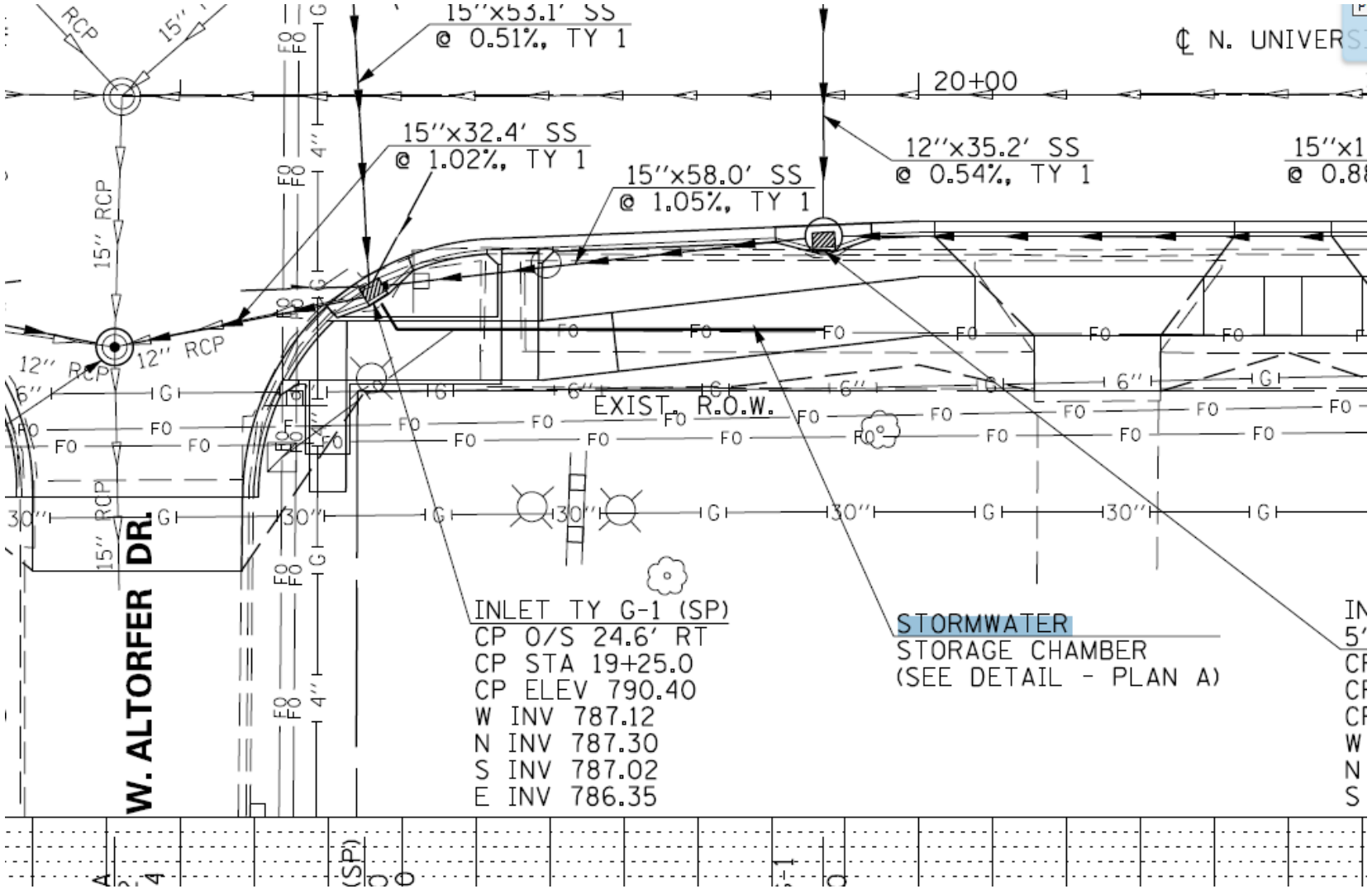
CITY OF PEORIA

DEPARTMENT OF PUBLIC WORKS

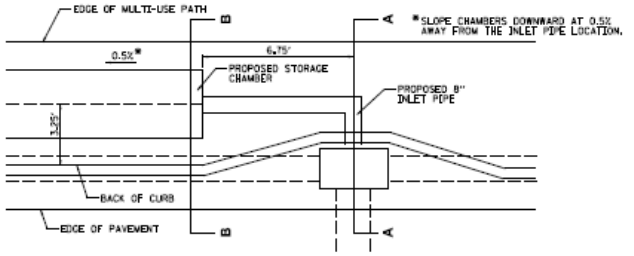
UNIVERSITY STREET (FAU 6593)
PIONEER PARKWAY TO TOWNLINE ROAD

F.A.U. ROUTE #6593
UNIVERSITY STREET
SECTION: 17–00371–00–PV
EDA ID # 06–79–06082
JOB # C–94–091–17 & P–94–026–17
PEORIA COUNTY

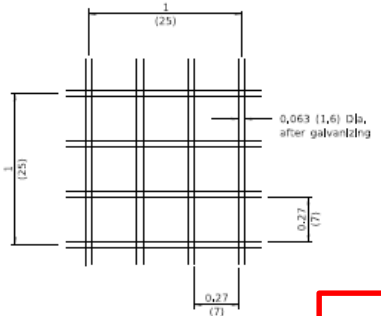
City R.O.W.


15"x53.1' SS
@ 0.51%, TY 1
℄ N. UNIVERS
20+00
15"x32.4' SS
@ 1.02%, TY 1
15"x58.0' SS
@ 1.05%, TY 1
12"x35.2' SS
@ 0.54%, TY 1
15"x1
@ 0.8
15" RCP
12" RCP
12" RCP
15" RCP
EXIST. R.O.W.
W. ALTORFER DR.
INLET TY G-1 (SP)
CP O/S 24.6' RT
CP STA 19+25.0
CP ELEV 790.40
W INV 787.12
N INV 787.30
S INV 787.02
E INV 786.35
STORMWATER
STORAGE CHAMBER
(SEE DETAIL - PLAN A)

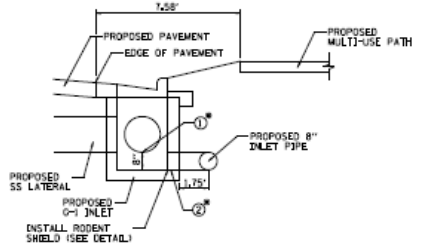
Cross Section B-B/D-D



PLAN A

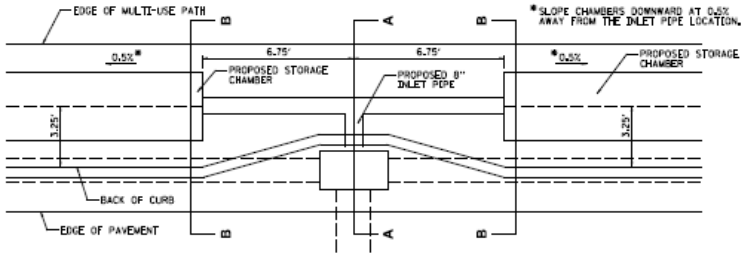


SECTION A-A

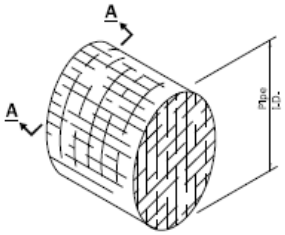


SECTION A-A

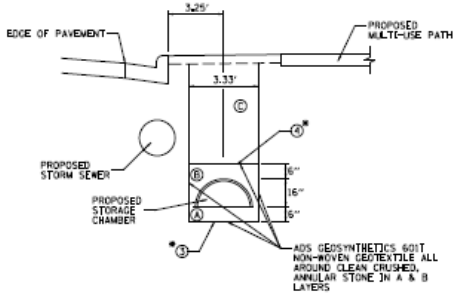
*SEE ELEVATION CHART



PLAN B

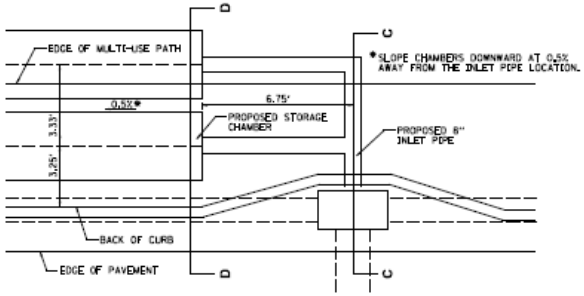


DETAIL OF RODENT SHIELD

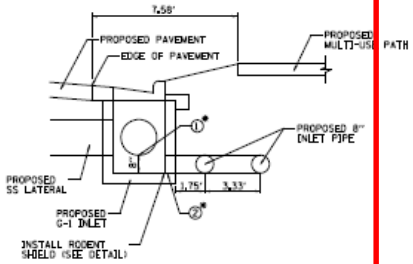


SECTION B-B

*SEE ELEVATION CHART

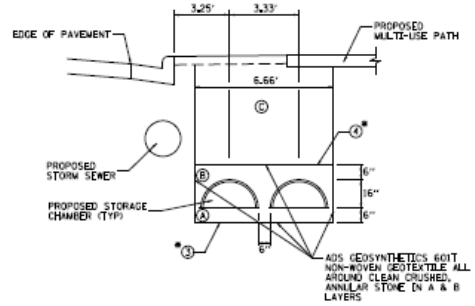


PLAN C



SECTION C-C

*SEE ELEVATION CHART



SECTION D-D

*SEE ELEVATION CHART

FILE NAME =	USER NAME = nbrandle	DESIGNED - MSL	Hutchison Engineering, Inc.	CITY OF PEORIA DEPARTMENT OF PUBLIC WORKS	N. UNIVERSITY ST. STORMWATER STORAGE CHAMBER	F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
	PLOT SCALE = 48.0000 ' / in.	CHECKED - MSL				6593	17-00371-00-PV	PEORIA	316	206
Default	PLOT DATE = 4/16/2018	DATE - 3/5/18			SCALE: N/A SHEET 1 OF 2 SHEETS STA. N/A TO STA. N/A			CONTRACT NO.		
		DRAWN - BD/SPH						ALIGNED | FED. AID PROJECT		


PIPCO
CAT
320E
PIPCO
PIPCO
Brian Windish

Washington DOT Highway Runoff Manual 2014

IN.04 – Infiltration Vault

Infiltration Vault along SR 303 in Kitsap County

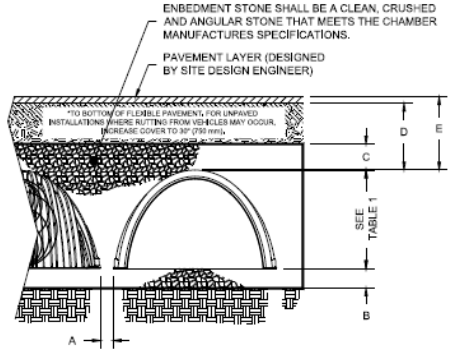
Description: Bottomless underground structures used for temporary storage and infiltration of stormwater runoff to groundwater. May be modified for runoff treatment.

Geometry Limitations

Limit to sites where infiltration ponds cannot be located due to site constraints.

BMP Function

- ☑ LID
- ☑ Flow Control
- ☑ Runoff Treatment*
  - ☐ Oil Control
  - ☑ Phosphorus
  - ☑ TSS - Basic
  - ☑ Dissolved Metals - Enhanced



NOTES:

1. CHAMBER DESIGN SHALL BE IN ACCORDANCE WITH ASTM F2787.
2. CHAMBER FOOT MUST BE DESIGNED TO DEVELOP A STRUCTURAL STONE COLUMN BETWEEN ROWS.
3. THE CHAMBER MANUFACTURES CUMULATIVE STORAGE SHALL BE USED AND INCLUDED IN THE DESIGN DOCUMENTATION.
4. THE CHAMBER ROW SPACING, BASE STONE, COVER STONE, MINIMUM COVER, AND MAXIMUM COVER SHALL BE PER THE CHAMBER MANUFACTURES SPECIFICATIONS.

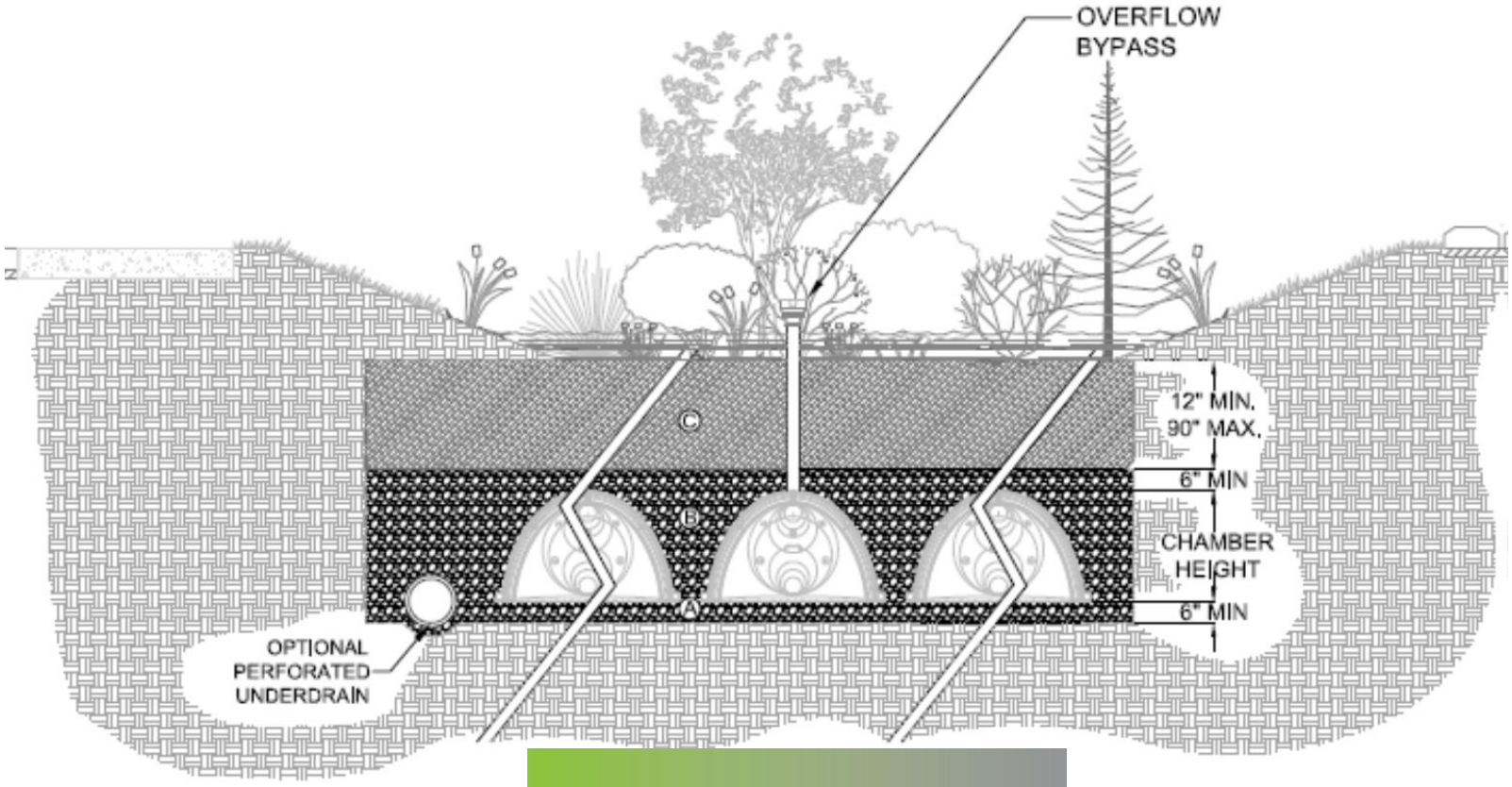
CITY OF GIG HARBOR
ENGINEERING DIVISION

STORMWATER CHAMBER DETAIL

DETAIL NO. 3-06

APPROVED FOR PUBLICATION
CITY ENGINEER _____ DATE MAY 16, 2016

Sustainable Design



Evaluation of Underground Stormwater Infiltration Systems

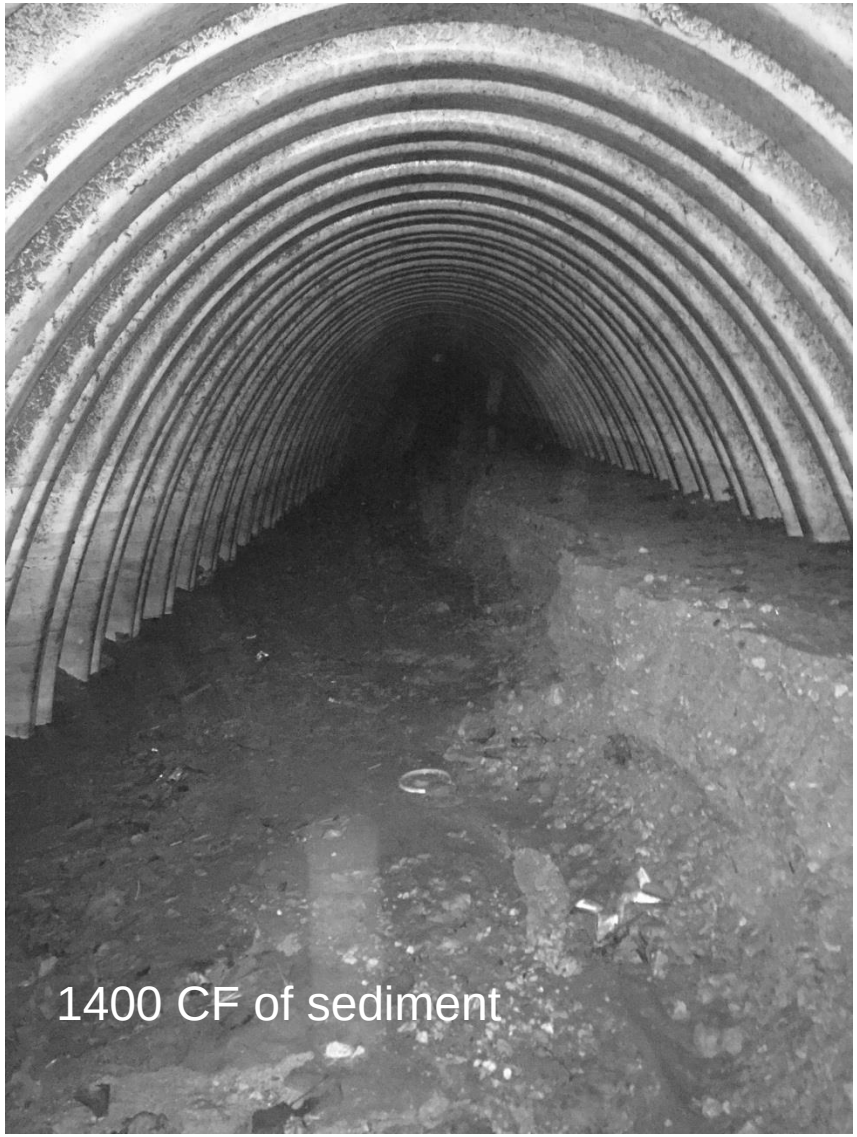
Toronto Conservation and Region Authority 2010

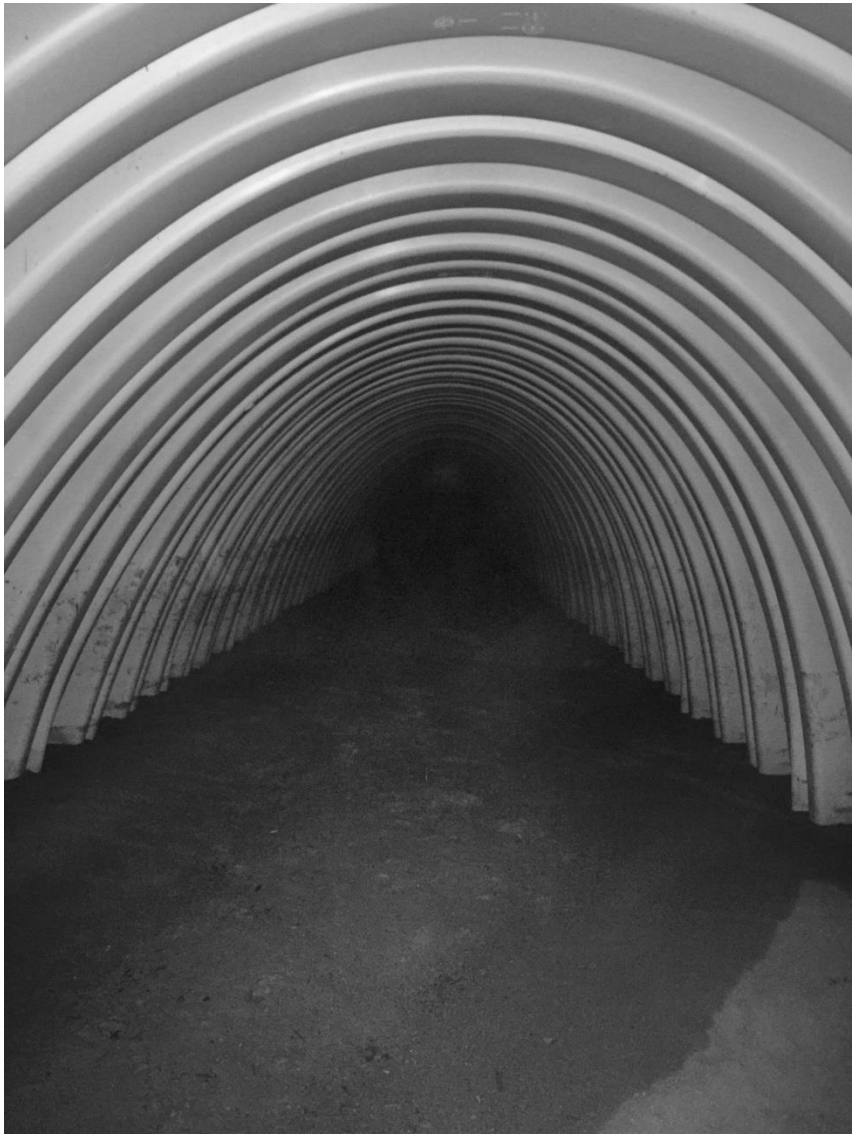
Inflow, Overflow and Infiltration Performance

Parameter	Monitoring Period	
	Jun. to Dec. 2008 [1]	Jan. to Dec. 2009 [2]
Total Precipitation [3] (mm)	333	790
Total Inflow Volume [4] (m^3)	8,137.099	17,802.563
Total Overflow Volume (m^3)	963.540	3,012.101
Total Infiltrated Volume [5] (m^3)	7,173.559	14,790.462
Runoff Reduction Ratio [6]	0.88	0.83
	33 events	44 events

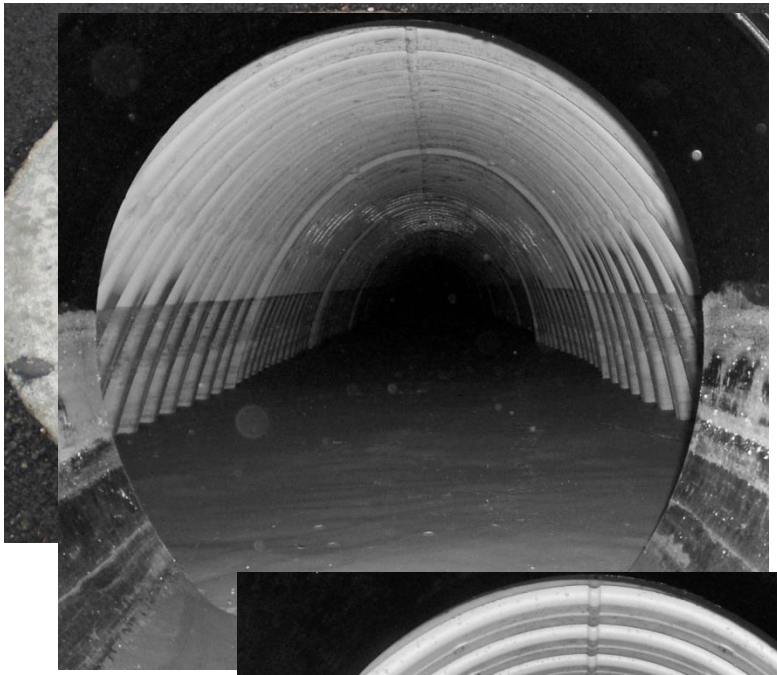
Volume Reduction Example

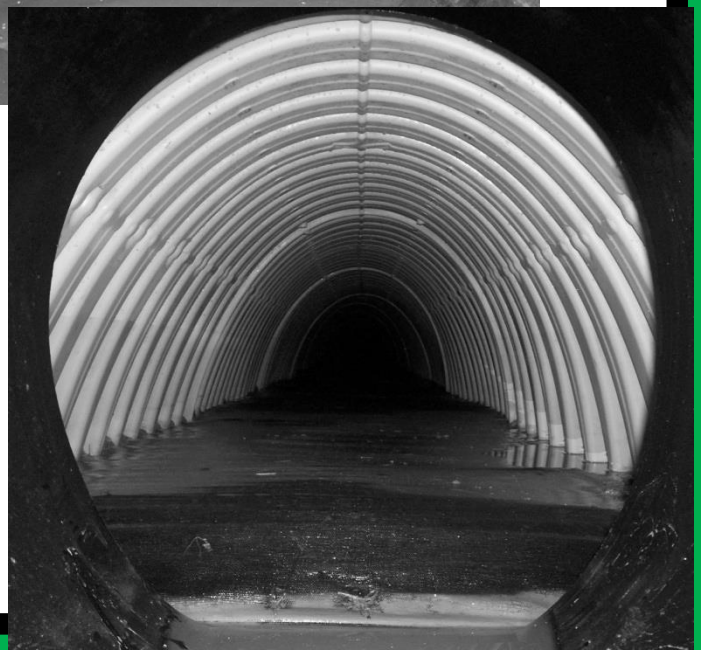
Pretreatment chamber SWPPP protection

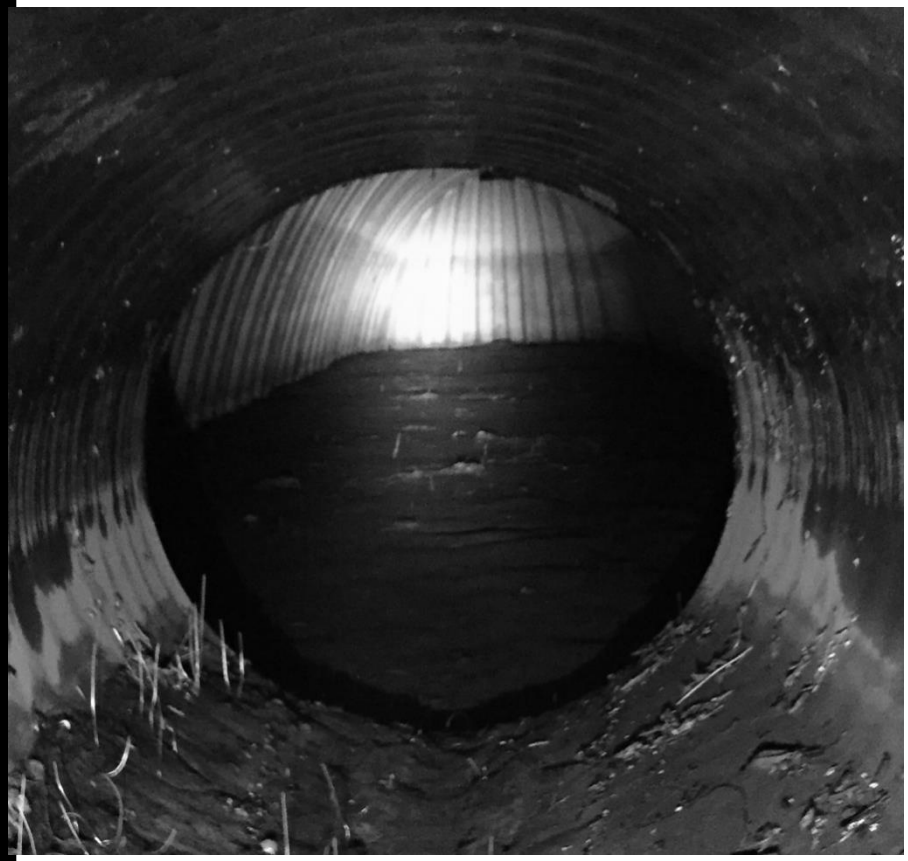


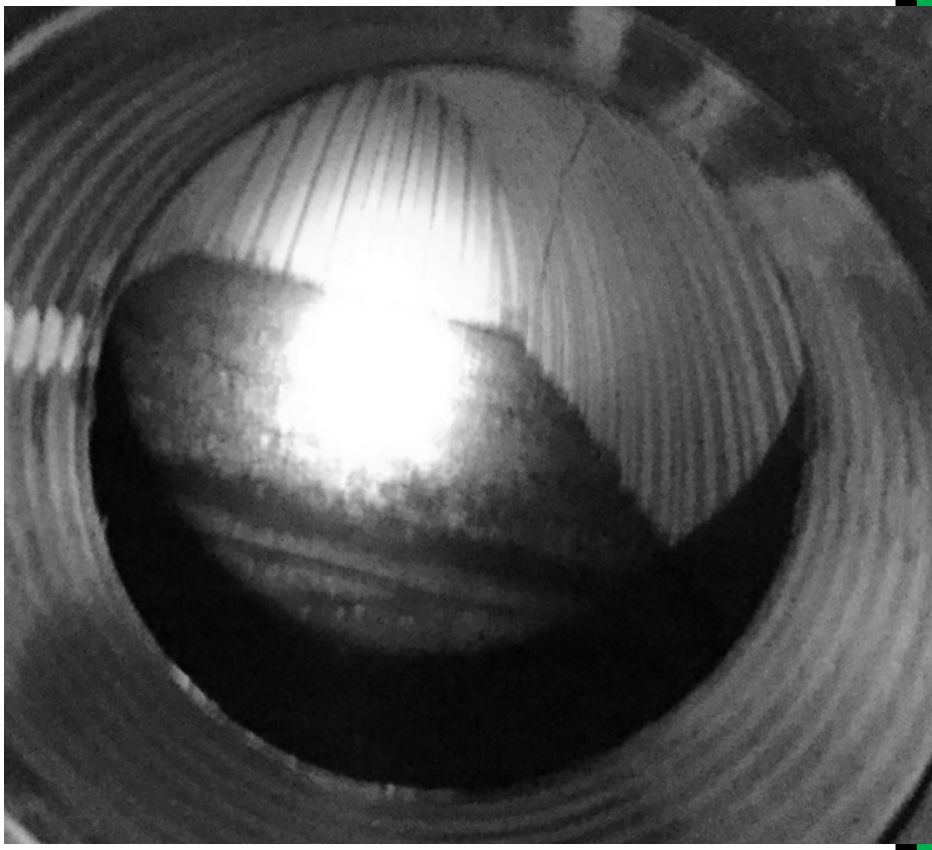


Maintenance





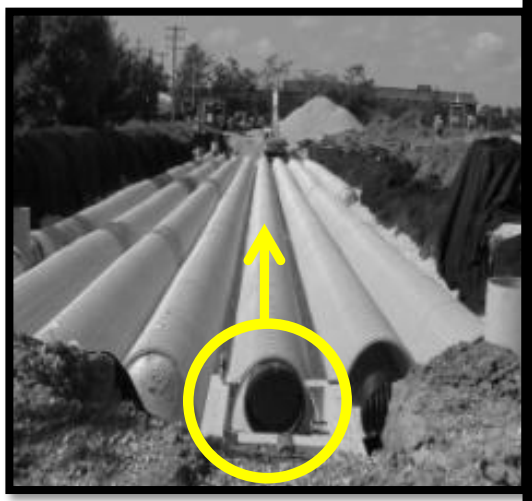




Trash Control

Real Sustainability Example – St. Louis

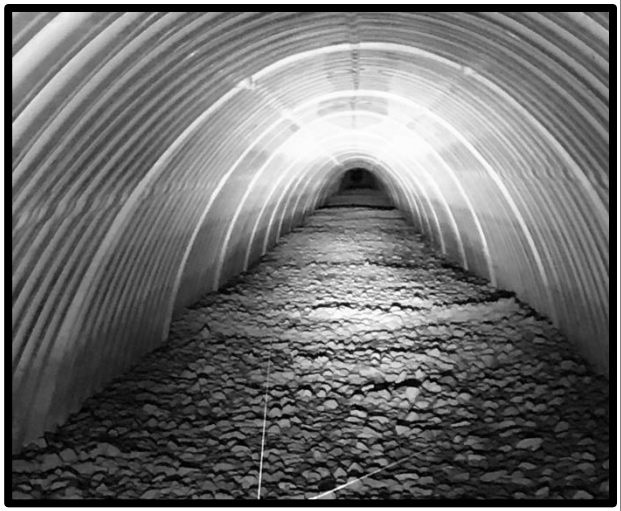
Daily Truck Traffic



September 2005

March 2007

April 2013

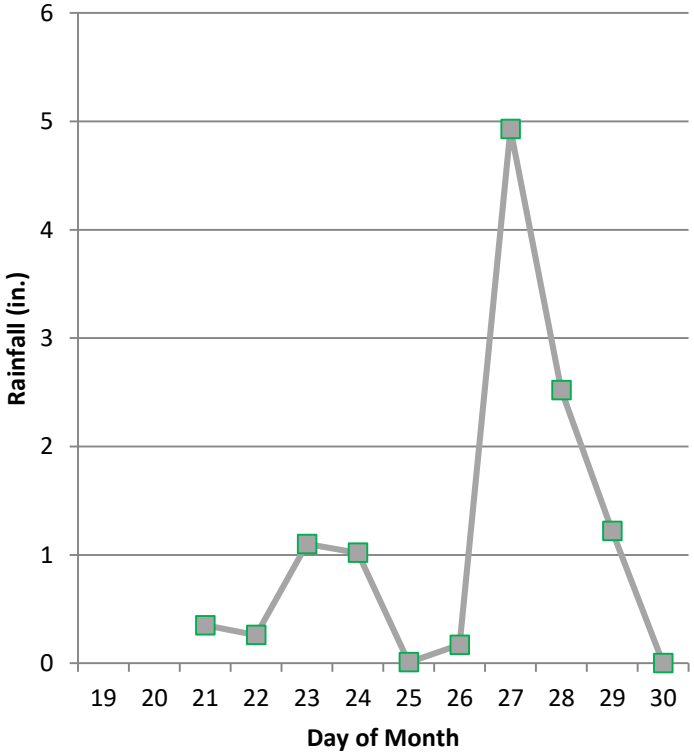


September 2017

Other Observations

COMMUNITY COLLABORATIVE RAIN, HAIL & SNOW NETWORK
"Because every drop counts"
Home | States | View Data | Maps | My Data Entry | Login
View Data : Rainy Days Report US Units

MAX Daily Rainfall
late-December 2015
St. Louis MO



11.58”

Comparison

	Traditional Green	Chambers
Water Quality	Yes	Pretreatment
Trash Collection	No	Yes
Attenuation	Yes	Yes
Infiltration	Site dependent	Site dependent
Evaporation	Technology dependent	No
Transpirations	Technology dependent	No
Detention	Somewhat	Yes
Thermal Reduction	Yes	Yes
Construction timing	Very near end	Anytime
Weather sensitivity	Technology dependent	None
Maintenance	Significant	Minor, infrequent
Replacement	5-10 years???	Never


Environmental
Sustainability
Social
Economic

QUESTIONS?

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