Sixth Street Park, Arts and River Connectivity Improvements (PARC)

Conceptual Low Impact Development Report – DRAFT

May, 2018

PRESENTED TO

City of Los Angeles
Department of Public Works
Bureau of Engineering
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APPENDICIES

1.0 INTRODUCTION

The Sixth Street Viaduct Division of the City of Los Angeles (City) Department of Public Works (DPW), Bureau of Engineering (BOE), is proposing the construction of the Sixth Street Park, Arts, River & Connectivity Improvements (PARC) Project. The Sixth Street PARC Project includes the creation of public recreational space on approximately 12 acres in areas underneath and adjacent to the Sixth Street Viaduct (Viaduct) in the City of Los Angeles.

This report summarizes the Project's mitigation requirements set by the Planning and Land Development Handbook for Low Impact Development (LID Handbook) dated May 9, 2016.

2.0 PROJECT DESCRIPTION AND PURPOSE

The proposed Project is located under and adjacent to the Sixth Street Viaduct (Viaduct) between Mateo Street to the west and the United States Highway 101 (U.S. 101) to the east in the City of Los Angeles (Project Area). The proposed Project will connect the Downtown LA Arts District, Boyle Heights and the Los Angeles River (River). The Project Area is located in Council District 14 at the boundary of the City of Los Angeles' Central City North and Boyle Heights Community Plan areas.

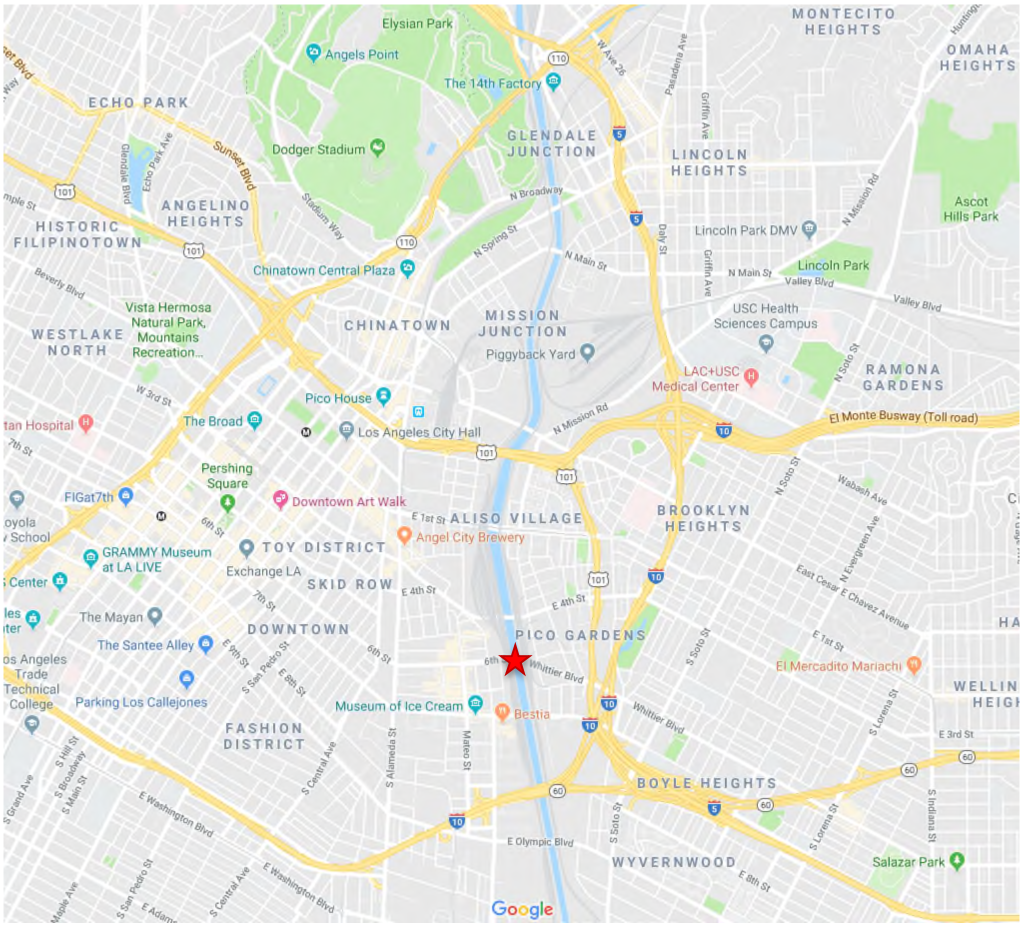


Figure 1. Project Location

The Project Area is located within a fully developed, mixed-use urban setting adjacent to the River. Land uses along the north and south sides of the Viaduct are predominately industrial and commercial. The existing space was primarily developed with industrial and commercial buildings and parking lots that have since been removed as part of the Sixth Street Viaduct's construction. The Project proposes to redevelop this area with new park space, which classifies the Project as a redevelopment project per the City of Los Angeles LID Handbook. Therefore, the Project will be designed to comply with the requirements of the LID Handbook. Additional improvements will include modifications to the adjacent roadways and the construction of new bicycle path connections within the Los Angeles River. Per the LID Handbook, the Stormwater LID Ordinance does not apply to infrastructure projects within the public right-of-way. Therefore, the roadway improvements are not addressed in this Report. The requirements of the LID Handbook were not applied to the bicycle path improvements to be constructed within the Los Angeles River since the construction of Best Management Practices (BMPs) within the large flood control facility would not be feasible.

3.0 HYDROLOGY

A hydrology analysis was performed in compliance with the Los Angeles County Department of Public Works Hydrology Manual dated January 2006. Per the LID Handbook, the onsite stormwater management (BMPs) shall be properly sized to mitigate the greater volume of water produced by either the:

- 0.75-inch, 24-hour storm event, or
- 85th percentile, 24-hour storm event.

Per the Los Angeles County Hydrology Map (located at http://dpw.lacounty.gov/wrd/hydrologygis/), the 85th percentile, 24-hour storm event produces one (1) inch of rain at the project location. Therefore, the rainfall depth of one (1) inch governs and was used for this analysis. The HydroCalc program, developed by Los Angeles County, was used to calculate the peak flow rates and peak flow volumes for each of the areas. The HydroCalc program utilizes the Modified Rational Method. Input data from the Los Angeles County Hydrology Map is included in **Appendix B**. Reports generated by the HydroCalc program are included in **Appendix C**.

The following table summarizes the attributes for the PARC subareas shown on the LID Exhibit in **Appendix A** in addition to the peak flow rates and peak flow volumes from the HydroCalc program results.

Sixth Street PARC					Sixth Street Viaduct				
Subarea	Area, ac	% Imp.	Q, cfs	V, cf	Subarea	Area, ac	% Imp.	Q, cfs	V, cf
P1	1.78	42	0.32	2799	V1	0.84	100	0.31	2722
P2	0.19	5	0.01	96	V2	0.74	100	0.26	2398
P3	0.20	65	0.06	448	V3	0.58	100	0.20	1879
P4	0.27	1	0.01	105	V4	0.72	100	0.23	2333
P5	0.19	5	0.01	96	V5	0.65	100	0.22	2106
P6	0.51	25	0.05	551	V6	0.69	100	0.24	2236
P7	0.15	6	0.01	80	V7	0.69	100	0.24	2236
P8	0.45	76	0.16	1150	V8	0.69	100	0.24	2236
P9	1.44	43	0.29	2309	V9	0.69	100	0.24	2236
P10	0.68	15	0.05	539	V10	0.64	100	0.22	2074
P11	0.34	30	0.04	416	-	-	-	-	-
P12	0.47	1	0.01	183	-	-	-	-	-
P13	0.02	1	0.00	8	-	-	-	-	-

Table 1. 85th Percentile, 24-Hour Storm Event Results

4.0 LOW IMPACT DEVELOPMENT

The proposed PARC Project will replace approximately 12 acres of previously developed impervious surfaces, consisting of pollutant-producing industrial and commercial buildings and parking lots, with new park spaces that will decrease the overall impervious footprint and improve the site's water quality. In the existing condition, runoff within the Project footprint was captured by existing local drainage systems and conveyed to the Los Angeles River untreated. The downstream receiving waters from the Project are listed for water quality impairments on the most recent 303(d)-list and are summarized below.

- LA River Reach 2 (Carson to Figueroa Street) – Ammonia, Coliform Bacteria, Copper, Lead, Nutrients (Algae), Oil, and Trash.
- LA River Reach 1 (Estuary to Carson Street) – Ammonia, Cadmium, Coliform Bacteria, Dissolved Copper, Cyanide, Diazinon, Lead, Nutrients (Algae), pH, Trash, and Dissolved Zinc.
- LA River Estuary (Queensway Bay) – Chlordane (sediment), DDT (sediment), PCBs (sediment), Sediment Toxicity, and Trash.
- San Pedro Bay Near/Off Shore Zones – Chlordane, DDT (tissue & sediment), PCBs, and Sediment Toxicity.

The PARC Project was designed for compliance with the City's LID Handbook in order to reduce the pollutant loading of the Sixth Street Viaduct and PARC Projects.

Although the Sixth Street Viaduct Project is not part of the PARC Project, treatment BMPs for the Viaduct's tributary runoff will be located within the PARC project site. Runoff from the Viaduct will be diverted to the PARC project site via storm drain pipes located within the proposed Viaduct bents. The following constraints limit the options for handling and treating this tributary runoff:

- Infiltration at the project site is not feasible due to the presence of soil and groundwater contamination that was found during the Viaduct Project and PARC Project environmental site investigations.
- Capture and Reuse at the site is not feasible for the significant runoff volume from the Viaduct due to the limited PARC budget, which lacks the necessary funding to provide treatment and storage of stormwater to be reused for irrigation across the linear site.
- The inverts of the outlet pipes from the Viaduct bents are set a minimum of 2 -3 feet below grade. Available space within the PARC project is limited, and there is not sufficient space to provide deep biofiltration basins.

Per Section 1 of the City's LID Handbook, the City's Stormwater LID Ordinance does not apply to "infrastructure projects within the public right-of-way." Given the above Project constraints, the Project proposes to utilize structural proprietary BMPs to treat the tributary runoff from the Viaduct in place of LID BMPs. These BMPs will consists of proprietary vaults equipped with media filter cartridges designed to remove pollutants such as sediments, oil & grease, metals, organics, and nutrients. The BMPs will be designed with an inlet chamber to provide pre-treatment of gross solids and allow for by-pass of larger storm events. The proposed BMPs will be installed to treat the runoff from all of the Viaduct subareas shown on the LID Exhibit in **Appendix A** except for subareas V.2 through V.4. The runoff to these subareas cannot be routed through the proposed BMPs due to the discharge location constraints. Runoff conveyed through the Viaduct bents within subareas V.3 and V.4 discharges directly to the Los Angeles River, while runoff conveyed through the Viaduct bents within subarea V.2 discharges to the low point of the proposed Arts Plaza. The proposed Arts Plaza drains directly to the Los Angeles River through the existing access tunnel. Viaduct runoff from these subareas will be treated by filter inserts installed within the Viaduct grated catch basins. Results of the BMP calculations are included in **Appendix D** and are summarized in Section 5 of this report.

For the remaining PARC Project subareas not covered by the Sixth Street Viaduct (Subareas P.1 through P.13 shown on the LID Exhibit in **Appendix A**), LID BMPs will be installed in accordance with the City's Stormwater LID Ordinance. As discussed above, infiltration at the Project site is not feasible due to the presence of contaminated soil and groundwater at the site. Therefore, the Project proposes to utilize LID Capture and Use BMPs, in the form of the Environmental Passive Integrated Chamber (EPIC) System or an approved equal, to meet the LID ordinance requirements for the PARC subareas with the highest pollutant load potentials (Subareas P.1, P.8, and P.9). The EPIC System is designed to convey captured runoff volume into a perforated pipe network within a sand media bed located below a landscaped area. Capillary action causes the water to rise through the sand media bed up to the plant roots. Site runoff will be diverted to a temporary storage vault equipped with a submersible pump designed to convey the runoff to the pipe network within the sand media bed. The remaining PARC sub-areas not mitigated by the EPIC System have been deemed to be self-treating as they largely consist of pervious surfaces with some minor impervious surfaces such as pedestrian walkways. Results of the BMP calculations are included in **Appendix D** and are summarized further in Section 5 of this report. BMP locations can be seen on the LID Exhibit.

Hydromodification impacts were not evaluated for the Project, since the project does not discharge to a natural drainage system. The Project site discharges into concrete lined, channelized, and engineered conveyances (Los Angeles River) from the site to the Pacific Ocean. Therefore, no additional analysis or hydromodification controls were necessary for the project.

Applicable structural source control measures were identified for the proposed project based on Section 3 of the City's LID handbook. Additional good housekeeping, non-structural source control measures were identified for the Project. Tables 2 and 3 below summarize the structural and non-structural BMPs for the project. Applicable fact sheets are included in **Appendix E.** Descriptions are provided for the applicable measures after each source control table. Additional educational materials for the City of Los Angeles are included within **Appendix G.** An Operations and Maintenance Plan has been created for the proposed BMPs and source control measures (see **Appendix F**).

Identifier	Name	Included	Not Applicable	Reason (If Not Applicable)
S-1	Storm Drain Message and Signage	☒	☐	
S-2	Outdoor Material Storage Area Design	☒	☐	
S-3	Outdoor Trash Storage Area Design	☒	☐	
S-4	Outdoor Loading/Unloading Dock Area Design	☐	☒	Outdoor loading/unloading docks are not proposed by the project.
S-5	Outdoor Repair/Maintenance Bay Design	☐	☒	Outdoor repair and maintenance areas are not proposed by the Project.
S-6	Outdoor Vehicle/Equipment/ Accessory Washing Area Design	☐	☒	Outdoor washing areas are not proposed by the Project.
S-7	Fueling Area Design	☐	☒	Fueling areas are not proposed by the Project.

Table 2. Structural Source Control BMPs

S-1 – Storm Drain Message and Signage

Existing and proposed storm drain catch basins within the vicinity of the Project shall be marked and maintained per the direction of Fact Sheet S-1, included in **Appendix E.** Stencil details shall be included on the Construction Plans.

S-2 – Outdoor Material Storage Area Design

Proposed outdoor storage areas shall be organized and maintained to prevent stored materials from being permitted to runoff with stormwater as described in Fact Sheet S-2, included in **Appendix E**. The outdoor storage of toxic and hazardous materials is not anticipated or permitted.

S-3 – Outdoor Trash Storage Area Design

Proposed outdoor trash storage enclosures shall be organized and maintained to prevent the transportation of trash and debris in stormwater as described in Fact Sheet S-3, included in **Appendix E**. Bins and dumpsters shall remain covered.

Identifier	Name	Included	Not Applicable	Reason (If Not Applicable)
N-1	Employee Training	☒	☐	
N-2	Common Area Landscape Management	☒	☐	
N-3	Common Area Litter Control	☒	☐	
N-4	Common Area Catch Basin Inspection	☒	☐	
N-5	Street Sweeping Parking Lots	☒	☐	
N-6	BMP Maintenance	☒	☐	

Table 3. Structural Source Control BMPs

N-1 – Employee Training

Operations and maintenance employees shall be trained and made aware of the source controls, LID BMPs, educational materials, and maintenance requirements outlined in this report at first hire and yearly thereafter.

N-2 – Common Area Landscape Management

A landscape maintenance program shall be established in order to optimize water efficiency, limit pollutant introduction from fertilizers and pesticides, manage landscape waste, and prevent soil erosion.

N-3 – Common Area Litter Control

A waste management program shall be implemented to inspect the proposed project areas for litter and pick up any litter as necessary on a regular basis.

N-4 – Common Area Catch Basin Inspection

Catch basins shall be inspected and maintained, at a minimum, yearly and prior to the rainy season.

N-5 – Street Sweeping Parking Lots

The parking plaza shall be vacuum swept, at a minimum, yearly and prior to the rainy season.

N-6 – BMP Maintenance

Proposed structural source controls, non-structural source controls, and LID BMPs shall be maintained as outlined in the Operations and Maintenance Plan (see **Appendix F**).

5.0 BMP SUMMARY

Table 4 below summarizes the results of the structural BMP sizing calculations for the Sixth Street Viaduct subareas. The BMPs shall consist of Oldcastle Perk Filter concrete vaults or an approved equal. The BMPs have been sized for the 85th Percentile, 24-Hour Event peak flow rates included in Section 2 and **Appendix C**. As discussed within Section 4, the discharge constraints for subareas V3 through V5 prevent the construction of BMPs for these subareas. Viaduct discharge from the bents in the remaining subareas will be routed through the proposed BMPs. Larger storm events will bypass through the internal bypass components of the BMPs. See the Hydrology and Hydraulic Analysis prepared by Tetra Tech for additional calculations for the larger storm events. Additional treatment calculations and manufacturer cut sheets for the proposed BMPs are included in **Appendix D**. Proposed locations of the BMPs can be seen on the LID Exhibit in **Appendix A**. Per manufacturer recommendations, the BMPs must be constructed with a difference in elevation between the inlet and outlet that is equal to or greater than the maximum head loss specified for the unit in Table 4 below. Proposed filter cartridges shall be equipped with ZPG media, a propriety blend of zeolite, perlite, and GAC (Granular Activated Carbon) or an approved equal. The media shall provide removal of sediments, oil & grease, metals, organics, and nutrients.

BMP ID.	Subarea ID.	Area, ac	Q_{85th}, cfs	Q_{treat}, cfs	Q_{bypass}, cfs	Vault Size, ft	# of Filters	Stack Config.	Max. Head Loss, ft	Min. Depth, ft
1	V1	0.84	0.31	0.32	8.7	6' x 9'	8	18"	2.3	5.0
2	V5	0.65	0.22	0.27	5.1	4' x 9'	5	12" & 12"	2.9	5.92
3	V6	0.69	0.47	0.48	10.0	6' x 11'	9	12" & 12"	2.9	5.92
	V7	0.69								
4	V8	0.69	0.24	0.27	5.1	4' x 9'	5	12" & 12"	2.9	5.92
5	V9	0.69	0.24	0.27	5.1	4' x 9'	5	12" & 12"	2.9	5.92
6	V10	0.64	0.22	0.27	5.1	4' x 9'	5	12" & 12"	2.9	5.92

Table 4. Sixth Street Viaduct Proprietary Structural BMPs

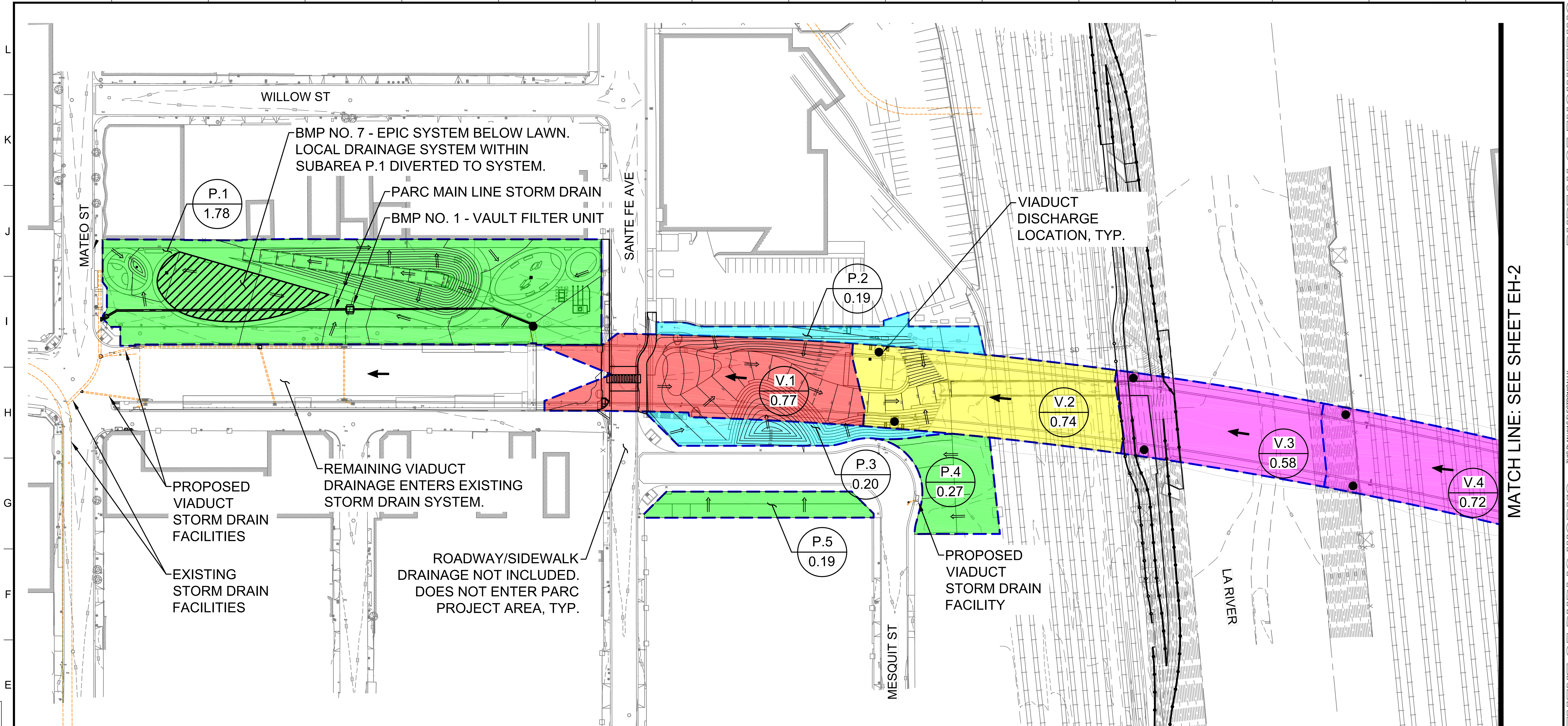
Table 5 below summarizes the results of the LID BMP sizing calculations for the Sixth Street PARC subareas. The calculations are included in **Appendix D**. The proposed BMPs shall consist of the EPIC System or an approved equal. The BMPs have been sized for the 85th Percentile, 24-Hour Event design volumes using the equation provided in Section 4 of the LID Handbook. The EPIC System storage capacity is listed at 2.5 Gal./SF of surface area. This BMP approach is typical for PARC subareas P1, P8, and P9. As discussed within Section 4, the remaining PARC subareas are primarily pervious with limited impervious surfaces such as pedestrian walkways, and they have been deemed to be self-treating. Therefore, additional BMPs are not proposed. These areas are identified in the summary table below.

Storm drainage systems will be installed to convey runoff from Subarea P1, P8, and P9 to the proposed EPIC Systems. Subareas P8 and P9 will share same system. The system will be designed to bypass larger storm events to the site's primary drainage systems per the Project's Hydrology and Hydraulics Analysis prepared by Tetra Tech. Runoff from the 85th Percentile Event will be passed through a hydrodynamic separator to provide pre-treatment of the runoff (see the Table 1 peak flow rates for reference) before being contained within a below-grade storage chamber equipped with a submersible pump. The pump will be used to convey the retained volume to the EPIC System piping, which will be located below the proposed PARC lawn areas shown on the LID Exhibit in **Appendix A**. Capillary action will cause the water to rise through the sand media bend where it will be absorbed by the roots of the proposed lawn area. Typical details and sections of the system are included within **Appendix D**.

BMP ID.	Subarea ID.	Area, ac	V_M, cf	V_M, gal.	Q_M, cfs	A_{min}, sf	$A_{provided}$, sf
7	P1	1.78	2,824	21,126	0.32	8,450	10,580
-	P2	0.19	98	N/A – Primarily Pervious, Self-Treating			
-	P3	0.20	450	N/A – Drains to Arts Plaza Low Point (+/- 18 Feet Below Grade)			
-	P4	0.27	98	N/A – Primarily Pervious, Self-Treating			
-	P5	0.19	95	N/A – Primarily Pervious, Self-Treating			
-	P6	0.51	563	N/A – Primarily Pervious, Self-Treating			
-	P7	0.15	81	N/A – Primarily Pervious, Self-Treating			
8	P8	0.45	1,151	25,987	0.45	10,394	18,540
	P9	1.44	2,323				
-	P10	0.68	537	N/A – Primarily Pervious, Self-Treating			
-	P11	0.34	414	N/A – Primarily Pervious, Self-Treating			
-	P12	0.47	171	N/A – Primarily Pervious, Self-Treating			
-	P13	0.02	7	N/A – Primarily Pervious, Self-Treating			

Table 5. Sixth Street PARC LID BMPs

APPENDIX A – LID EXHIBIT



LEGEND:

(red)	TYPICAL VIADUCT DRAINAGE AREA - DISCHARGES TO PARC PROJECT
(magenta)	VIADUCT DRAINAGE AREA - DISCHARGES DIRECTLY TO RIVER. FILTER INSERTS INSTALLED IN VIADUCT DECK DRAINS.
(yellow)	VIADUCT DRAINAGE AREA - DISCHARGES TO ARTS PLAZA INVERT AND TO THE RIVER THROUGH THE TUNNEL. FILTER INSERTS INSTALLED IN VIADUCT DECK DRAINS.
(green)	PARC PROJECT AREA OUTSIDE OF VIADUCT FOOTPRINT
(cyan)	PARC PROJECT AREA OUTSIDE OF VIADUCT FOOTPRINT - DRAINS TO ARTS PLAZA
(hatched)	EPIC SYSTEM BMP BELOW LAWN AREA
●	VIADUCT DISCHARGE LOCATION
— —	DRAINAGE SUBAREA BOUNDARY
➞	TYP. VIADUCT DRAINAGE PATTERN
⇒	TYP. PARC DRAINAGE PATTERN
X.X / XX.X	SUBAREA / ACREAGE

NOTES:

1. LOCAL PARC PROJECT MINOR STORM DRAINAGE SYSTEMS NOT SHOWN FOR CLARITY.

SCALE: 1" = 60'

PLANS PREPARED BY:
TETRA TECH, INC.
350 SOUTH GRAND AVENUE, SUITE 3310
LOS ANGELES, CALIFORNIA 90071
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CITY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS BUREAU OF ENGINEERING

GARY LEE MOORE, P.E., ENV SP — CITY ENGINEER

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PROJECT: SIXTH STREET PARK, ARTS AND RIVER CONNECTIVITY IMPROVEMENTS (PARC)
ADDRESS: SIXTH STREET OVER THE LOS ANGELES RIVER

WORK ORDER NO. E700235D
FILE NO. --
DRAWING NO. EH-1
SHEET 1 OF 2 SHEETS

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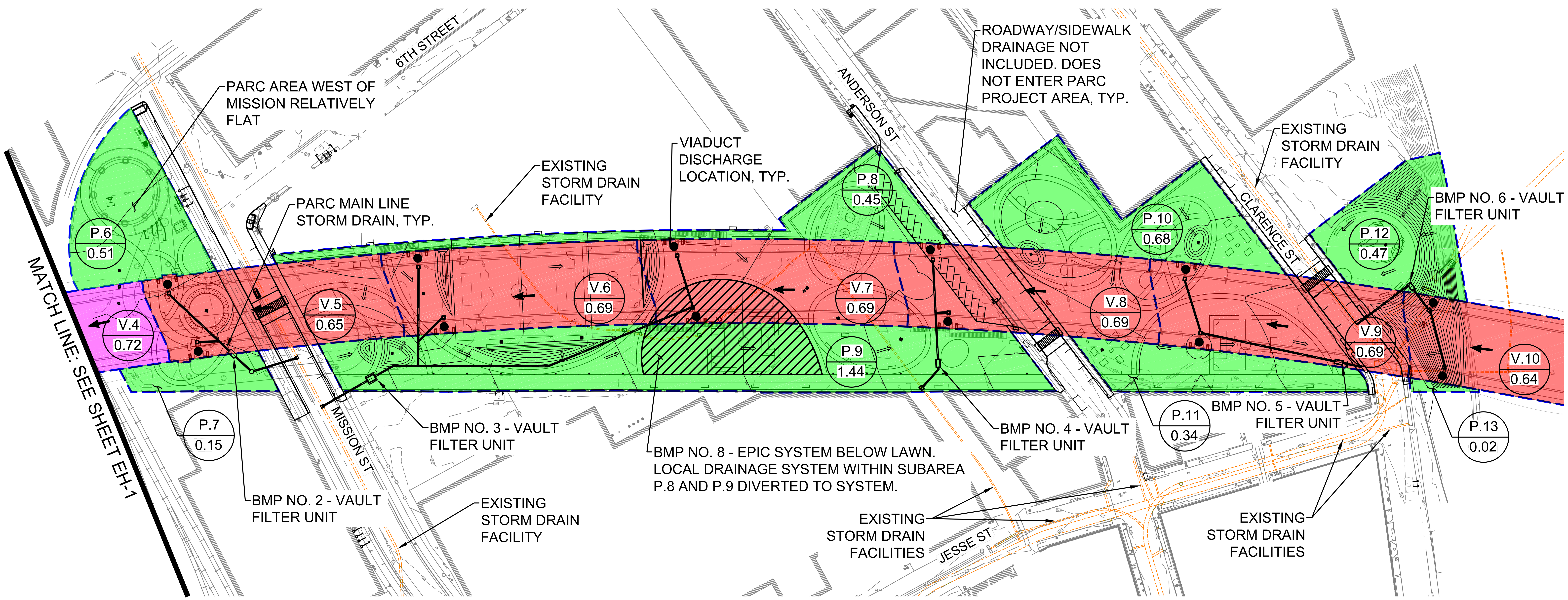

LEGEND:

- TYPICAL VIADUCT DRAINAGE AREA - DISCHARGES TO PARC PROJECT
- VIADUCT DRAINAGE AREA - DISCHARGES DIRECTLY TO RIVER. FILTER INSERTS INSTALLED IN VIADUCT DECK DRAINS.
- VIADUCT DRAINAGE AREA - DISCHARGES TO ARTS PLAZA INVERT AND TO THE RIVER THROUGH THE TUNNEL. FILTER INSERTS INSTALLED IN VIADUCT DECK DRAINS.
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- EPIC SYSTEM BMP BELOW LAWN AREA
- VIADUCT DISCHARGE LOCATION
- DRAINAGE SUBAREA BOUNDARY
- TYP. VIADUCT DRAINAGE PATTERN
- TYP. PARC DRAINAGE PATTERN
- X.X / XX.X — SUBAREA / ACREAGE

NOTES:

1. LOCAL PARC PROJECT MINOR STORM DRAINAGE SYSTEMS NOT SHOWN FOR CLARITY.

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SCALE: 1" = 60'

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ENGINEER:
DESIGNED BY:
DRAWN BY:
CHECKED BY:
APPROVED BY:

VERT. CONTROL:
HORIZ. CONTROL:
SHEET TITLE: PRELIMINARY LID EXHIBIT
PROJECT: SIXTH STREET PARK, ARTS AND RIVER CONNECTIVITY IMPROVEMENTS (PARC)
ADDRESS: SIXTH STREET OVER THE LOS ANGELES RIVER

WORK ORDER NO. E700235D
FILE NO. --
DRAWING NO. EH-2
SHEET 2 OF 2 SHEETS

BUILDING NO.
INDEX NO.
NO. REVISIONS: DATE: BY:

REVISION DATES (DESIGN STAGE ONLY)

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Sheet Version 3.0

APPENDIX B – LOS ANGELES COUNTY GIS DATA

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Hydrology Map

A GIS viewer application to view the data for the hydrology manual.

LAYERS

- ☐ 50yr Two Tenths (Rainfall)
- ☐ DPA Zones
- ☐ Soils 2004
- ☐ TG Page
- ☑ Final 85th Percentile, 24-hr Rainfall
- ☐ Final 95th Percentile, 24-hr Rainfall
- ☐ 1-year, 1-hour Rainfall Intensity

SEARCH

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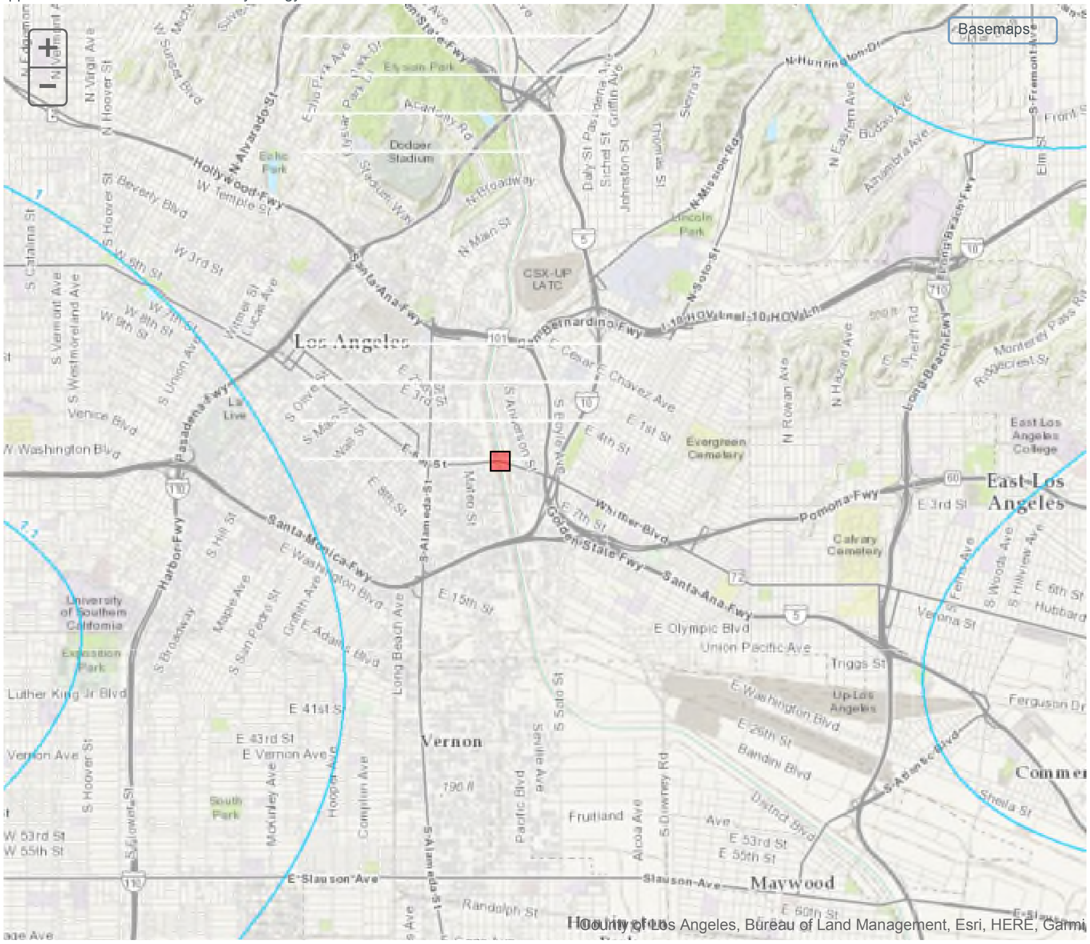
Address Search Results:

6th street viaduct



Map Tips

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Hydrology Map

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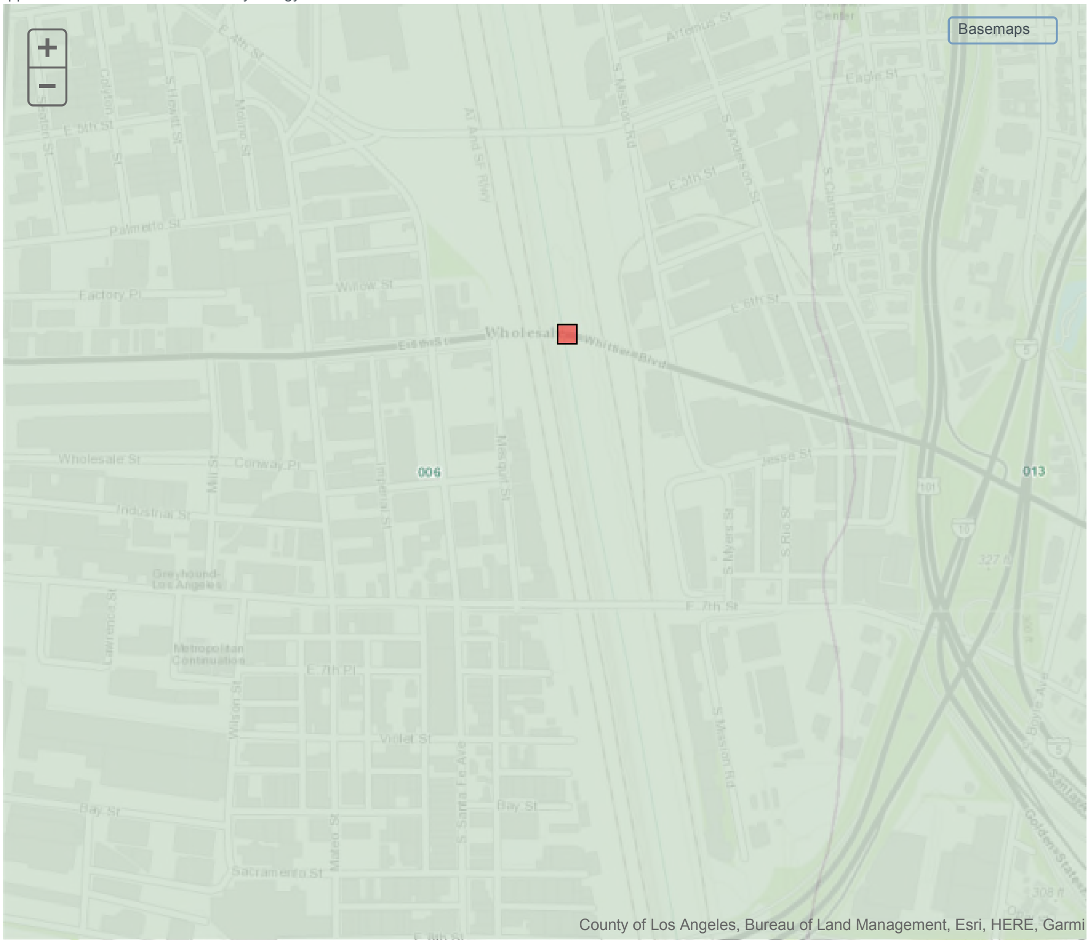
6th street viaduct



Map Tips

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APPENDIX C – HYDROCALC REPORTS

Peak Flow Hydrologic Analysis

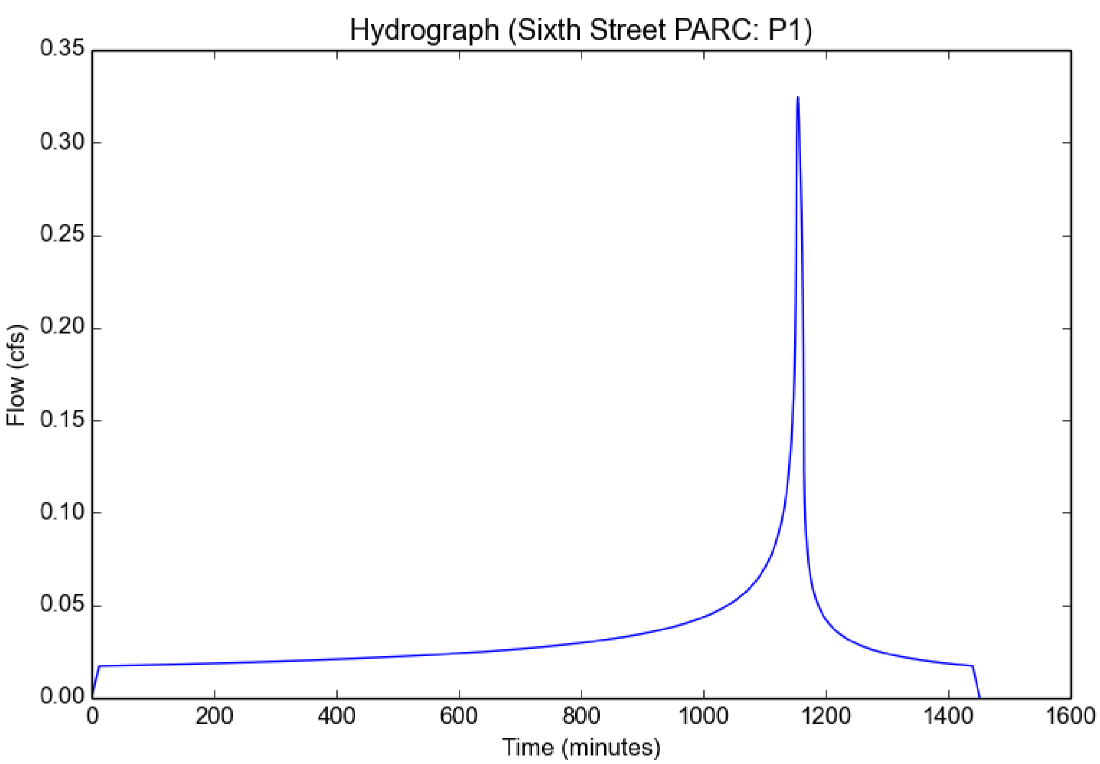
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street PARC Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street PARC
Subarea ID	P1
Area (ac)	1.78
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.42
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.3954
Undeveloped Runoff Coefficient (Cu)	0.1436
Developed Runoff Coefficient (Cd)	0.4613
Time of Concentration (min)	12.0
Clear Peak Flow Rate (cfs)	0.3246
Burned Peak Flow Rate (cfs)	0.3246
24-Hr Clear Runoff Volume (ac-ft)	0.0642
24-Hr Clear Runoff Volume (cu-ft)	2798.5112



Peak Flow Hydrologic Analysis

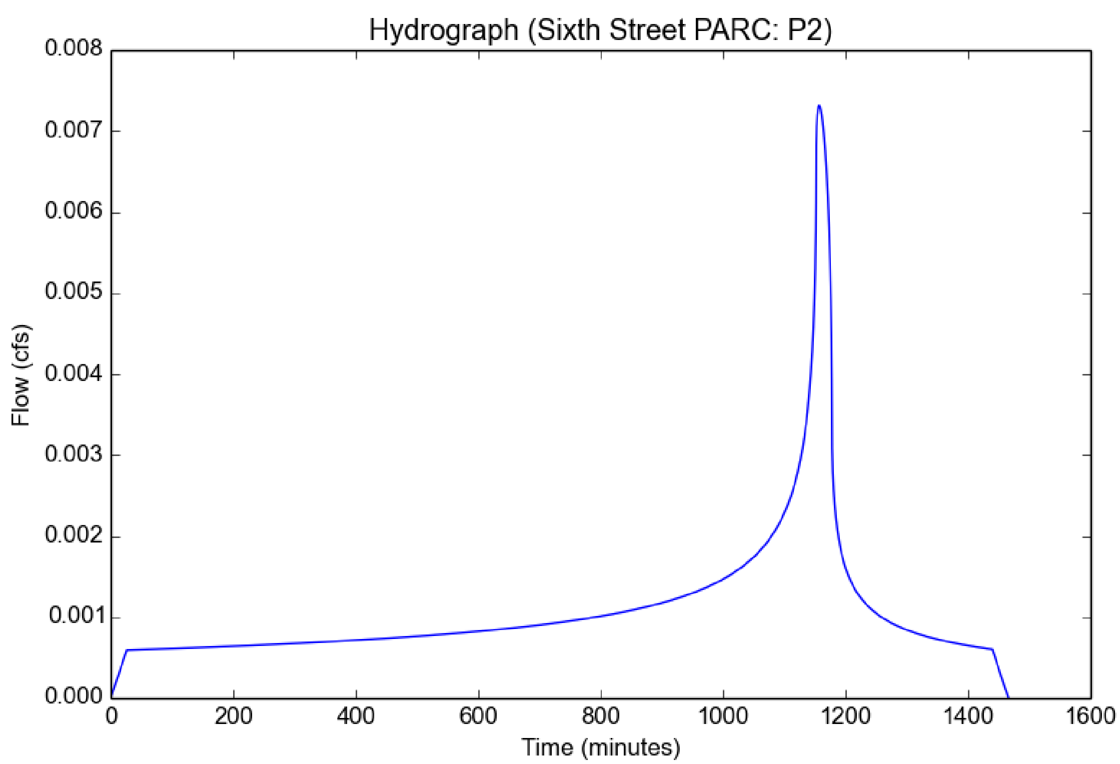
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street PARC Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street PARC
Subarea ID	P2
Area (ac)	0.19
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.05
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.2749
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.14
Time of Concentration (min)	26.0
Clear Peak Flow Rate (cfs)	0.0073
Burned Peak Flow Rate (cfs)	0.0073
24-Hr Clear Runoff Volume (ac-ft)	0.0022
24-Hr Clear Runoff Volume (cu-ft)	95.7608



Peak Flow Hydrologic Analysis

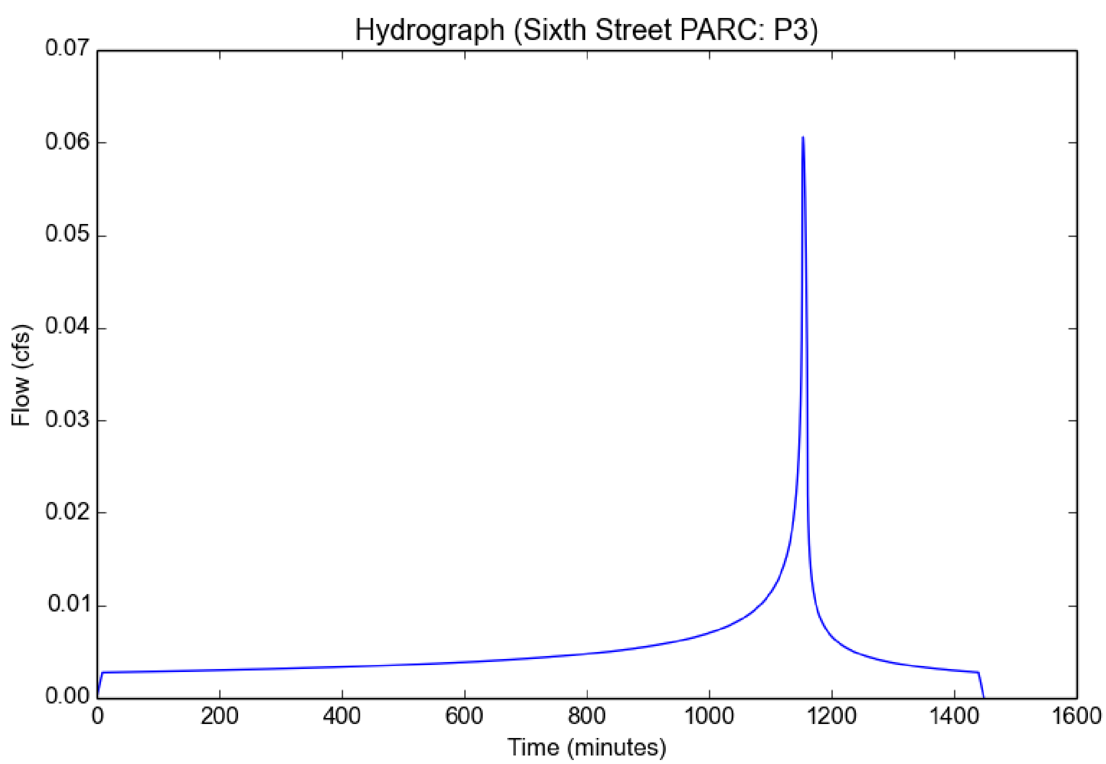
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street PARC Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street PARC
Subarea ID	P3
Area (ac)	0.2
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.65
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.4526
Undeveloped Runoff Coefficient (Cu)	0.2419
Developed Runoff Coefficient (Cd)	0.6697
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	0.0606
Burned Peak Flow Rate (cfs)	0.0606
24-Hr Clear Runoff Volume (ac-ft)	0.0103
24-Hr Clear Runoff Volume (cu-ft)	447.731



Peak Flow Hydrologic Analysis

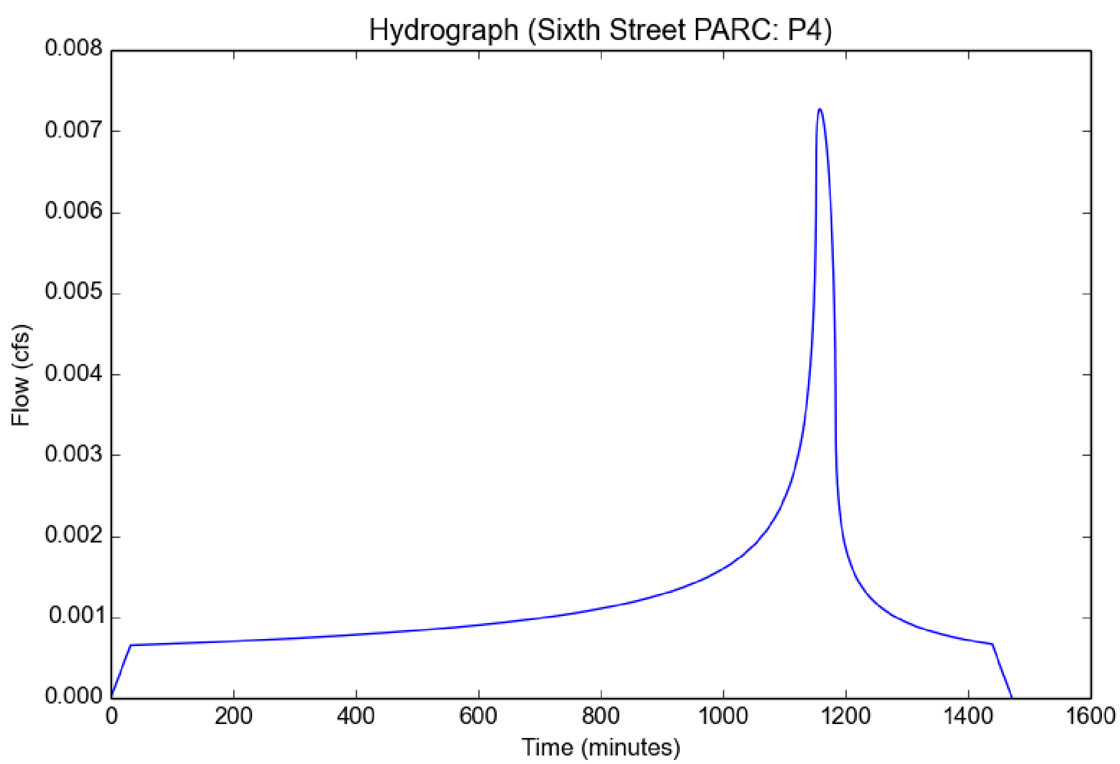
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street PARC Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street PARC
Subarea ID	P4
Area (ac)	0.27
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.01
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.2493
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.108
Time of Concentration (min)	32.0
Clear Peak Flow Rate (cfs)	0.0073
Burned Peak Flow Rate (cfs)	0.0073
24-Hr Clear Runoff Volume (ac-ft)	0.0024
24-Hr Clear Runoff Volume (cu-ft)	104.9774



Peak Flow Hydrologic Analysis

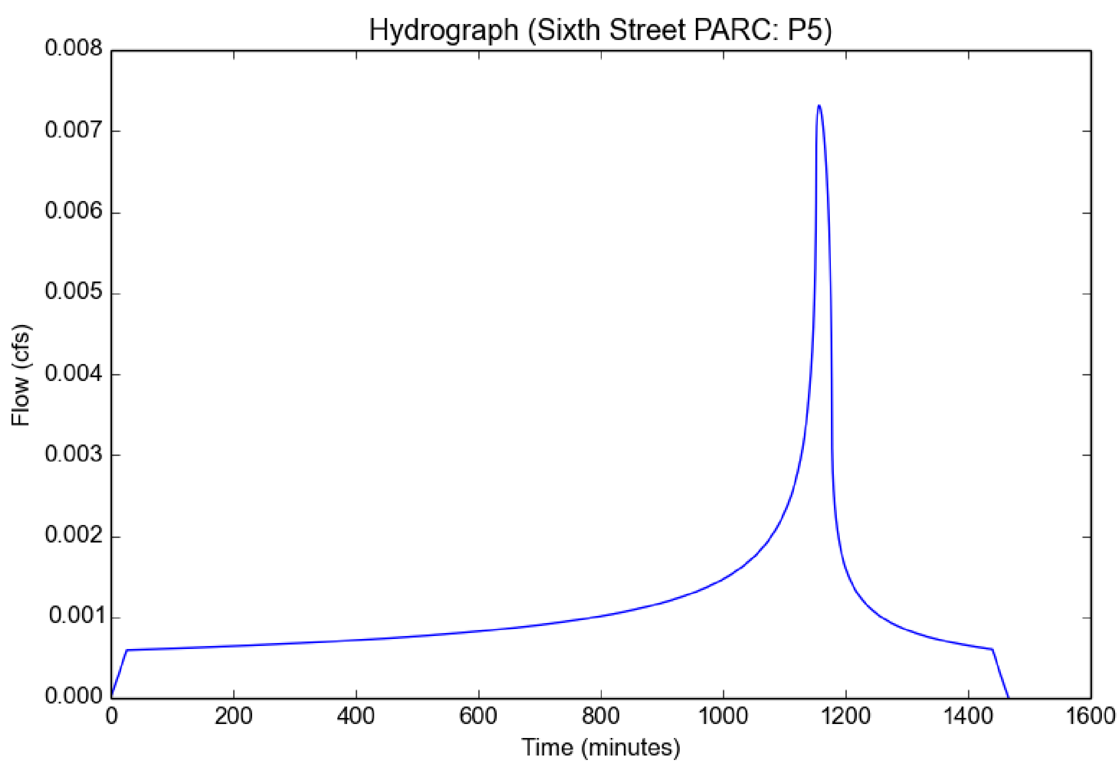
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street PARC Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street PARC
Subarea ID	P5
Area (ac)	0.19
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.05
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.2749
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.14
Time of Concentration (min)	26.0
Clear Peak Flow Rate (cfs)	0.0073
Burned Peak Flow Rate (cfs)	0.0073
24-Hr Clear Runoff Volume (ac-ft)	0.0022
24-Hr Clear Runoff Volume (cu-ft)	95.7608



Peak Flow Hydrologic Analysis

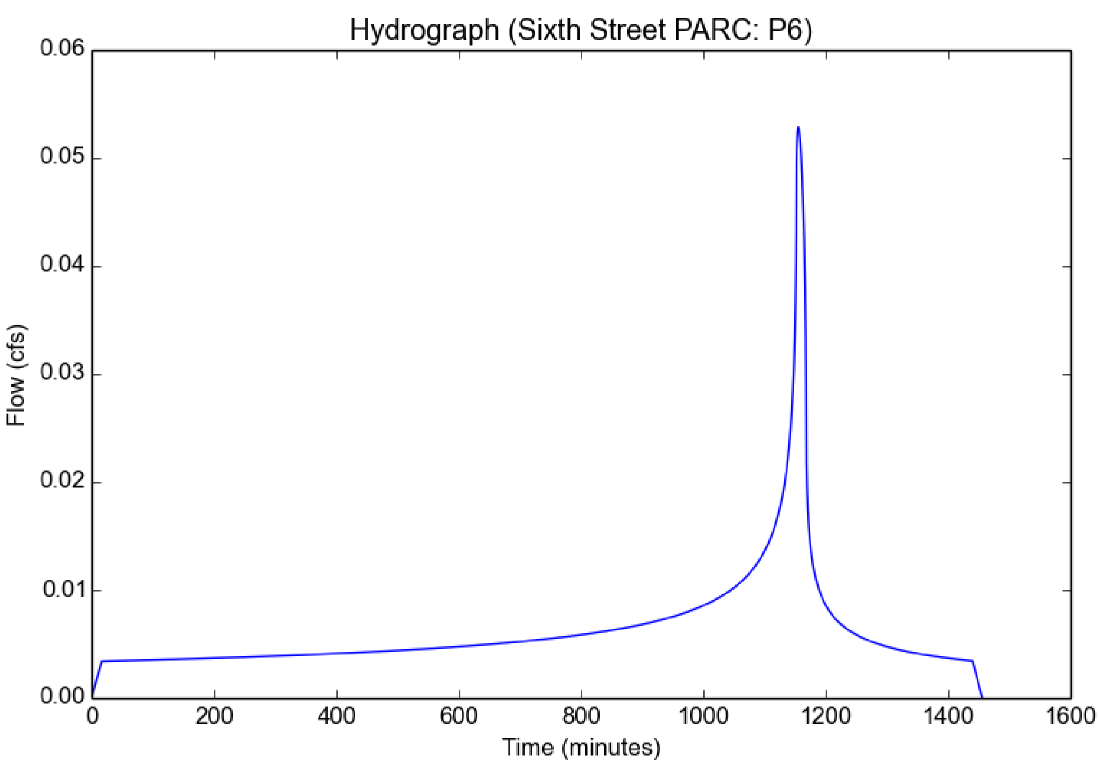
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street PARC Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street PARC
Subarea ID	P6
Area (ac)	0.51
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.25
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.3454
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.3
Time of Concentration (min)	16.0
Clear Peak Flow Rate (cfs)	0.0528
Burned Peak Flow Rate (cfs)	0.0528
24-Hr Clear Runoff Volume (ac-ft)	0.0126
24-Hr Clear Runoff Volume (cu-ft)	550.8018



Peak Flow Hydrologic Analysis

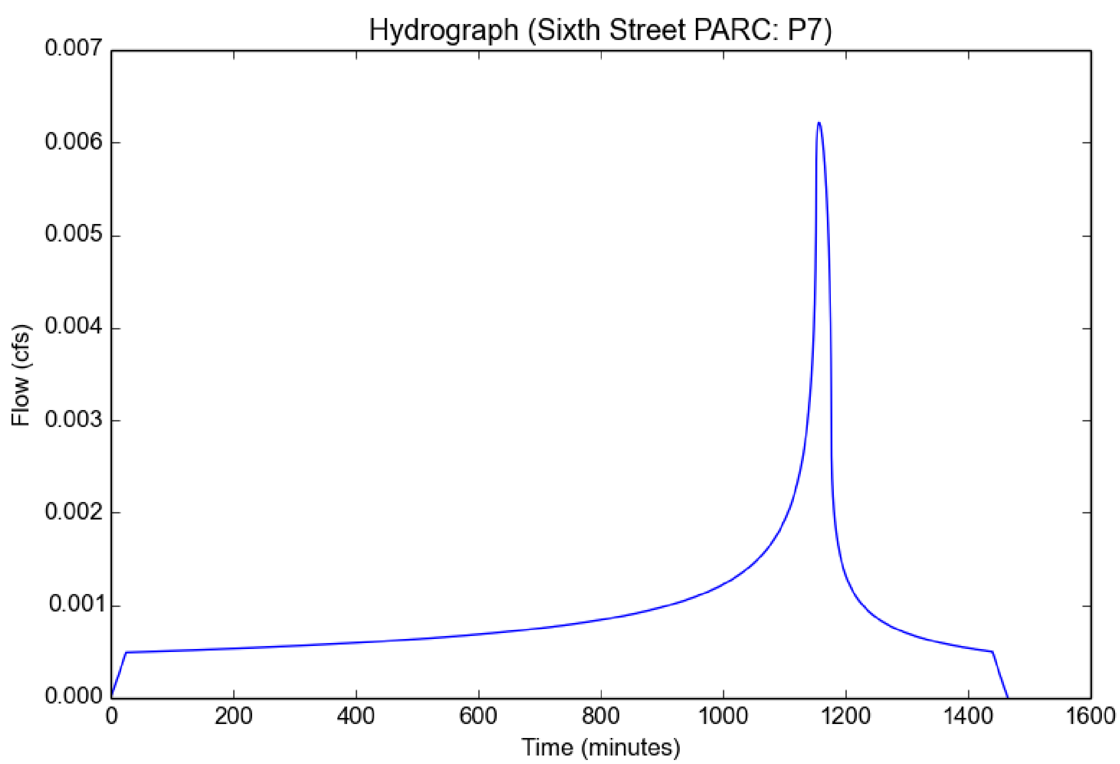
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street PARC Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street PARC
Subarea ID	P7
Area (ac)	0.15
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.06
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.28
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.148
Time of Concentration (min)	25.0
Clear Peak Flow Rate (cfs)	0.0062
Burned Peak Flow Rate (cfs)	0.0062
24-Hr Clear Runoff Volume (ac-ft)	0.0018
24-Hr Clear Runoff Volume (cu-ft)	79.9206



Peak Flow Hydrologic Analysis

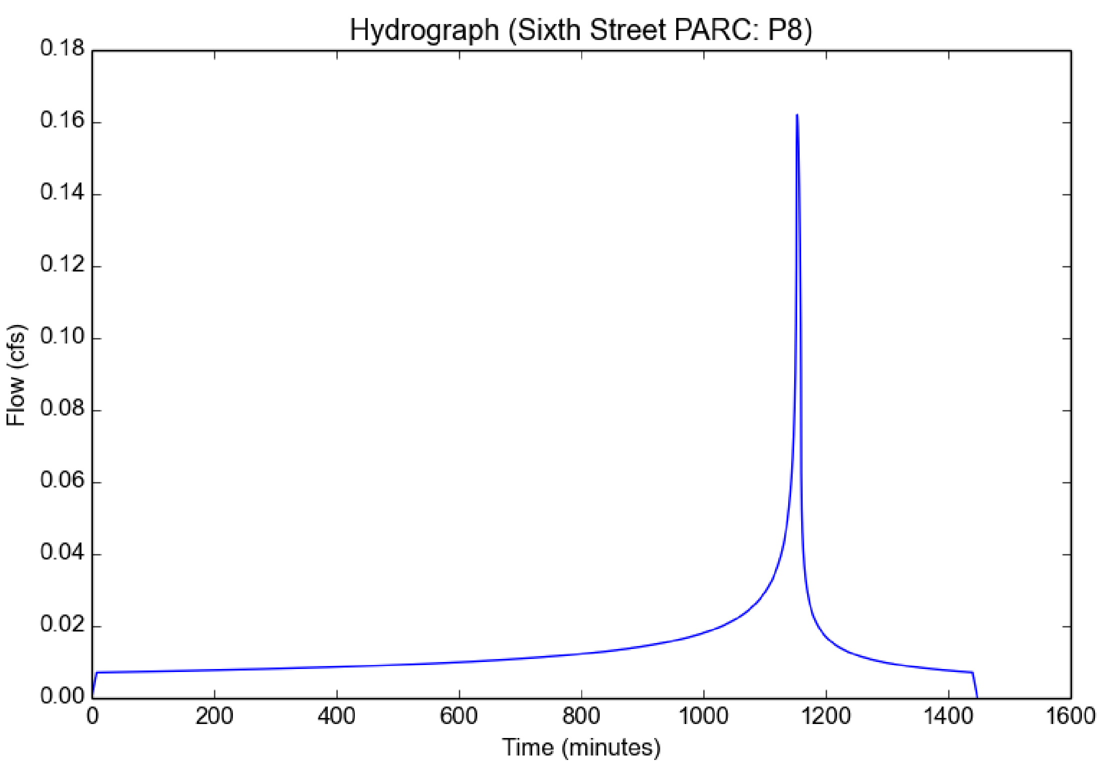
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street PARC Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street PARC
Subarea ID	P8
Area (ac)	0.45
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.76
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.4784
Undeveloped Runoff Coefficient (Cu)	0.2862
Developed Runoff Coefficient (Cd)	0.7527
Time of Concentration (min)	8.0
Clear Peak Flow Rate (cfs)	0.162
Burned Peak Flow Rate (cfs)	0.162
24-Hr Clear Runoff Volume (ac-ft)	0.0264
24-Hr Clear Runoff Volume (cu-ft)	1149.6987



Peak Flow Hydrologic Analysis

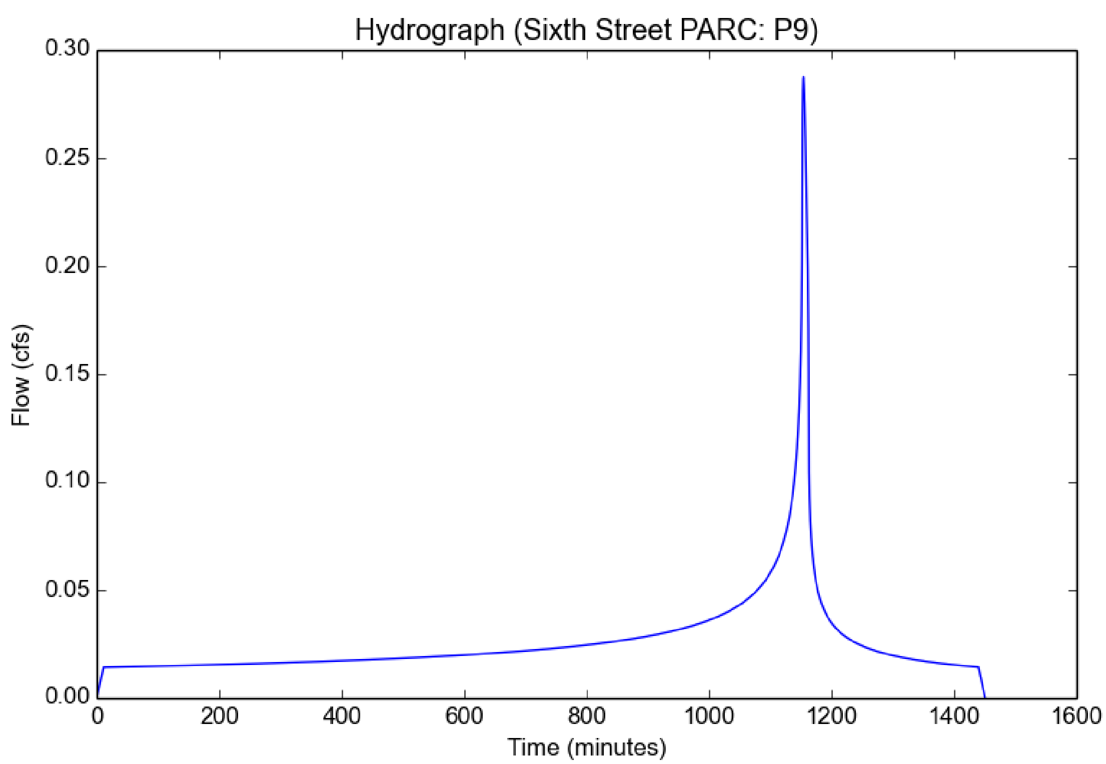
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street PARC Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street PARC
Subarea ID	P9
Area (ac)	1.44
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.43
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.4119
Undeveloped Runoff Coefficient (Cu)	0.1719
Developed Runoff Coefficient (Cd)	0.485
Time of Concentration (min)	11.0
Clear Peak Flow Rate (cfs)	0.2877
Burned Peak Flow Rate (cfs)	0.2877
24-Hr Clear Runoff Volume (ac-ft)	0.053
24-Hr Clear Runoff Volume (cu-ft)	2308.6945



Peak Flow Hydrologic Analysis

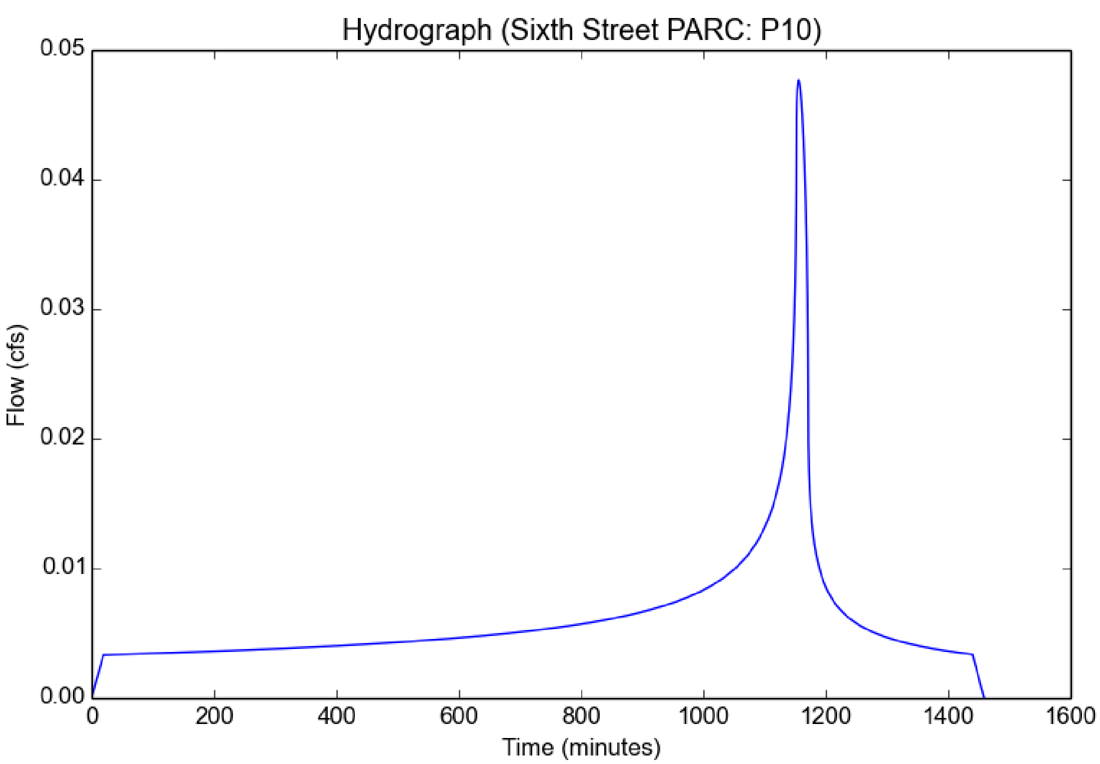
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street PARC Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street PARC
Subarea ID	P10
Area (ac)	0.68
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.15
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.3186
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.22
Time of Concentration (min)	19.0
Clear Peak Flow Rate (cfs)	0.0477
Burned Peak Flow Rate (cfs)	0.0477
24-Hr Clear Runoff Volume (ac-ft)	0.0124
24-Hr Clear Runoff Volume (cu-ft)	538.5625



Peak Flow Hydrologic Analysis

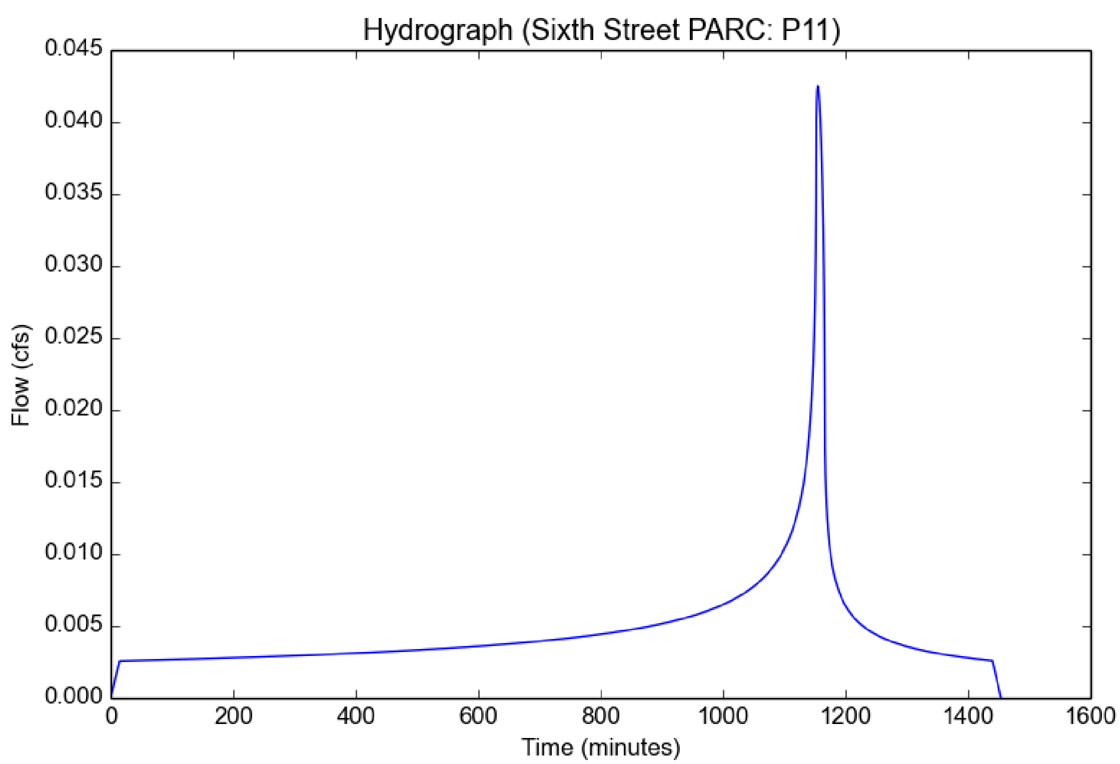
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street PARC Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street PARC
Subarea ID	P11
Area (ac)	0.34
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.3
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.3677
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.34
Time of Concentration (min)	14.0
Clear Peak Flow Rate (cfs)	0.0425
Burned Peak Flow Rate (cfs)	0.0425
24-Hr Clear Runoff Volume (ac-ft)	0.0096
24-Hr Clear Runoff Volume (cu-ft)	416.161



Peak Flow Hydrologic Analysis

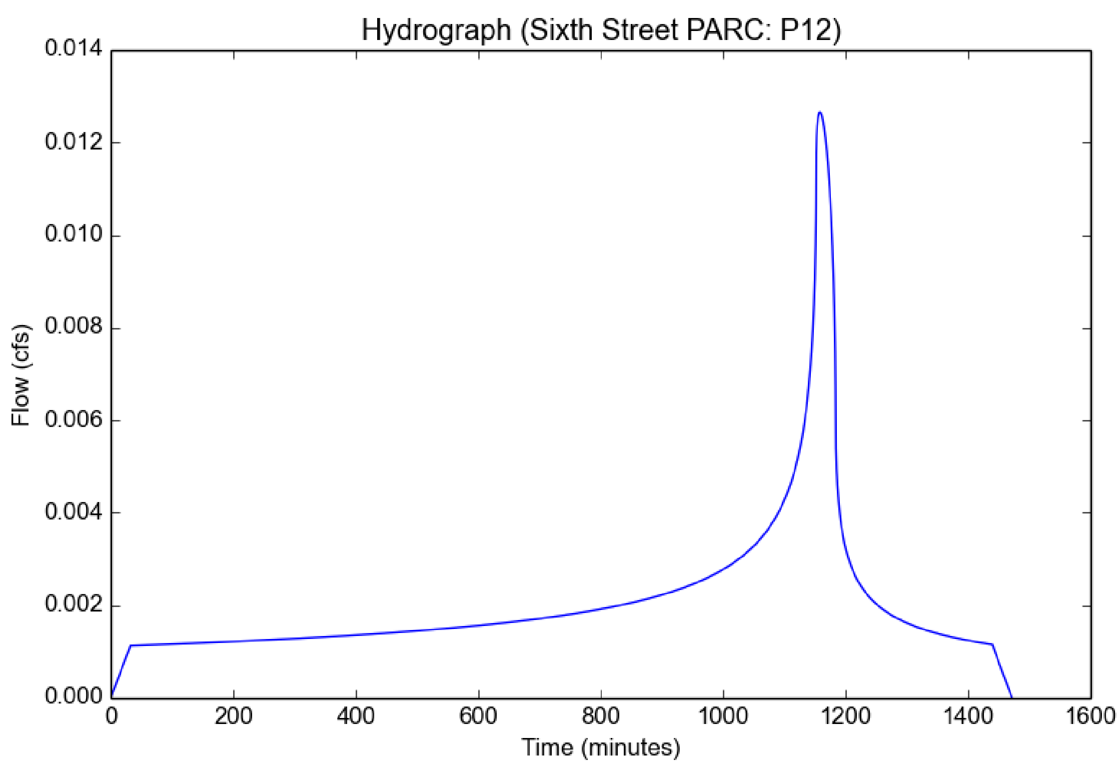
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street PARC Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street PARC
Subarea ID	P12
Area (ac)	0.47
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.01
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.2493
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.108
Time of Concentration (min)	32.0
Clear Peak Flow Rate (cfs)	0.0127
Burned Peak Flow Rate (cfs)	0.0127
24-Hr Clear Runoff Volume (ac-ft)	0.0042
24-Hr Clear Runoff Volume (cu-ft)	182.7384



Peak Flow Hydrologic Analysis

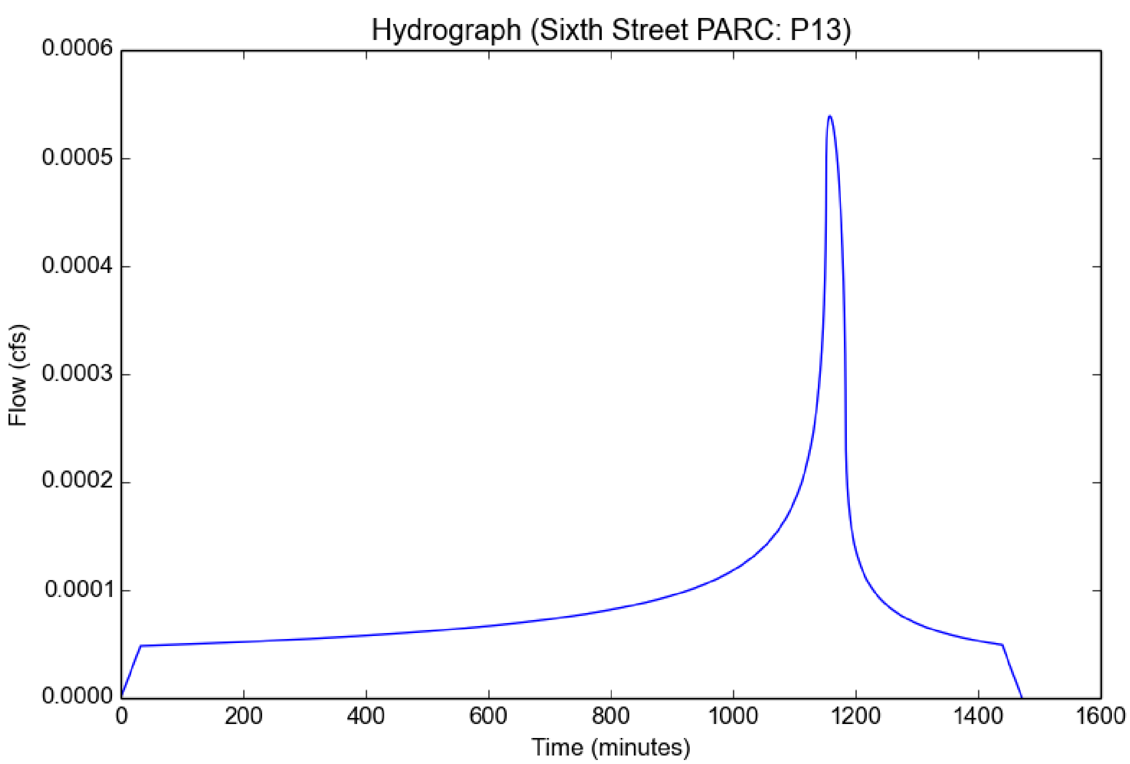
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street PARC Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street PARC
Subarea ID	P13
Area (ac)	0.02
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.02
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	0.01
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.2493
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.108
Time of Concentration (min)	32.0
Clear Peak Flow Rate (cfs)	0.0005
Burned Peak Flow Rate (cfs)	0.0005
24-Hr Clear Runoff Volume (ac-ft)	0.0002
24-Hr Clear Runoff Volume (cu-ft)	7.7761



Peak Flow Hydrologic Analysis

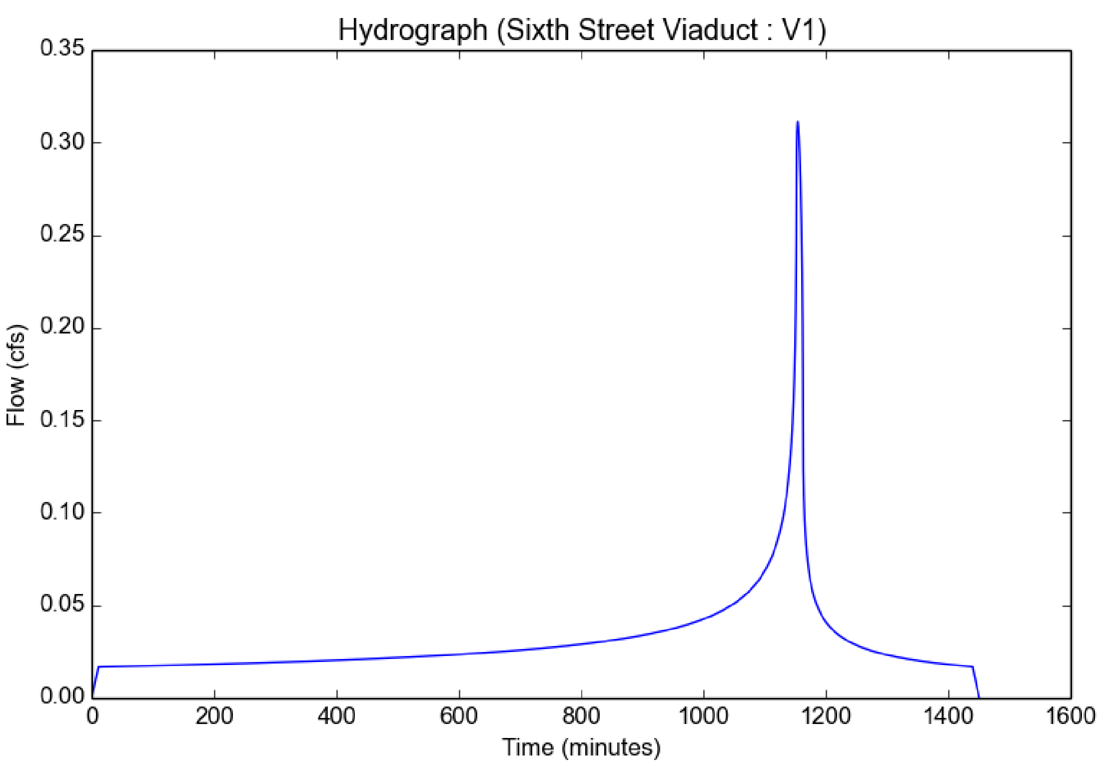
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street Viaduct Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street Viaduct
Subarea ID	V1
Area (ac)	0.84
Flow Path Length (ft)	225.0
Flow Path Slope (vft/hft)	0.05
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.4119
Undeveloped Runoff Coefficient (Cu)	0.1719
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	11.0
Clear Peak Flow Rate (cfs)	0.3114
Burned Peak Flow Rate (cfs)	0.3114
24-Hr Clear Runoff Volume (ac-ft)	0.0625
24-Hr Clear Runoff Volume (cu-ft)	2721.6041



Peak Flow Hydrologic Analysis

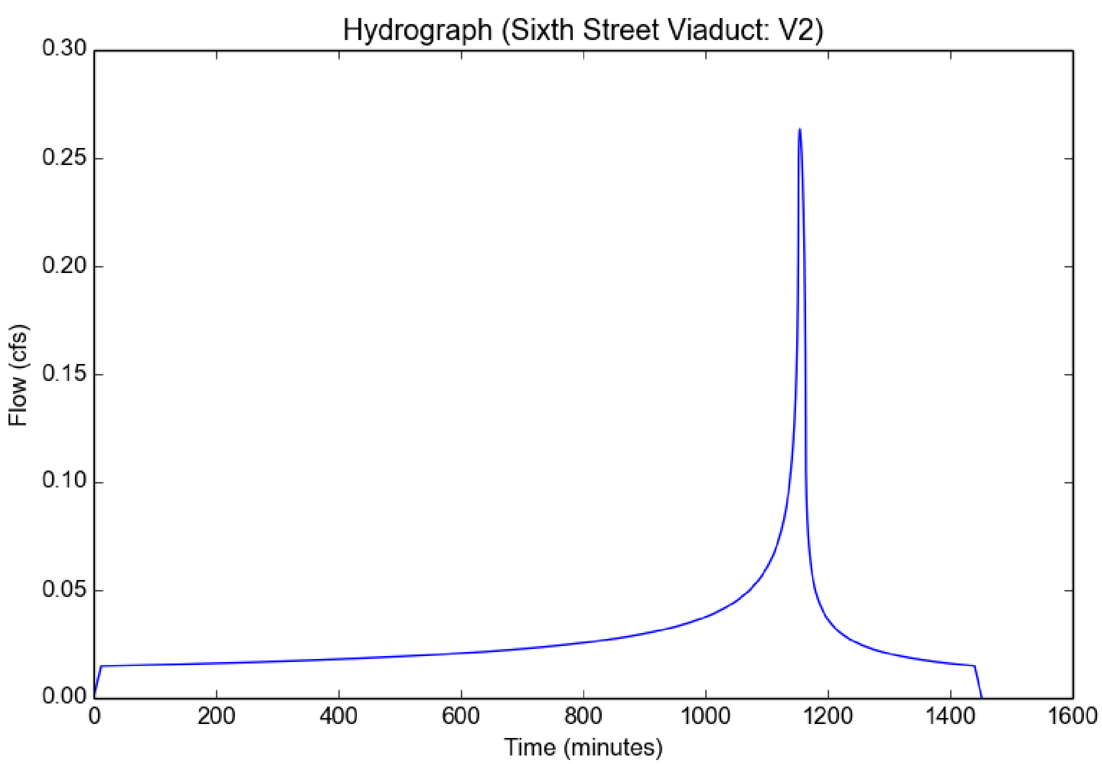
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street Viaduct Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street Viaduct
Subarea ID	V2
Area (ac)	0.74
Flow Path Length (ft)	250.0
Flow Path Slope (vft/hft)	0.03
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.3954
Undeveloped Runoff Coefficient (Cu)	0.1436
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	12.0
Clear Peak Flow Rate (cfs)	0.2633
Burned Peak Flow Rate (cfs)	0.2633
24-Hr Clear Runoff Volume (ac-ft)	0.055
24-Hr Clear Runoff Volume (cu-ft)	2397.6044



Peak Flow Hydrologic Analysis

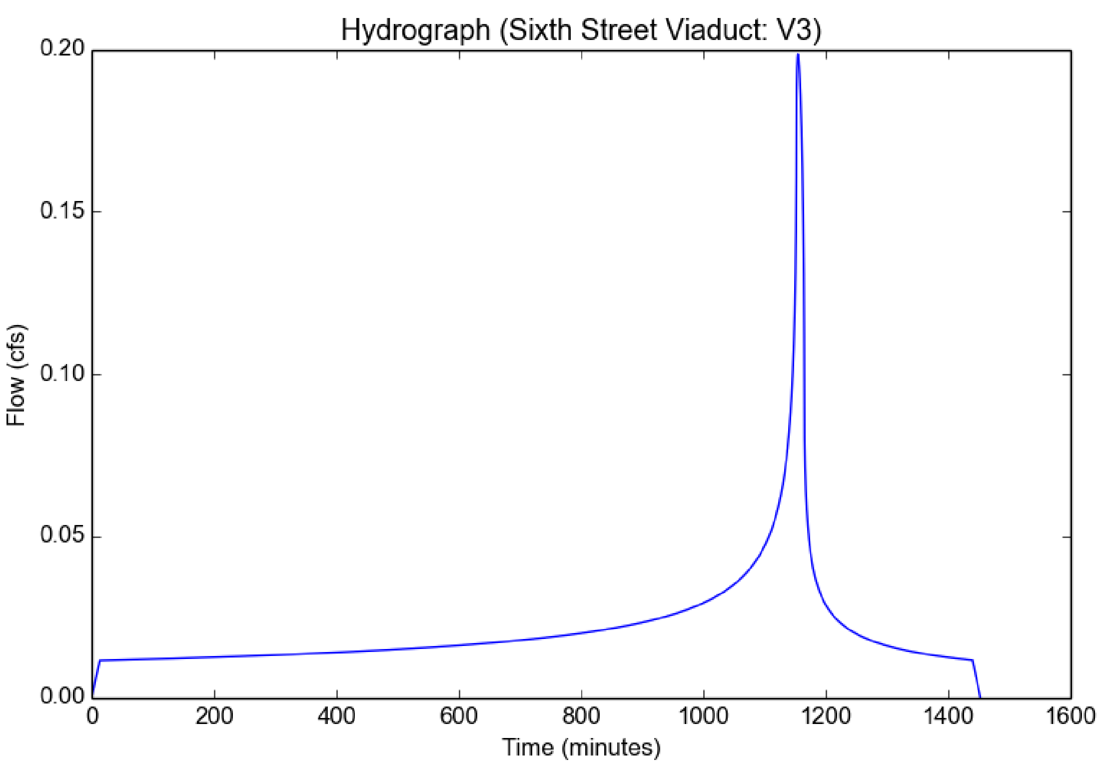
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street Viaduct Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street Viaduct
Subarea ID	V3
Area (ac)	0.58
Flow Path Length (ft)	200.0
Flow Path Slope (vft/hft)	0.01
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.3808
Undeveloped Runoff Coefficient (Cu)	0.1185
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	13.0
Clear Peak Flow Rate (cfs)	0.1988
Burned Peak Flow Rate (cfs)	0.1988
24-Hr Clear Runoff Volume (ac-ft)	0.0431
24-Hr Clear Runoff Volume (cu-ft)	1879.204



Peak Flow Hydrologic Analysis

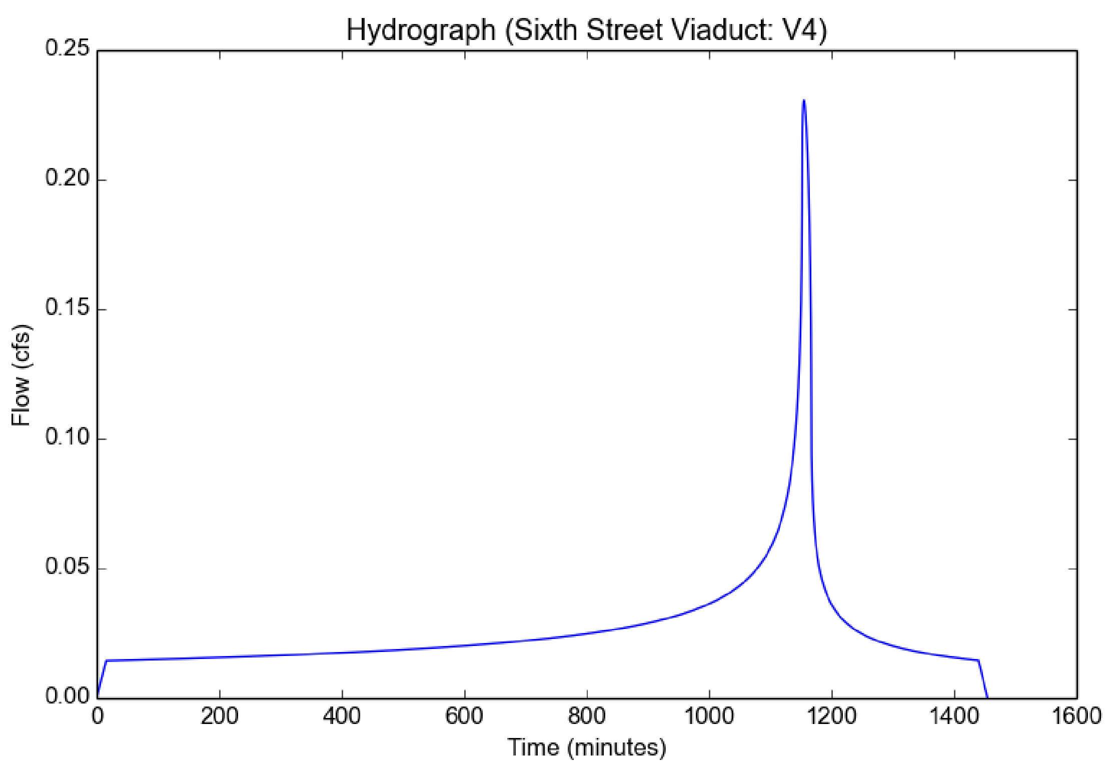
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street Viaduct Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street Viaduct
Subarea ID	V4
Area (ac)	0.72
Flow Path Length (ft)	250.0
Flow Path Slope (vft/hft)	0.01
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.356
Undeveloped Runoff Coefficient (Cu)	0.1
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	15.0
Clear Peak Flow Rate (cfs)	0.2307
Burned Peak Flow Rate (cfs)	0.2307
24-Hr Clear Runoff Volume (ac-ft)	0.0536
24-Hr Clear Runoff Volume (cu-ft)	2332.8066



Peak Flow Hydrologic Analysis

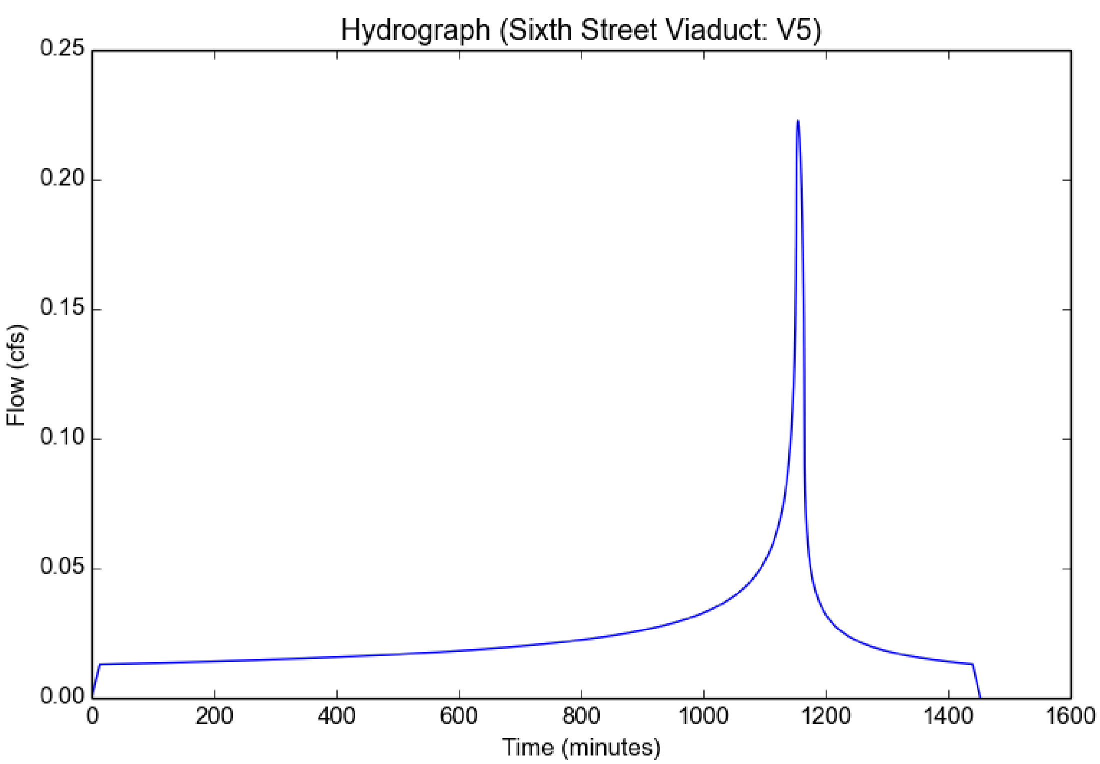
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street Viaduct Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street Viaduct
Subarea ID	V5
Area (ac)	0.65
Flow Path Length (ft)	210.0
Flow Path Slope (vft/hft)	0.01
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.3808
Undeveloped Runoff Coefficient (Cu)	0.1185
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	13.0
Clear Peak Flow Rate (cfs)	0.2228
Burned Peak Flow Rate (cfs)	0.2228
24-Hr Clear Runoff Volume (ac-ft)	0.0483
24-Hr Clear Runoff Volume (cu-ft)	2106.0045



Peak Flow Hydrologic Analysis

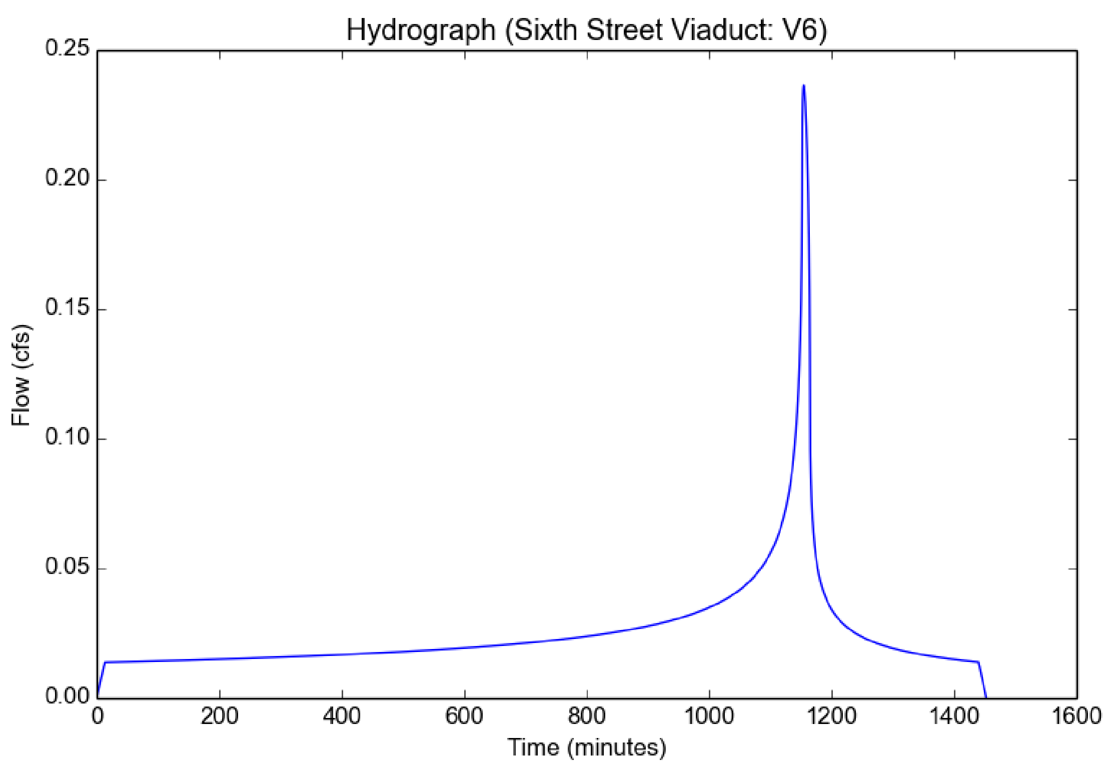
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street Viaduct Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street Viaduct
Subarea ID	V6
Area (ac)	0.69
Flow Path Length (ft)	210.0
Flow Path Slope (vft/hft)	0.01
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.3808
Undeveloped Runoff Coefficient (Cu)	0.1185
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	13.0
Clear Peak Flow Rate (cfs)	0.2365
Burned Peak Flow Rate (cfs)	0.2365
24-Hr Clear Runoff Volume (ac-ft)	0.0513
24-Hr Clear Runoff Volume (cu-ft)	2235.6048



Peak Flow Hydrologic Analysis

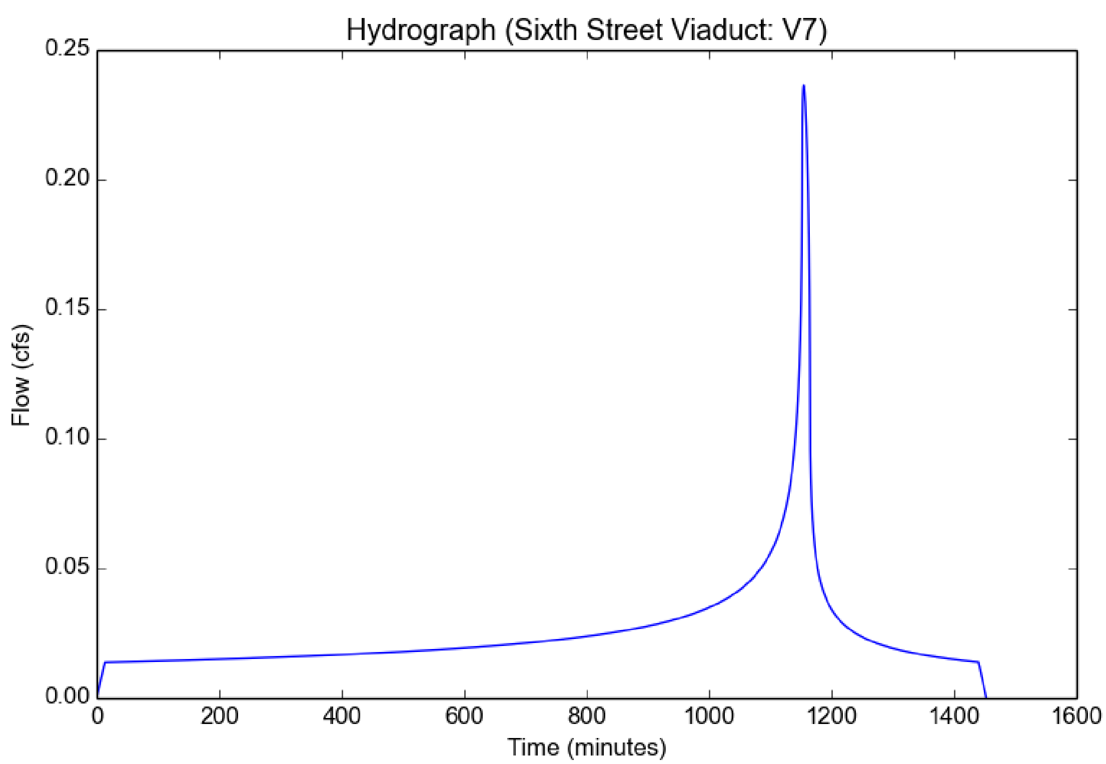
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street Viaduct Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street Viaduct
Subarea ID	V7
Area (ac)	0.69
Flow Path Length (ft)	210.0
Flow Path Slope (vft/hft)	0.01
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.3808
Undeveloped Runoff Coefficient (Cu)	0.1185
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	13.0
Clear Peak Flow Rate (cfs)	0.2365
Burned Peak Flow Rate (cfs)	0.2365
24-Hr Clear Runoff Volume (ac-ft)	0.0513
24-Hr Clear Runoff Volume (cu-ft)	2235.6048



Peak Flow Hydrologic Analysis

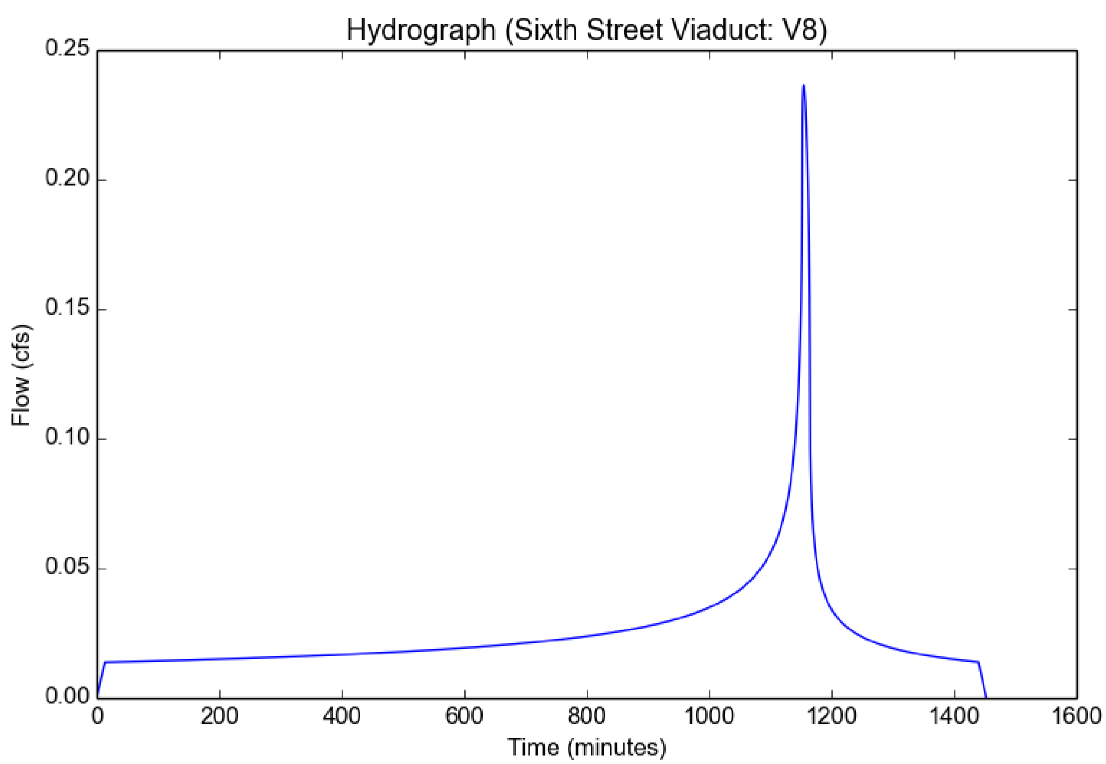
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street Viaduct Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street Viaduct
Subarea ID	V8
Area (ac)	0.69
Flow Path Length (ft)	210.0
Flow Path Slope (vft/hft)	0.01
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.3808
Undeveloped Runoff Coefficient (Cu)	0.1185
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	13.0
Clear Peak Flow Rate (cfs)	0.2365
Burned Peak Flow Rate (cfs)	0.2365
24-Hr Clear Runoff Volume (ac-ft)	0.0513
24-Hr Clear Runoff Volume (cu-ft)	2235.6048



Peak Flow Hydrologic Analysis

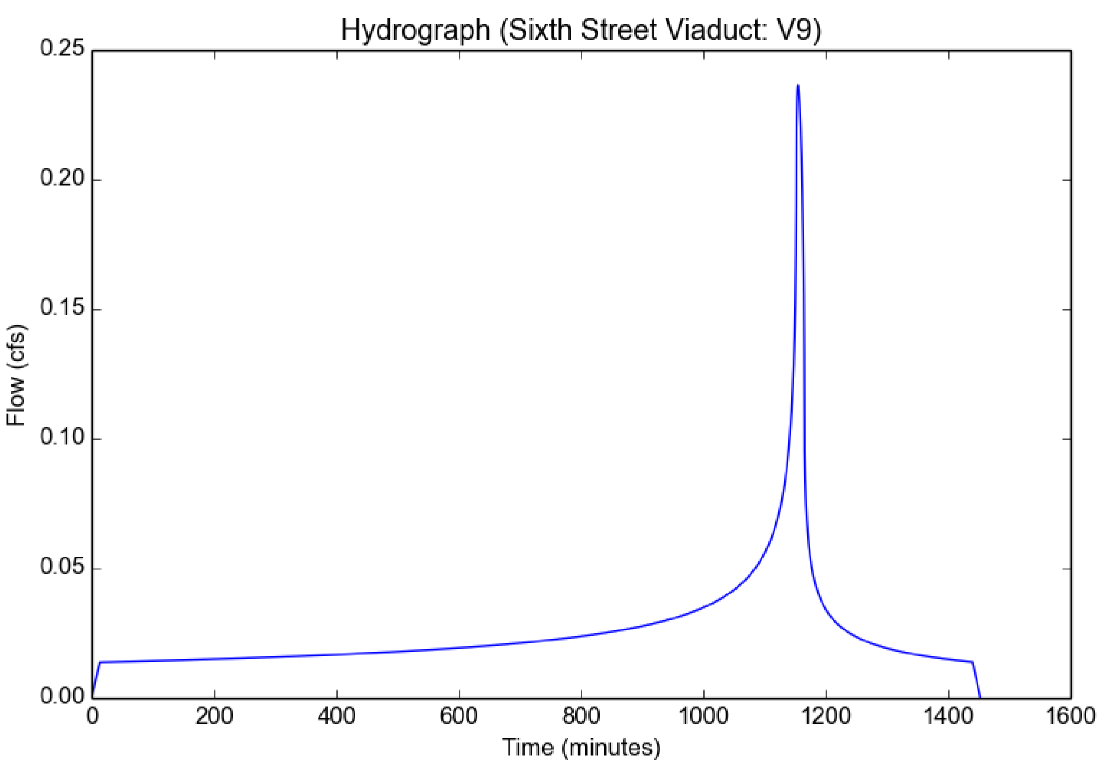
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street Viaduct Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street Viaduct
Subarea ID	V9
Area (ac)	0.69
Flow Path Length (ft)	210.0
Flow Path Slope (vft/hft)	0.01
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.3808
Undeveloped Runoff Coefficient (Cu)	0.1185
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	13.0
Clear Peak Flow Rate (cfs)	0.2365
Burned Peak Flow Rate (cfs)	0.2365
24-Hr Clear Runoff Volume (ac-ft)	0.0513
24-Hr Clear Runoff Volume (cu-ft)	2235.6048



Peak Flow Hydrologic Analysis

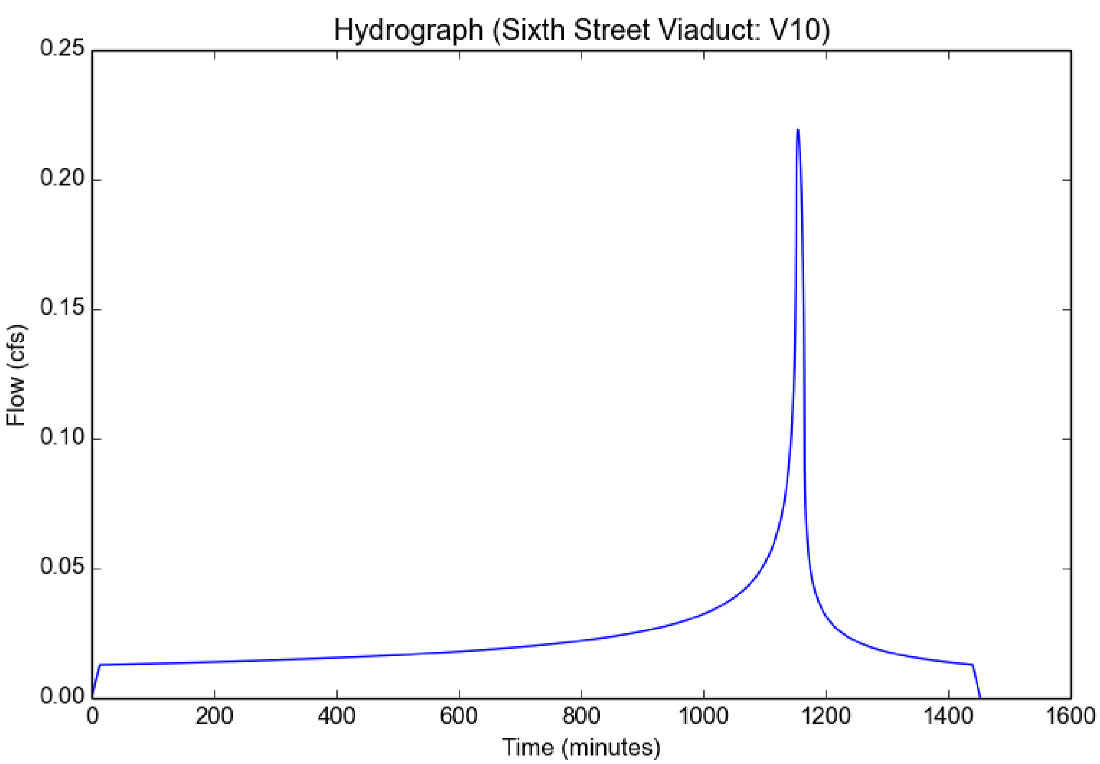
File location: P:/20043/200-20043-17001/Docs/Reports/LID/Appendix C_HydroCalc Calculations/Sixth Street Viaduct Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	Sixth Street Viaduct
Subarea ID	V10
Area (ac)	0.64
Flow Path Length (ft)	200.0
Flow Path Slope (vft/hft)	0.01
85th Percentile Rainfall Depth (in)	1.0
Percent Impervious	1.0
Soil Type	6
Design Storm Frequency	85th percentile storm
Fire Factor	0
LID	True

Output Results

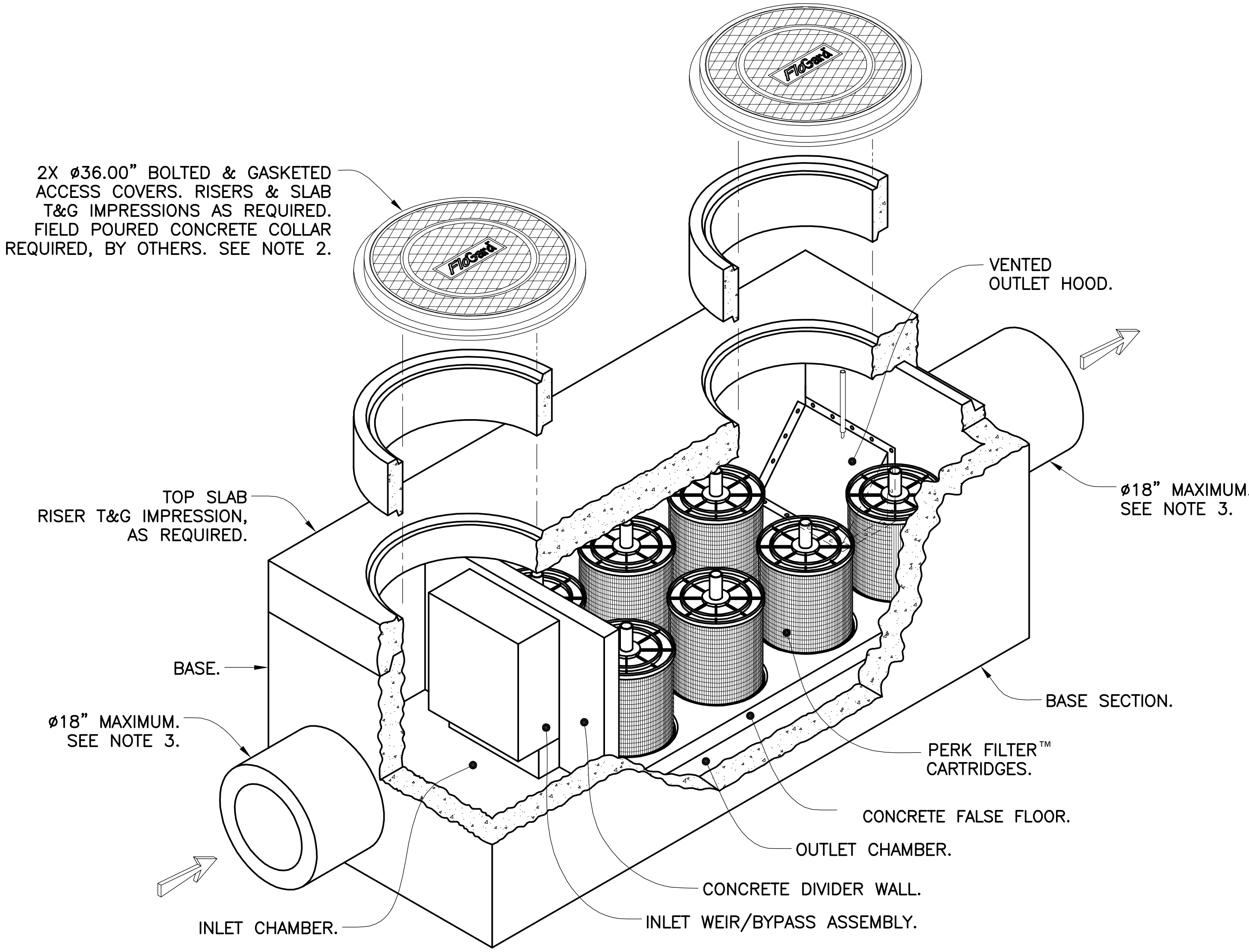
Modeled (85th percentile storm) Rainfall Depth (in)	1.0
Peak Intensity (in/hr)	0.3808
Undeveloped Runoff Coefficient (Cu)	0.1185
Developed Runoff Coefficient (Cd)	0.9
Time of Concentration (min)	13.0
Clear Peak Flow Rate (cfs)	0.2193
Burned Peak Flow Rate (cfs)	0.2193
24-Hr Clear Runoff Volume (ac-ft)	0.0476
24-Hr Clear Runoff Volume (cu-ft)	2073.6044



APPENDIX D – BMP CALCULATIONS

Viaduct BMP Sizing Summary										
Drainage Area ID.	Q_{85TH} (CFS)	Q_{85th} (GPM)	Vault Width (FT)	# of Cartridges	Stack Configuration	Vault Length (FT)	Treatment Flow Rate (GPM)	Treatment Flow Rate (CFS)	Peak Bypass Flow Rate (CFS)	Max Head Loss (FT)
V1	**0.31**	139	6	8	18"	9	144	**0.32**	8.7	2.3
V5	**0.22**	99	4	5	12"&12"	9	120	**0.27**	5.1	2.9
V6 & V7	**0.47**	211	6	9	12"&12"	11	216	**0.48**	10.0	2.9
V8	**0.24**	108	4	5	12"&12"	9	120	**0.27**	5.1	2.9
V9	**0.24**	108	4	5	12"&12"	9	120	**0.27**	5.1	2.9
V10	**0.22**	99	4	5	12"&12"	9	120	**0.27**	5.1	2.9

PF-V-4-0001



Notes:

1. Precast concrete structure shall be manufactured in accordance with ASTM Designation C857 and C858.

2. Filter system shall be supplied with traffic rated (H20) bolted & gasketed Ø36" circular access covers with risers as required. Shallow applications may require configurations with (H20) bolted & gasketed square/rectangular access hatches. Field poured concrete collars required,by others.

3. Inlet & outlet pipe(s) (Ø 18" maximum) may enter device on all three sides of the inlet & outlet chambers respectively.

4. Inlet chamber shall be supplied with a drain-down device designed to remove standing water between storm events.

5. For depths less than specified minimums contact Oldcastle® Stormwater Solutions for engineering assistance.

Media Filtration

Perk Filter™

4' Wide Concrete Vault

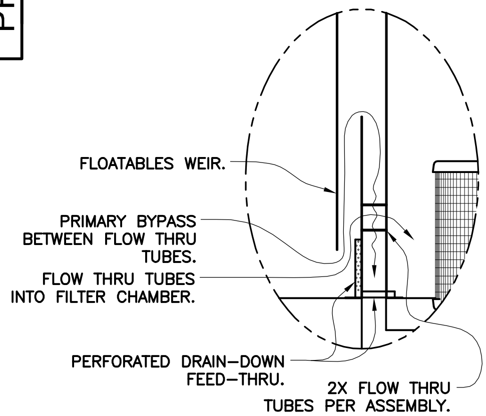
Three to Seven Cartridges / Stacks

Oldcastle® Stormwater Solutions

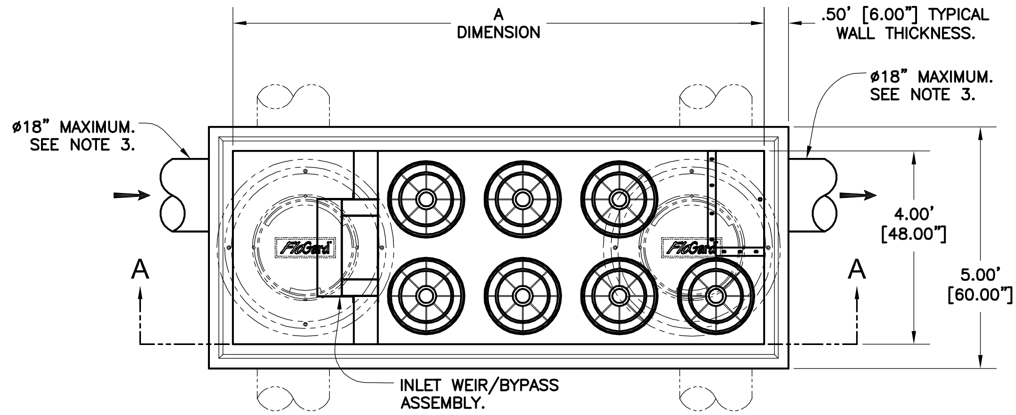
7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

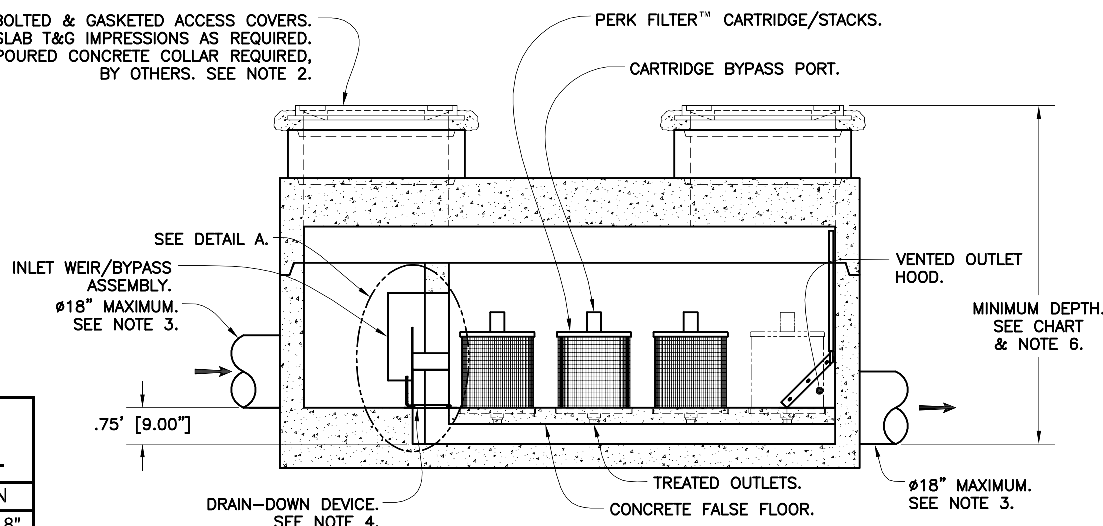
DRAWING NO.	REV	ECO	DATE	
PF-V-4-0001	E	ECO-0122 JPR 10/3/14	JPR 7/8/08	SHEET 1 OF 2

PF-V-4-0001



DETAIL A
INLET WEIR/BYPASS ASSEMBLY & DRAIN–DOWN.
SCALE: NONE





SECTION A-A

MINIMUM DEPTH
- RIM TO OUTLET INVERT -

CARTRIDGE STACK CONFIGURATION			
12"	18"	12" + 12"	12" + 18"
4.25' [51.00"]	5.00' [60.00"]	5.92' [71.00"]	6.67' [80.00"]

4' VAULT
TREATMENT FLOW RATES, TOTAL FLOW CAPACITIES & MAXIMUM HEAD LOSS

CARTRIDGE STACK QUANTITY	A DIMENSION - LENGTH - (ID-FEET)	CARTRIDGE STACK CONFIGURATION							
		12"		18"		12" & 12"		12" & 18"	
		TREATMENT FLOW RATE (GPM / CFS)	TOTAL FLOW CAPACITY (CFS)	TREATMENT FLOW RATE (GPM / CFS)	TOTAL FLOW CAPACITY (CFS)	TREATMENT FLOW RATE (GPM / CFS)	TOTAL FLOW CAPACITY (CFS)	TREATMENT FLOW RATE (GPM / CFS)	TOTAL FLOW CAPACITY (CFS)
3	7	36 / 0.08	2.9	54 / 0.12	4.3	72 / 0.16	5.0	90 / 0.20	6.7
4	9	48 / 0.11	2.9	72 / 0.16	4.4	96 / 0.21	5.0	120 / 0.27	6.8
5	9	60 / 0.13	2.9	90 / 0.20	4.4	120 / 0.27	5.1	150 / 0.33	6.8
6	11	72 / 0.16	3.0	108 / 0.24	4.5	144 / 0.32	5.1	180 / 0.40	6.9
7	11	84 / 0.19	3.0	126 / 0.28	4.5	168 / 0.37	5.2	210 / 0.47	7.0
MAXIMUM HEAD LOSS		1.7 FEET		2.3 FEET		2.9 FEET		3.5 FEET	

Media Filtration

Perk Filter™

4' Wide Concrete Vault

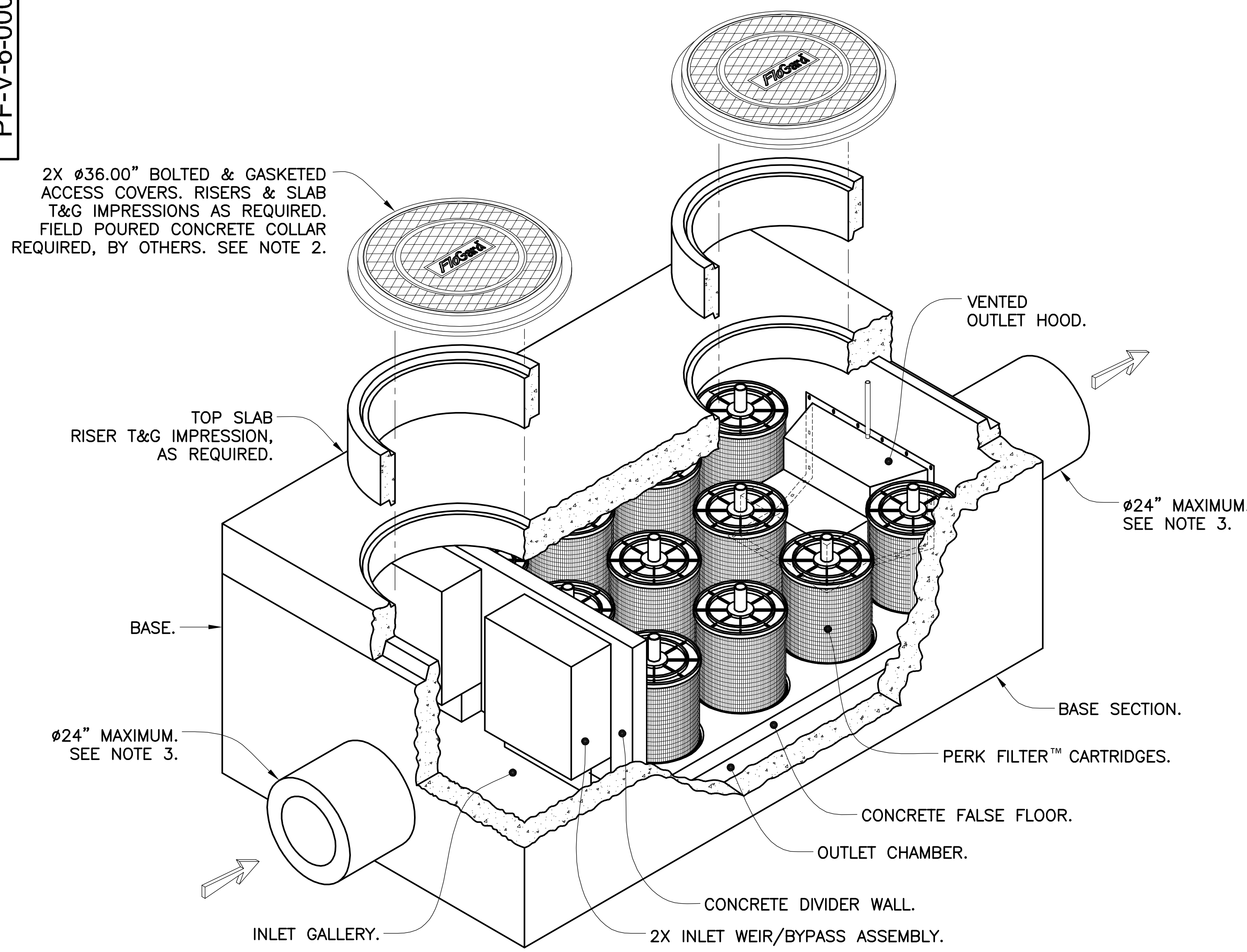
Three to Seven Cartridges / Stacks

Oldcastle® Stormwater Solutions

7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

DRAWING NO.	REV	ECO	DATE	
PF-V-4-0001	E	ECO–0122 JPR 10/3/14	JPR 7/8/08	SHEET 2 OF 2

PF-V-6-0001



Notes:

1. Precast concrete structure shall be manufactured in accordance with ASTM Designation C857 and C858.

2. Filter system shall be supplied with traffic rated (H20) bolted & gasketed Ø36" circular access covers with risers as required. Shallow applications may require configurations with (H20) bolted & gasketed square/rectangular access hatches. Field poured concrete collars required, by others.

3. Inlet & outlet pipe(s) (Ø 24" maximum) may enter device on all three sides of the inlet & outlet chambers respectively.

4. Inlet chamber shall be supplied with a drain-down device designed to remove standing water between storm events.

5. For depths less than specified minimums contact Oldcastle® Stormwater Solutions for engineering assistance.

Media Filtration

Perk Filter™

6' Wide Concrete Vault

Four to Eleven Cartridges / Stacks

Oldcastle® Stormwater Solutions

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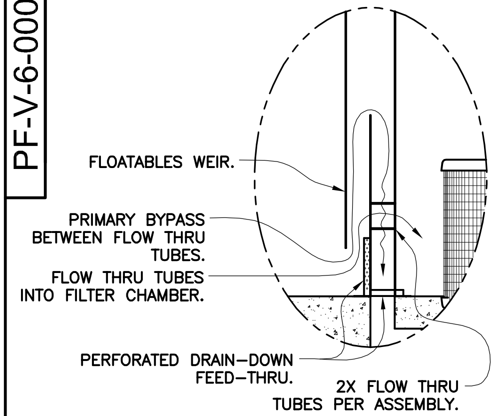
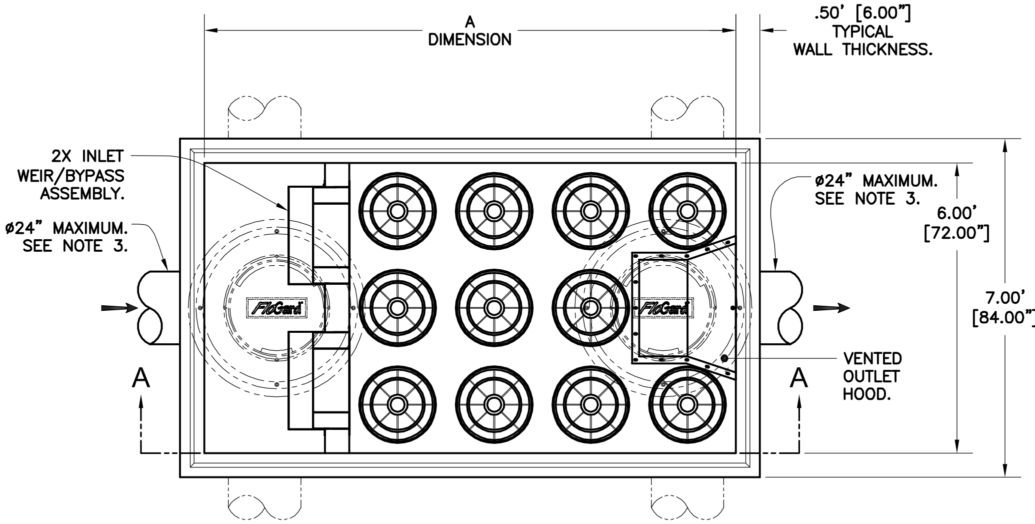
DRAWING NO.	REV	ECO	DATE	
PF-V-6-0001	F	ECO-0122 JPR 10/3/14	JPR 7/8/08	SHEET 1 OF 2

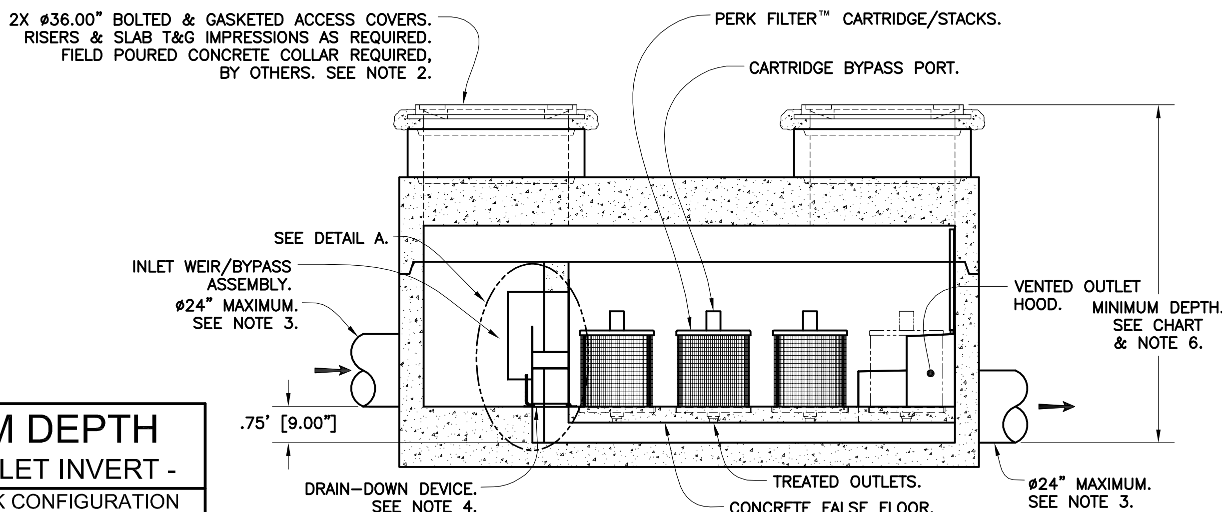
PF-V-6-0001



DETAIL A

INLET WEIR/BYPASS ASSEMBLY & DRAIN-DOWN.
SCALE: NONE





SECTION A-A

MINIMUM DEPTH - RIM TO OUTLET INVERT -			
CARTRIDGE STACK CONFIGURATION			
12"	18"	12" + 12"	12" + 18"
4.25' [51.00"]	5.00' [60.00"]	5.92' [71.00"]	6.67' [80.00"]

6' VAULT
TREATMENT FLOW RATES, TOTAL FLOW CAPACITIES & MAXIMUM HEAD LOSS

CARTRIDGE STACK QUANTITY	A DIMENSION - LENGTH - (ID-FEET)	12" TREATMENT FLOW RATE (GPM / CFS)	12" TOTAL FLOW CAPACITY (CFS)	18" TREATMENT FLOW RATE (GPM / CFS)	18" TOTAL FLOW CAPACITY (CFS)	12" & 12" TREATMENT FLOW RATE (GPM / CFS)	12" & 12" TOTAL FLOW CAPACITY (CFS)	12" & 18" TREATMENT FLOW RATE (GPM / CFS)	12" & 18" TOTAL FLOW CAPACITY (CFS)
4	7	48 / 0.11	5.7	72 / 0.16	8.5	96 / 0.21	9.7	120 / 0.27	13.0
5	7	60 / 0.13	5.7	90 / 0.20	8.6	120 / 0.27	9.7	150 / 0.33	13.0
6	9	72 / 0.16	5.8	108 / 0.24	8.6	144 / 0.32	9.8	180 / 0.40	13.1
7	9	84 / 0.19	5.8	126 / 0.28	8.6	168 / 0.37	9.9	210 / 0.47	13.2
8	9	96 / 0.21	5.8	144 / 0.32	8.7	192 / 0.43	9.9	240 / 0.53	13.2
9	11	108 / 0.24	5.8	162 / 0.36	8.7	216 / 0.48	10.0	270 / 0.60	13.3
10	11	120 / 0.27	5.9	180 / 0.40	8.8	240 / 0.53	10.0	300 / 0.67	13.4
11	11	132 / 0.29	5.9	198 / 0.44	8.8	264 / 0.59	10.1	330 / 0.74	13.4
MAXIMUM HEAD LOSS		1.7 FEET		2.3 FEET		2.9 FEET		3.5 FEET	

Media Filtration

Perk Filter ™

6' Wide Concrete Vault

Four to Eleven Cartridges / Stacks

Oldcastle® Stormwater Solutions

7921 Southpark Plaza, Suite 200 | Littleton, CO | 80120 | Ph: 800.579.8819 | oldcastlestormwater.com

DRAWING NO.	REV	ECO	DATE	
PF-V-6-0001	F	ECO-0122 JPR 10/3/14	JPR 7/8/08	SHEET 2 OF 2

PARC BMP Sizing Summary								
Subarea ID.	**A_{total} (AC)**	**$A_{impervious}$ (AC)**	**$A_{pervious}$ (AC)**	**V_M (FT^3)**	**V_M (Gal.)**	**BMP Storage (Gal./FT^2)**	**A_{min} (FT^2)**	**$A_{provided}$ (FT^2)**
P1	**1.78**	**0.75**	**1.03**	**2,824**	**21126**	**2.5**	**8,450**	**10580**
P2	0.19	0.01	0.18	98	N/A			
P3	0.20	0.13	0.07	450	N/A			
P4	0.27	0.00	0.27	98	N/A			
P5	0.19	0.01	0.18	95	N/A			
P6	0.51	0.13	0.38	563	N/A			
P7	0.15	0.01	0.14	81	N/A			
P8	**0.45**	**0.34**	**0.11**	**1,151**	**8608**	**2.5**	**3,443**	**18540**
P9	**1.44**	**0.62**	**0.82**	**2,323**	**17379**	**2.5**	**6,951**	
P10	0.68	0.10	0.58	537	N/A			
P11	0.34	0.10	0.24	414	N/A			
P12	0.47	0.00	0.47	171	N/A			
P13	0.02	0.00	0.02	7	N/A			

<u>Begin part II</u>

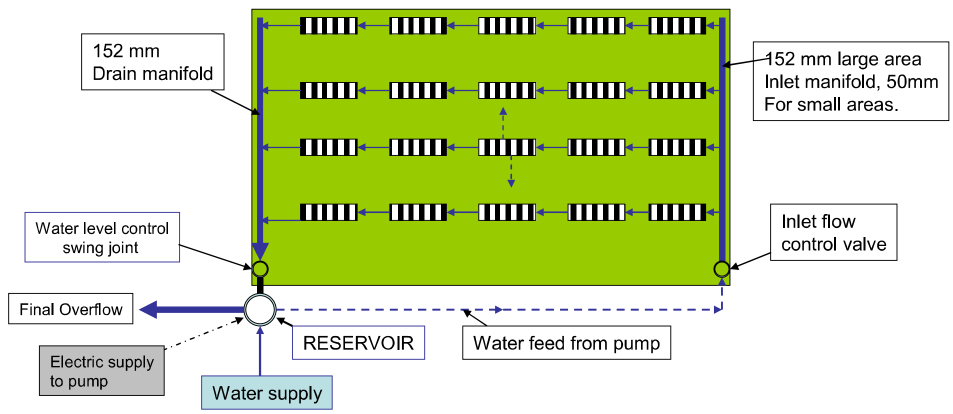
DESIGN Approaches:

There are two basic approaches for the construction of EPIC cells. One we have a broad area of a flat design where water introduction occurs through a manifold as shown below.

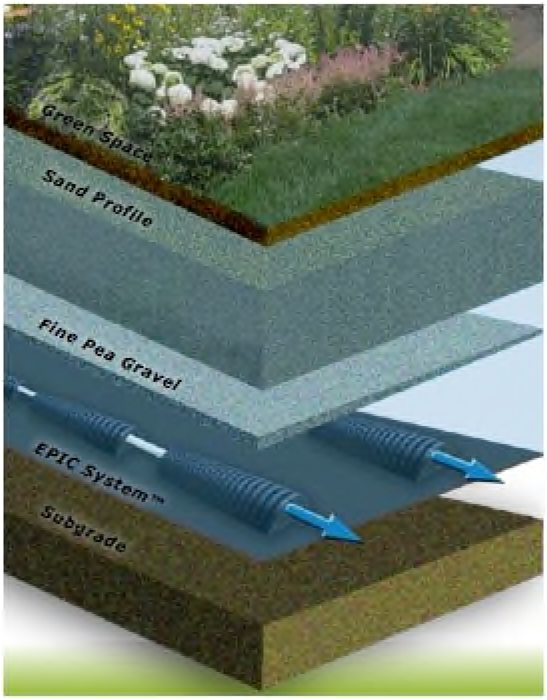
EPIC CONSTRUCTION PROCEDURE – Water flow flat System

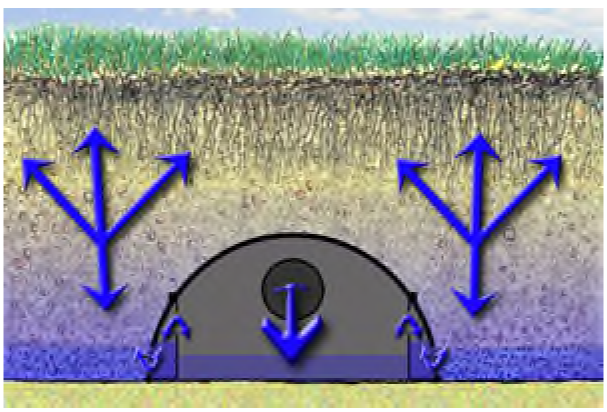
The principles of water flow in flat EPIC installations are as follows:

1. A pressured water supply keeps the reservoir partially full by a float valve
2. A submersible pump when activated by a timer (or manually) pumps water to the inlet control valve which then feeds the inlet manifold.
3. Flow (by gravity) from the manifold goes to the EPIC chambers, the field, and is collected by the drain manifold.
4. Water level in the field is controlled by the swing joint, and excess water returns to the reservoir and is recirculated if the pump is running and the field at capacity.
5. Excess storm water leaves reservoir overflow pipe.



On narrow and smaller areas a serpentine connection flow is used. The serpentine flow concept is also used on desired surface slope accommodations where individual level underground steps and cells are separated by an 8” subsurface wall between the level benches.


Green Space
Sand Profile
Fine Pea Gravel
EPIC System™
Subgrade



APPENDIX E – SOURCE CONTROL BMPS

Source Control Measures

S-1: Storm Drain Message and Signage

Purpose

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. This Fact Sheet contains details on the installation of storm drain messages at storm drain inlets located in new or redeveloped commercial, industrial, and residential sites.

Design Criteria

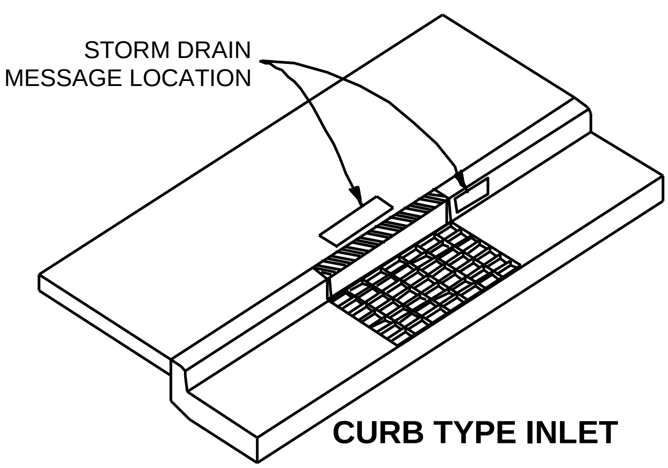
Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal into the storm drain system. The signs are typically stenciled or affixed near the storm drain inlet. The message simply informs the public that dumping of wastes into storm drain nlets is prohibited and/or the drain discharges to a receiving water.

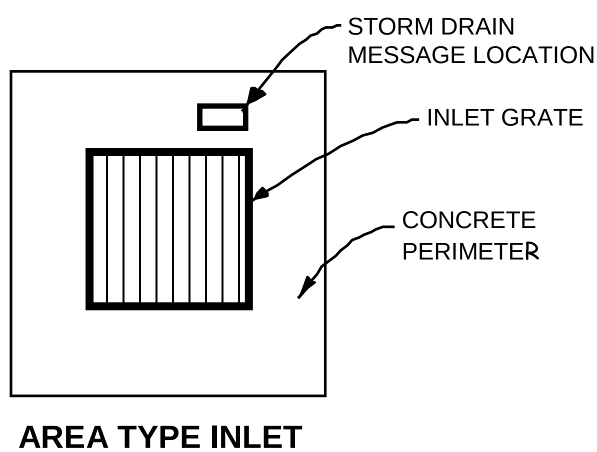
Storm drain message markers or placards are required at all storm drain inlets within the boundary of the development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side (see figures below). All storm drain inlet locations must be identified on the development site map.

Signs with language and/or graphical icons, which prohibit illegal dumping, shall be posted at designated public access points along channels and streams within a project area. Consult plan checking staff to determine specific signage requirements.

Maintenance Requirements

Legibility of markers and signs shall be maintained.





NOTES:

1. USE PROHIBITIVE LANGUAGE SUCH AS "NO DUMPING – DRAINS TO OCEAN"
2. STORM DRAIN MESSAGE SHALL BE APPLIED IN SUCH A WAY AS TO PROVIDE A CLEAR, LEGIBLE IMAGE
3. STORM DRAIN MESSAFE SHALL BE PERMANENTLY APPLIED DURING THE CONSTRUCTION OF THE CURB AND GUTTER USING A METHOD APPROVED BY THE CITY OF LOS ANGELES

S-2: Outdoor Material Storage Area Design

Purpose

Materials that are stored outdoors could become sources of pollutants in stormwater runoff if not handled or stored properly. Materials could be in the form of raw products, by-products, finished products, and waste products. The type of pollutants associated with the materials will vary depending on the type of commercial or industrial activity.

Some materials are more of a concern than others. Toxic and hazardous materials must be prevented from coming in contact with stormwater. Non-toxic or non-hazardous materials do not have to be prevented from stormwater contact, but cannot be allowed to runoff with the stormwater. These materials may have toxic effects on receiving waters. Accumulated material on an impervious surface could result in significant debris and sediment being discharged with stormwater runoff causing a significant impact on the rivers or streams that receive the runoff.

Materials may be stored in a variety of ways, including bulk piles, containers, shelving, stacking, and tanks. Stormwater contamination may be prevented by eliminating the possibility of stormwater contact with the material storage areas either through diversion, cover, or capture of the stormwater. Control measures may also include minimizing the storage area. Control measures are site-specific, and must meet local permitting requirements.

Design Criteria

Design requirements for material storage areas are governed by Building and Fire Codes, and by current City or County ordinances and zoning requirements. Source Control Measures described in the Fact Sheet are intended to enhance and be consistent with these code and ordinance requirements. The following design features should be incorporated into the design of material storage area when storing materials outside that will contribute significant pollutants to the storm drain.

Source Control Design Feature	Design Criteria
Surfacing	• Construct the storage area base with a material impervious to leaks and spills.
Covers	• Install a cover that extends beyond the storage area, or use a manufactured storage shed for small containers.
Grading/Containment	• Minimize the storage area. • Slope the storage area towards a dead-end sump to contain spills. • Grade or berm storage areas to prevent run-on from surrounding areas. • Direct runoff from downspouts/roofs away from storage areas.

Accumulated Stormwater and Non-stormwater

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

S-3: Outdoor Trash Storage Area Design

Purpose

Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by the forces of water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles. This Fact Sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling.

Design Criteria

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current City of Los Angeles ordinances and zoning requirements. The design criteria described in the Fact Sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulations.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria listed below are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection area to obtain established and accepted guidelines for designing trash collection areas. Conflicts or issues should be discussed with plan checking staff.

The following trash storage area design controls were developed to enhance the local permitting codes and ordinances and should be implemented depending on the type of waste and the type of containment:

Source Control Design Feature	**Design Criteria**
Surfacing	• Construct the storage area base with a material impervious to leaks and spills.
Screens/Covers	• Install a screen or wall around trash storage area to prevent off-site transport of loose trash. • Use lined bins or dumpsters to reduce leaking of liquid wastes. • Use water-proof lids on bins/dumpsters or provide a roof to cover enclosure to prevent rainfall from entering containers
Grading/Contouring	• Berm or grade the waste handling area to prevent run-on of stormwater. • Do not locate storm drains in immediate vicinity of the trash storage area.
Signs	• Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Maintenance Requirements

The integrity of structural elements that are subject to damage (e.g. screens, covers and signs) must be maintained by the owner/operator.

APPENDIX F – OPERATIONS & MAINTENANCE PLAN

Oldcastle Precast®

PERKFILTER™

Inspection and Maintenance Guide

Stormwater

PerkFilter™ Media Filtration System

Description

The PerkFilter is a stormwater treatment device used to remove pollutants from urban runoff. Impervious surfaces and other urban and suburban landscapes generate a variety of contaminants that can enter stormwater and pollute downstream receiving waters. The PerkFilter is a media-filled cartridge filtration device designed to capture and retain sediment, gross solids, metals, nutrients, hydrocarbons, and trash and debris. As with any stormwater treatment system, the PerkFilter requires periodic maintenance to sustain optimum system performance.

Function

The PerkFilter is a water quality treatment system consisting of three chambers: an inlet chamber, a filter cartridge treatment chamber, and an outlet chamber (Figure 1). Stormwater runoff enters the inlet chamber through an inlet pipe, curb opening, or grated inlet. Gross solids are settled out and floating trash and debris are trapped in the inlet chamber. Pretreated flow is then directed to the treatment chamber through an opening in the baffle wall between the inlet chamber and treatment chamber. The treatment chamber contains media-filled filter cartridges (Figure 2) that use physical and chemical processes to remove pollutants. During a storm event, runoff pools in the treatment chamber before passing radially through the cylindrical cartridges from the outside surface, through the media for treatment, and into the center of the cartridge. At the center of the cartridge is a center tube assembly designed to distribute the hydraulic load evenly across the surface of the filter cartridge and control the treatment flow rate. The center tube assembly discharges treated flow through the false floor and into the outlet chamber. A draindown feature built into each cartridge allows the treatment chamber to dewater between storm events.

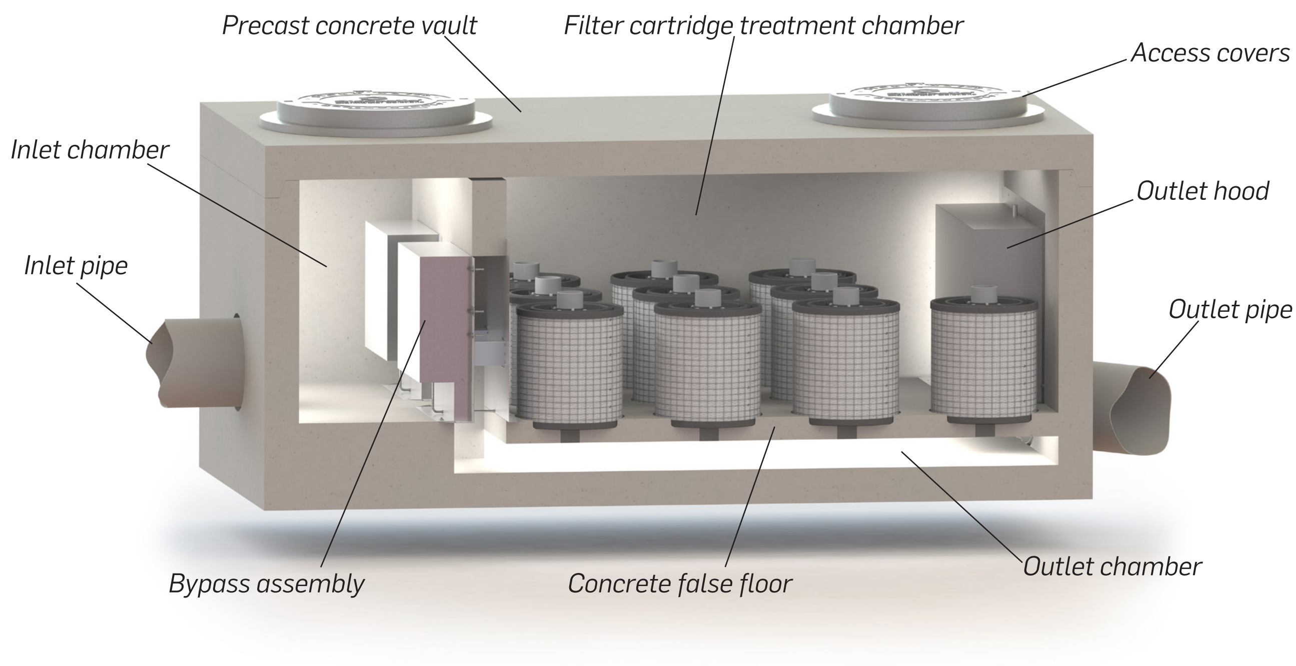
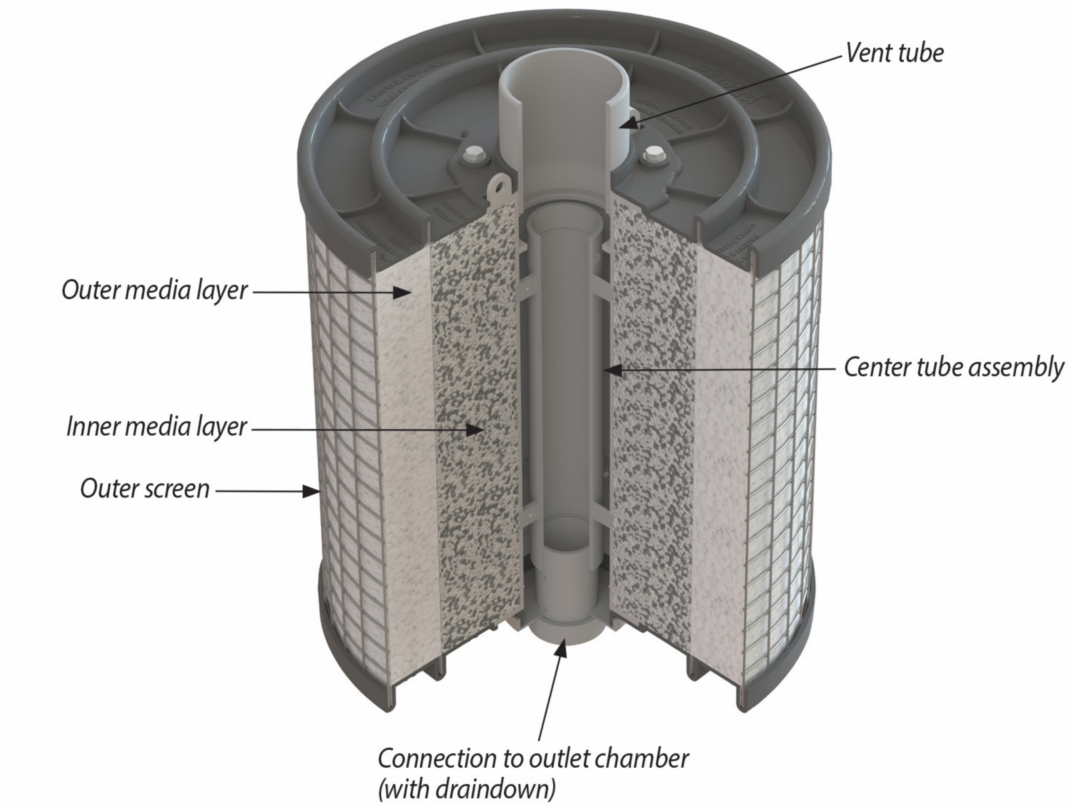


Figure 1. Schematic of the PerkFilter system.

All PerkFilter systems include a high flow bypass assembly to divert flow exceeding the treatment capacity of the filter cartridges around the treatment chamber. The bypass assembly routes peak flow from the inlet chamber directly to the outlet chamber, bypassing the treatment chamber to prevent sediment and other captured pollutants from being scoured and re-entrained by high flow. Treated flow and bypass flow merge in the outlet chamber for discharge by a single outlet pipe.



Configuration

The PerkFilter structure may consist of a vault, manhole, or catch basin configuration. Catch basin units may be fabricated from concrete or steel. Internal components including the PerkFilter cartridges are manufactured from durable plastic and stainless steel components and hardware. All cartridges are 18 inches in diameter and are available in two heights: 12-inch and 18-inch. Cartridges may be used alone or may be stacked (Figure 3) to provide 24-inch and 30-inch combinations. The capacity of each cartridge or cartridge combination is dictated by the allowable operating rate of the media and the outer surface area of the cartridge. Thus, taller cartridges have greater treatment capacity than shorter cartridges but they also require more hydraulic drop across the system. Cartridges may be filled with a wide variety of media but the standard mix is composed of zeolite, perlite and carbon (ZPC).

Access to an installed PerkFilter system is typically provided by ductile iron castings or hatch covers. The location and number of access appurtenances is dependent on the size and configuration of the system.

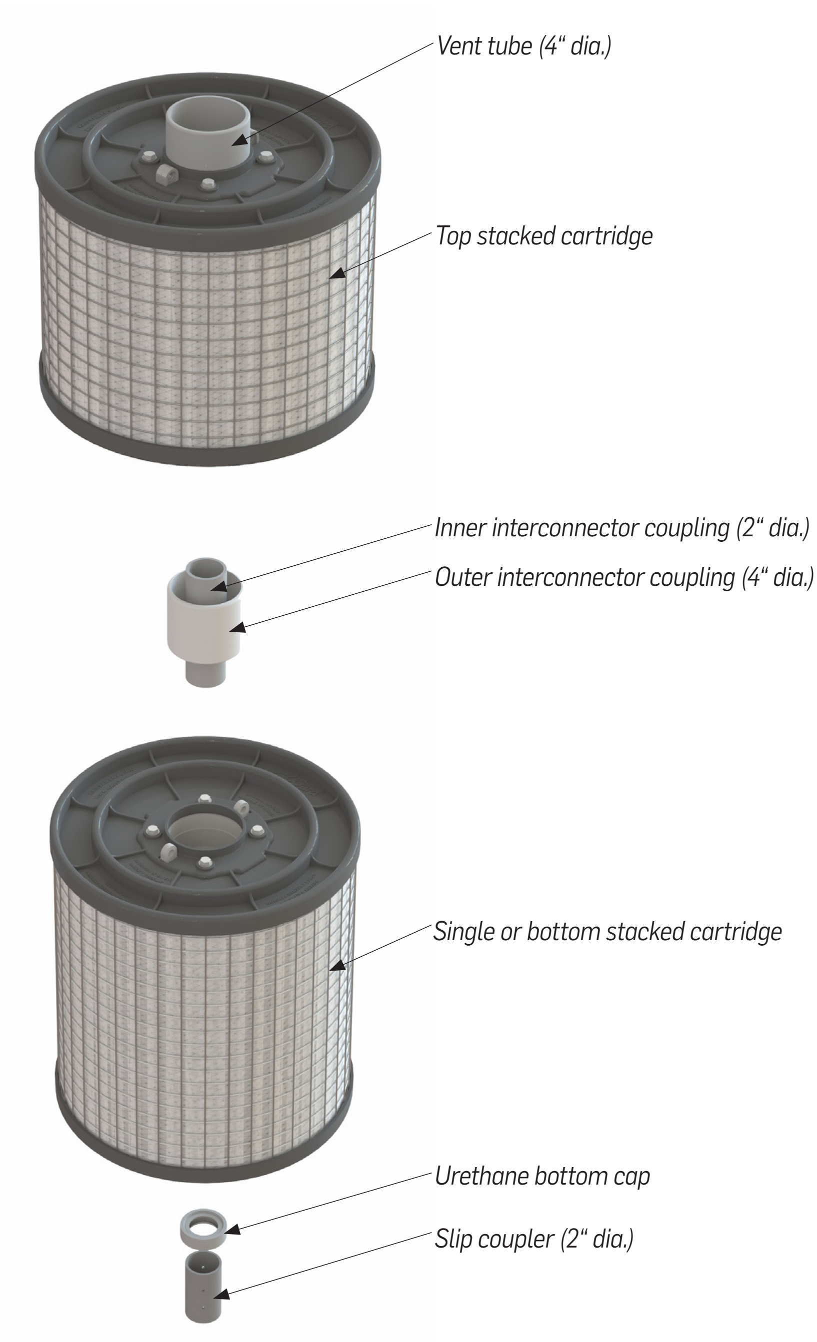


Figure 3. Schematic of stacked cartridges and connector components.

Maintenance Overview

State and local regulations require all stormwater management systems to be inspected on a periodic basis and maintained as necessary to ensure performance and protect downstream receiving waters. Maintenance prevents excessive pollutant buildup that can limit system performance by reducing the operating capacity and increasing the potential for scouring of pollutants during periods of high flow.

Inspection and Maintenance Frequency

The PerkFilter should be inspected on a periodic basis, typically twice per year, and maintained as required. Initially, inspections of a new system should be conducted more frequently to help establish an appropriate site-specific inspection frequency. The maintenance frequency will be driven by the amount of runoff and pollutant loading encountered by a given system. In most cases, the optimum maintenance interval will be one to three years. Inspection and maintenance activities should be performed only during dry weather periods.

Inspection Equipment

The following equipment is helpful when conducting PerkFilter inspections:

- Recording device (pen and paper form, voice recorder, iPad, etc.)
- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Socket and wrench for bolt-down access covers
- Manhole hook or pry bar
- Flashlight
- Tape measure
- Measuring stick or sludge sampler
- Long-handled net (optional)

Inspection Procedures

PerkFilter inspections are visual and may be conducted from the ground surface without entering the unit. To complete an inspection, safety measures including traffic control should be deployed before the access covers are removed. Once the covers have been removed, the following items should be checked and recorded (see form provided at the end of this document) to determine whether maintenance is required:

- Inspect the internal components and note whether there are any broken or missing parts. In the unlikely event that internal parts are broken or missing, contact Oldcastle Stormwater at (800) 579-8819 to determine appropriate corrective action.
- Note whether the inlet pipe is blocked or obstructed. The outlet pipe is covered by a removable outlet hood and cannot be observed without entering the unit.
- Observe, quantify and record the accumulation of floating trash and debris in the inlet chamber. The significance of accumulated floating trash and debris is a matter of judgment. A long-handled net may be used to retrieve the bulk of trash and debris at the time of inspection if full maintenance due to accumulation of floating oils or settled sediment is not yet warranted.

- Observe, quantify and record the accumulation of oils in the inlet chamber. The significance of accumulated floating oils is a matter of judgment. However, if there is evidence of an oil or fuel spill, immediate maintenance by appropriate certified personnel is warranted.
- Observe, quantify and record the average accumulation of sediment in the inlet chamber and treatment chamber. A calibrated dipstick, tape measure, or sludge sampler may be used to determine the amount of accumulated sediment in each chamber. The depth of sediment may be determined by calculating the difference between the measurement from the rim of the PerkFilter to the top of the accumulated sediment and the measurement from the rim of the PerkFilter to the bottom of the PerkFilter structure. Finding the top of the accumulated sediment below standing water takes some practice and a light touch, but increased resistance as the measuring device is lowered toward the bottom of the unit indicates the top of the accumulated sediment.
- Finally, observe, quantify and record the amount of standing water in the treatment chamber around the cartridges. If standing water is present, do not include the depth of sediment that may have settled out below the standing water in the measurement.

Maintenance Triggers

Maintenance should be scheduled if any of the following conditions are identified during the inspection:

- Internal components are broken or missing.
- Inlet piping is obstructed.
- The accumulation of floating trash and debris that cannot be retrieved with a net and/or oil in the inlet chamber is significant.
- There is more than 6" of accumulated sediment in the inlet chamber.
- There is more than 4" of accumulated sediment in the treatment chamber.
- There is more than 4" of standing water in the treatment chamber more than 24 hours after end of rain event.
- A hazardous material release (e.g. automotive fluids) is observed or reported.
- The system has not been maintained for 3 years (wet climates) to 5 years (dry climates).

Maintenance Equipment

The following equipment is helpful when conducting PerkFilter maintenance:

- Suitable clothing (appropriate footwear, gloves, hardhat, safety glasses, etc.)
- Traffic control equipment (cones, barricades, signage, flagging, etc.)
- Socket and wrench for bolt-down access covers
- Manhole hook or pry bar
- Confined space entry equipment, if needed
- Flashlight
- Tape measure
- 9/16" socket and wrench to remove hold-down struts and filter cartridge tops
- Replacement filter cartridges
- Vacuum truck with water supply and water jet

Contact Oldcastle Stormwater at (800) 579-8819 for replacement filter cartridges. A lead time of four weeks is recommended.

Maintenance Procedures

Maintenance should be conducted during dry weather when no flow is entering the system. Confined space entry is necessary to maintain vault and manhole PerkFilter configurations. Only personnel that are OSHA Confined Space Entry trained and certified may enter underground structures. Confined space entry is not required for catch basin PerkFilter configurations. Once safety measures such as traffic control are deployed, the access covers may be removed and the following activities may be conducted to complete maintenance:

- Remove floating trash, debris and oils from the water surface in the inlet chamber using the extension nozzle on the end of the boom hose of the vacuum truck. Continue using the vacuum truck to completely dewater the inlet chamber and evacuate all accumulated sediment from the inlet chamber. Some jetting may be required to fully remove sediment. The inlet chamber does not need to be refilled with water after maintenance is complete. The system will fill with water when the next storm event occurs.
- Remove the hold-down strut from each row of filter cartridges and then remove the top of each cartridge (the top is held on by four 9/16" bolts) and use the vacuum truck to evacuate the spent media. When empty, the spent cartridges may be easily lifted off their slip couplers and removed from the vault. The couplers may be left inserted into couplings cast into the false floor to prevent sediment and debris from being washed into the outlet chamber during washdown.
- Once all the spent cartridges have been removed from the structure, the vacuum truck may be used to evacuate all accumulated sediment from the treatment chamber. Some jetting may be required to fully remove sediment. Take care not to wash sediment and debris through the openings in the false floor and into the outlet chamber. All material removed from the PerkFilter during maintenance including the spent media must be disposed of in accordance with local, state, and/or federal regulations. In most cases, the material may be handled in the same manner as disposal of material removed from sumped catch basins or manholes.
- Place a fresh cartridge in each cartridge position using the existing slip couplers and urethane bottom caps. If the vault is equipped with stacked cartridges, the existing outer and inner interconnector couplers must be used between the stacked cartridges to provide hydraulic connection. Transfer the existing vent tubes from the spent cartridges to the fresh cartridges. Finally, refit the struts to hold the fresh cartridges in place.
- Securely replace access covers, as appropriate.
- Make arrangements to return the empty spent cartridges to Oldcastle Stormwater.

PerkFilter
Inspection and Maintenance Log

Location ____

Structure Configuration and Size: Inspection Date ____________

☐ Vault _____feet x _____feet
☐ Manhole _____feet diameter
☐ Catch Basin _____feet x _____feet

Number and Height of Cartridge Stacks:
Count_____each ☐12" ☐18" ☐24" ☐30"

Media Type:
☐ ZPC ☐ Perlite ☐ Other________________

Condition of Internal Components ☐ Good ☐ Damaged ☐ Missing	Notes:
Inlet or Outlet Blockage or Obstruction ☐ Yes ☐ No	Notes:
Floating Trash and Debris ☐ Significant ☐ Not Significant	Notes:
Floating Oils ☐ Significant ☐ Not Significant ☐ Spill	Notes:
Sediment Depth in Inlet Chamber ☐ Inches of Sediment:___________	Notes:
Sediment Depth in Treatment Chamber ☐ Inches of Sediment:___________	Notes:
Standing Water in Treatment Chamber ☐ Inches of Standing Water:___________	Notes:

Maintenance Required

☐ **Yes - Schedule Maintenance** ☐ **No - Inspect Again in _______ Months**

PERKFILTER™

OUR MARKETS

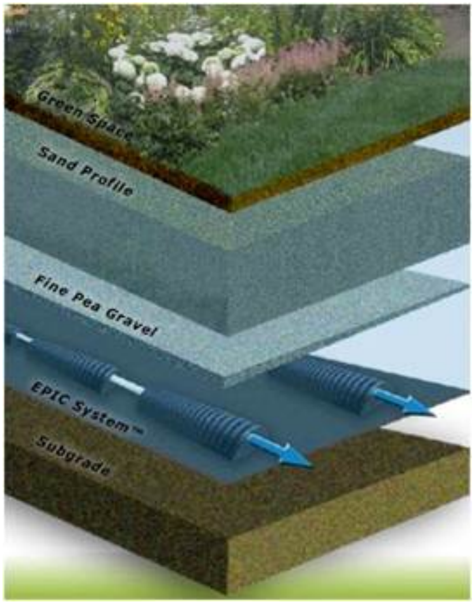
BUILDING STRUCTURES

COMMUNICATIONS

WATER

ENERGY

TRANSPORTATION



EPIC System Maintenance Manual

EPIC Maintenance Manual

PREFACE

This manual provides the general procedural process for EPIC system maintenance. It is not intended to cover all aspects or site specific applications of the continuous maintenance process which can vary between projects, climatic locations, and landscapes.

Unlike the complex world of pressurized sprinkler irrigation that deals with trenches, 24V wiring circuits, zone valves, and hardware with many moving parts; the Environmental Passive Integrated Chamber (EPIC™) System has no moving parts, is non-pressurized and primarily gravity driven. EPIC systems involve a unique, yet simple approach to landscape irrigation, drainage, and water management; distributing moisture reliably to the plant's root zone when operated correctly.

Good grass management has become, and is both an art and a science that not only involves nutrients but also mowing, aeration, thatching, awareness of disease, environmental factors, timing, and patience. There is not one successful formula for maintenance.

Every turf manager has their own experiences related to climatic conditions and environmental circumstances. Fertilizer manufacturers also provide their own special formulations and recommendations based on their research and experience. EPIC efficiently assists with the management of water, allowing your focus to be managing the turf.

THE EPIC PARADIGM SHIFT

Historically the same philosophy and practiced methods of water management have repeated since Joseph Smith patented the first swiveling lawn sprinkler in 1894. Fundamentally, all the different sprinkler brands and various part categories have remained the same, in principle, for over a century. Drip systems share the operational maintenance challenges of pressurized irrigation.

Trials addressed by every irrigation system are providing enough water to satisfy plant growth, while attempting to avoid water waste. Climate factors such as temperature, humidity, sun exposure, air ventilation / wind, leaf area all contribute to a plant's evapotranspiration (ET) rate. Advancements in irrigation system "improvements" include precise distribution patterns & timers, various sensors, controllers, even satellite imagery; complex technology to determine a "best guess" of water ET rates allocated for the plant.

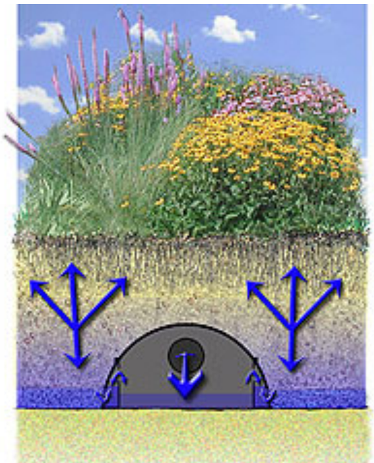
Conversely, the EPIC system philosophy trusts the plant itself to determine its own need, as nature intended. Scientific metered studies around the world continue to verify EPIC's 100% irrigation efficiency with zero waste, and 60%-80% reduction in water use compared to sprinklers or drip systems. Nearly every drop is conserved in EPIC as the Firestone EPDM liner prevents any water loss to the ground table or adjoining native soils. Multiple types of water sources may be blended and utilized in the EPIC System.

Figure - Roots of bean plant irrigated from the surface reveals the fast sheering effect that cuts at developing root hairs and damages the root system.

Typically, water absorption occurs at the roots of a plant. Therefore, the current practice of surface applications is inefficient. This results in wasteful practices including erosive runoff, environmental pollution, compacted soils, poor drainage, pressurized breakage / repairs, wind pattern loss, hard water stain calcification, surface evaporation and maintenance headaches. EPIC "capillary irrigation" utilizes basic science, founded in nature, to provide an aerobic and consistent moisture supply to the plant's root system.

Figure - Roots of an identical bean plant develop more root hairs and a stronger, more prolific root system from EPIC's method of slow moving, subsurface capillary irrigation.

EPIC SCIENCE | HOW IT WORKS



The science of EPIC utilizes particle characteristics of washed sand and water's unique cohesion and adhesion properties to distribute moisture between sand particles efficiently, even against gravity. Non-pressurized, low flow, and gravity driven, water seeks its own level by path of least resistance through the EPIC System in a three-dimensional flow; yielding non-clogging, filtered drainage, and sand hydroponic "capillary irrigation"; effectively achieving both irrigation and drainage without moving parts, on a13mm tolerance laser level subgrade. Depending on chamber density and outfall connections, EPIC can drain up to 26mm in 24 hours without endured surface pooling.

Analogous to cellular biology, EPIC functions as individual "cells" integrated into a "system," Interfaced to the bottom fine gravel layer (1-3mm) that bridges water distribution to the washed sand profile. Four Liters per minute inlet water fills the first EPIC chamber, and then spills to the 2nd, and the remaining sequence of chambers until the system is "charged." The sand mimics a sponge holding an average 100-200 Liters per square meter of surface area, depending on approved local aggregates characteristics which, in turn, determine a project's EPIC profile depth. The EPIC profile will absorb26mm of rain prior to any system drainage. Thus, EPIC landscapes additionally serve as storm water retention and reuse.

EPIC water management dynamics are integrated in two distinct zones unique in the EPIC profile.

EPIC Profile Zones

Capillary Zone

The sand profile area above the invert of the connecting pipes in the EPIC chamber is defined as the capillary zone. This zone is the biologically active zone as it simultaneously provides even and variable moisture distribution along with proportional oxygen content. This is where the roots grow, and the soil bacteria are active. This zone provides sand stability, and the zone that enhances biological filtration through adhesion. A combination of sand's capillary rise characteristic (obtained from testing) and intended use of the EPIC profile determine the design depth of the profile, the depth and location of the capillary zone.

Figure V - EPIC sand capillary zone above saturated zone

For example, in turf applications the design guidelines are to add 100mm to the height the sand will capillarize upwards in 24 hours. This then provides an adequate moisture level at the surface to allow for germination of seed and the lateral growth of rhizomes from turf grasses under normal operating levels.

Saturated Zone

The EPIC system creates a temporary 8 cm perched water table on top of the EPDM liner. The water spreads evenly through the bridging gravel and then is absorbed upward into the sand profile. In flat EPIC areas the height of the saturation zone can be adjusted by manipulating the "swing joint" elbow at the drain vault.

Water Management

Global precipitation is constant, distribution is variable. Either there is too much water and flooding, or too little fresh water and drought in any given area. EPIC systems vary design approach with solutions to accommodate both the "too dry, too wet" problems using fundamentally the same technology.

In dry climates water during brief periods of excess storm events is channeled to a secondary storage system for reuse. A 2.5cm rain event produces 2.5 L , EPIC areas capture and filter water for reuse as future irrigation water. Void spaces between sand particles total 100L per m² in a 38cm EPIC profile, and more than 120L per square meter in 60 cm profiles.

EPIC systems with established turf absorb rates of 25mm per hour continuously without surface pooling. Excess water can then drain into underground storage reservoirs for sustainable reuse. The water is bio-filtered for storage, or ground water recharge, without stagnation, algae growth or evaporation loss.

Some EPIC applications include storm water management, grey water reuse, erosion control, infiltration, grass parking and turf utility roads, agriculture, saline landscape irrigation; the list of EPIC's capabilities span a vast palette of liquid and air movement solutions.

WATER MANAGEMENT MAINTENANCE

Water management alone is not a guarantee of successful plant growth. Aeration, nutrient additions and various cultural practices all play a major part in this field's aesthetics.

Water needs of any plant divides into the two categories of *physical content* of water in the roots, stems, leaf structure tissue itself and water lost by *transpiration* of the plant.

Turf grasses provide minimal storage in structure but lose a lot of water thru transpiration. Transpiration is the invisible physical activity of growing plants where water absorbed at the root level is transferred through the supporting stems and out to the surrounding atmosphere from leaf openings called "stomata".

Turf grasses may transpire as little as 1 Liter per m² per day during cooler time periods, or possibly over 4 Liters per m² per day during hot, dry windy conditions. Water loss by transpiration is a variable rate that will be dependent on a combination of Plant species, Leaf area (of growing tissue), Humidity, Temperature, Wind speed, Sun exposure (cloudiness), and Health of the plant.

Grass does not waste water – people do.

Properly constructed EPIC™ Systems will match the transpiration needs of the plant by simply providing a stable underground reservoir, and the plants themselves determine the water uptake they need.

OPERATION

COMPONENTS

Figure - EPIC sub-grade, EPDM liner, EPIC Chambers, finish

The sequential primary components of the EPIC™ System are:

1) Laser level subgrade
2) Geotextile Felt Fabric
3) 45 mil Firestone EPDM Liner on subgrade and upright walls
4) EPIC Chambers w/ non-pressurized 60mm connectors
5) 51mm of washed bridging gravel or coarse sand
6) 55cm (+/-)clean dune sand (“sweet sand”)
7) Total average profile depth +/-55mm (varies upon approved EPIC aggregate sources)
8) Inlet | Inlet header pipe
9) Outlet | Drain header pipe | Observation ports
10) Reservoir assembly

INLET

The Inlet is the point of water introduction into the EPIC system. Recommend to locate EPIC inlets from project “as-built” plans, and routinely verify inlet rate(s). Due to friction loss, inlets the greatest distance & vertical lift away from the water pump may require a more open valve setting, compared to inlets closer to the pump, to maintain equal low-flow rates. EPIC chamber shall not exceed a flow rate of 8 L/Min. in connections from a single inlet.

Figure - Inlet vault with gate valve inlet from pump in reservoir

Figure- Inlet Header Pipe

INLET HEADER PIPE

Large athletic fields incorporate 15cm header pipes along the sideline with multiple inlets from the reservoir pump. The inlet flow of a typical field is adjusted between 8-14 Liters per minute per number of EPIC chamber row connections to the 15cm inlet header.

The recommended operating water level is at the mid-point of the 15cm inlet header and/or the 60mm connector pipe to the EPIC chamber. This allows for an efficient air displacement exchange through the EPIC system simultaneous to its irrigation cycles.

OUTLET

The Outlet of water leaving the EPIC system discharge into the tank reservoir or to secondary storage reservoirs as allocated in the "as-built" plans. A closed EPIC system has no outlet and continually recirculates the water. An open EPIC system has a final outlet from the reservoir, at capacity, to project outfall. Water elevation levels of the EPIC cell can be controlled by the adjustable union joint and elbow installed in the outlet vault.

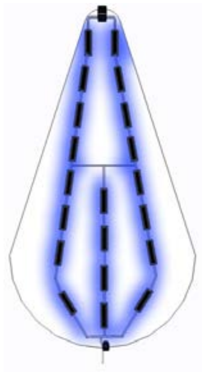
Figure- Concrete outlet vault with adjustable "swing joint" to control water elevation.

ZERO-DRAIN

A feature typical of EPIC designs in flat EPIC systems is a simple upgrade that provides more precise and immediate saturated zone water elevation adjustments. The zero drain option is installed in the last EPIC chamber of the flow pattern.

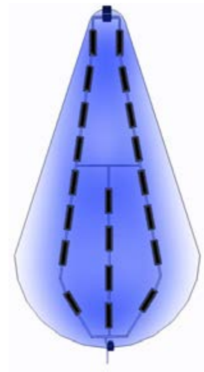
Figure- Zero Drain EPIC camber connection

Dig. 1: Filling EPIC™ System too fast



Drain

Dig. 2: Filling EPIC™ System correctly



Drain

- **Running the submersible pump too <u>long</u> (+24-48 hrs.) will not create a problem.**
- **Running the submersible pump too <u>often / frequent</u> can cause a problem; too much water will not allow the system to fluctuate water levels which is good for the exchange of O_2 & CO_2.**

At the end of an EPIC flow pattern is an observation drain vault to verify water has reached the entire length of each EPIC flow pattern. If the EPIC™ system is filled too fast (+12 Liters per minute) the water will quickly move from chamber to chamber and begin to come out the drain giving the impression that the system has been fully charged. In reality the system is barely charged because ample time was not given to allow the water to move laterally through the gravel layer and into the sand layer (Dig. 1). When ample time is given, as seen in (Dig. 2), the water will move laterally allowing for sufficient system charging.

The **EPIC™** System field is designed to require minimum maintenance of moisture levels. The only pressurized connections to the system are from the pump to the inlet units, otherwise the **EPIC™** System is gravity driven with no moving parts.

IRRIGATION DUTY CYCLE

Water levels must be "pulsed" weekly by "charging" EPIC with water to push out CO^2 and other respiration gases and the water recedes over time to draw in O^2. A typical irrigation cycle is 24 hours each week programmed by the adjustable electrical timer, which controls the electrical current to the water pump.

If the water supply pumps are not on long enough (24 hour ***minimum*** per cycle) the water may not reach the drain ports, potentially causing stressed areas of the turf furthest from the water inlets.

Tank Reservoir

Typical EPIC installations utilize a plastic tank reservoir or various capacity sizes. The Reservoir houses the Float Valve, Water Pump, and electrical / water supply.

Secondary Storage Reservoirs

Various secondary storage reservoirs can integrate with EPIC as an underground void space to hold, retain, reuse, and/or delay storm volumes ranging from thousands to millions of gallons and its potential erosive energy. Captured excess water is filtered through the EPIC sand profile prior to reservoir storage. Storage reservoirs may be lined with EPDM liner to retain water for reuse, or be unlined for ground infiltration.

Figure- Triton S-29 Chambers with EPDM liner

Access covers

All electrical, pump, float valve are equipped with accessible cover or manhole as specified in plans. Routine monitoring of component operation and functionality during its duty cycle is recommended.

Figure - Reservoir access showing pump, float, & drain

Float Valve

Float valves shall operate within a pressure range of 103 – 792 kPa in conjunction with the water pump specified in accordance to the construction documents and plan set. Water flow through the float valve must be larger than the output rate of the submersible pump. Float valve shall have a quick connect union to retrieve if necessary as specified in plans.

Water Pump

Submersible water pump shall have quick connect union to retrieve pump if necessary as specified in plans.

Water & Electrical Supply

Pressurized water supply connections typically are a single point location in conjunction with the electrical supply that operates the recirculation pump. A dedicated 20 Amp 115V electrical circuit shall operate the submersible water pump positioned in the recirculation tank reservoir as specified in the plans.

Function of an EPIC™ System sand profile.

In a given volume of medium-sized sand grains, approximately half of the space (50%) is occupied by the sand particles and the other half (50%) as void space. In the growing environment of an EPIC™ System profile this void space is a combination of water, air and growing plant tissue (roots). As capillary physics draws water upward from the saturated zone (area totally submerged with water) a graduated water concentration occurs within the profile. The closer to the water line the more saturated the sand. The further from the water line the drier the sand.

EPIC Holding capacity

The Normal **EPIC™** Water Operating Level is the midpoint of the 2" connection pipe between EPIC chambers. In the profile just above this water line the water content in the sand is approximately 85% and the remaining void space is 15%. The surface will feel damp and there is sufficient moisture to germinate seed and sustain turf grass.

If the water level is allowed to drop 90mm (the bottom of the liner) the moisture level at the surface may only be 3% water and 97% air. This allows air to enter the profile while moisture remains available held between sand particles. A given volume of sand has about 50% of its volume available as open space and 50% occupied by water or gases (air).

If the water supply is shut off, the volume of water will still be held by capillary adhesion and will slowly start to **dry out from the top down**. A typical EPIC system holds 120 L per m^2 of surface area. Shutting off the water supply in the **EPIC™** System will not produce an immediate drying affect and water will continue to be available to developed turf root structure.

In climates that have frequent rain events, it is possible that supplementary water may never need to be added. Rain water is harvested and stored, and only excess water is allowed to drain out of the system.

Routine Maintenance

A nutrient (fertilization) program is required and it will have a routine schedule attached to it. **Follow the routine even if the grass appears to be healthy**. The program balances out the sand, making nutrients available for future growth. Do not wait for the grass to look stressed before reaction, the formulas may be too little, too late, or even chemically overwhelming to already injured and stressed grass.

The fertility program for a sand-based field must be developed and implemented by the field manager.

Mowing of Turf


Figure 1: Sharp blade cut


Figure 2: Dull blade cut

Mow frequently and keep mower blades sharp. Grass grows from the bottom up constantly pushing the upper part the leaf blade upward. The cut ends of leaf blades are "open wounds" where plant diseases can take hold. Sharp mower blades make a clean "wound" while dull blades cause shredding and pulling of tissue thus increasing the damaged area.

Frequent mowing has four advantages:

- Cutting off a smaller portion of the upper grass blade means that the formerly damaged tissue from the last mowing is removed before diseases had time to establish in the "open wound"
- By removing a smaller portion of the leaf blade, most of the photosynthesis surface area remains intact thus the grass blade is less stressed
- Smaller cut portions fall down between the grass blades easier, decompose quicker and the field looks greener
- By not allowing the grass to stretch upward, grasses tend to respond by creating more shoots laterally providing denser, thicker turf.

Aeration

Aeration is critical to avoid formation of Black Plug Layer (BPL), a "capping" affect between the sand profile and the organic matter layer that is present in turf grass. This will result in **anaerobic** (oxygen deficient) conditions within the soil profile. This BPL affect will prevent the exchange of gases and infiltration of water in the fields sand profile which will result in a steady decline of turf quality.

The washed sands used in **EPIC™** profiles assure that pore space is always available for a certain amount of oxygen content. Oxygen is generally introduced into the profile from air pressure (21% oxygen) in the atmosphere above the surface, which then disperses into upper layers of the sand profile. Oxygen then combines with moisture films around individual sand grains, thus making it available to the root hairs.

Conversely, the respiration of roots in healthy growing plants and the biological activity of soil organisms in the soil produce carbon dioxide gas which must equalize itself with the carbon dioxide levels of air. While the carbon dioxide level in air is a mere 0.03 %, the sand content can be 5 % or more. Oxygen therefore is not only used up physically to form carbon dioxide, but is also displaced by the carbon dioxide concentrations. As such it is necessary to maintain an exchange pathway between the sand and the air above it so equalization can take place. This exchange pathway can be blocked or hindered by:

- Compacted clay soil
- Infrequent or lack of core aeration
- Tight plant thatch
- Rapidly decomposing organic material or dead grass
- Saturated soil conditions
- Sod that **has not** been cored **within several weeks** of being laid
- Lack of soil worm activity

AEROBIC CONDITIONS

Aerobic (oxygen sufficient) conditions must be available for respiration in roots, which in turn is necessary for plant growth. Experiments on numerous plants have shown that growth ceases when oxygen is removed by replacing it with another gas or water. The amount of oxygen necessary for growth varies with the species. Roots at great depths, in water logged soils or in very compact soils are likely to suffer from lack of oxygen.

Agronomic Overview

Nutrient Agronomy

Eight inorganic elements have been recognized as essential nutrients for plant growth, each with a specific function in plant physiology. The following table summarizes these eight and their function within plants. Washed sands are traditionally considered sterile environments but may contain some of the listed nutrients naturally as composition elements from their derivative rock. As such testing at a certified soil lab of the sand source will be required to determine which of the eight elements are missing or in need of replenishing.

Essential Element	Symbol	Plant usage
Calcium	Ca++	Calcium plays a prominent role in the absorption of other minerals from the soil. It neutralizes acids and has an antitoxic effect on other poisonous substances in the soil. Root hair cells contain calcium pectate, a colloid which enables it to imbibe water. This substance also forms the cementing material for holding all cells together, and is the first substance in the formation of new cell walls.
Iron	Fe+++	Iron is essential as part of the cytochrome oxidation system in respiration function. It is also essential for chlorophyll formation even though it is not part of the chlorophyll molecule. Many brown and reddish sands and soils may have an abundance of Iron, but it is not always in a form usable by the plant.
Magnesium	Mg++	Magnesium is a constituent of the chlorophyll molecule. Without chlorophyll there is no interaction with sunlight to produce plant tissue. However very high concentrations of magnesium are toxic to plants.
Manganese	Mn++	Manganese is thought to be necessary for the proper function of plant respiratory enzymes.

Nitrogen	NO_3^-	Nitrogen, only absorbed as a nitrate, is absolutely essential to growth, affecting particularly the growth of above ground parts. It is a constituent of chlorophyll, but is chiefly used for the production of proteins which are essential to every cell. A nitrogen deficiency quickly manifests itself as the yellowing of green foliage (chlorotic). Excess nitrogen may cause excessive vegetative growth which can result in weak and tender stems and foliage which are then susceptible to fungus and insect injury. Some nitrates are produced naturally through the interaction of lightning in thunderstorms; some is fixed by specialized soil bacteria living in nodules of specialized plants such as clover and alfalfa. Decomposition of dead organic material by soil organisms and their waste products (urea) may also provide nitrates through complex biological interactions. Urea → Ammonia→ Nitrites→ Nitrates. However, for lush thick turf, supplemental addition of nitrogen sources will almost always be necessary.
Potassium	K^+	Potassium is necessary for the proper carbohydrate metabolism of the plant. When potassium is deficient, storage organs such as roots, tubers, and seeds are small and shriveled. Plants with ample supply of potassium have been reported to be more resistant to disease and insect injury.
Phosphorus	PO_4^{---}	Phosphorus in the soil is most likely absorbed as a phosphate ion. It is essential for the formation of many compounds such as phosphoproteins and phospholipids. Lack of this element interferes with normal cell division and checks growth. It is important for proper functioning of photosynthesis and respiration. Phosphorus also increases root development and as such is important in the early stages of sod or seed growth.
Sulfur	SO_4^{--}	Sulfur, absorbed as a sulfate ion, is a constituent of at least three amino acids that occur in proteins. Glutathione is an essential component in the respiration role of plants and the take up of oxygen.

Soil analysis

Many regional and national soil testing and Agricultural Laboratories are available to assist owners that grow turf or crops. The installation of EPIC systems does not diminish the requirement to periodically obtain soil samples of the root zone to determine missing or excess elements involved with good vegetative growth. Routine sampling and record keeping with a reputable laboratory is a very valuable association.

Rely on testing and sound advice to establish the nutrient formula. Large athletic fields should as a matter of routine send in appropriate soil samples to agricultural labs at least annually, and preferably semiannual to determine what is missing and what supplement levels are needed. If storm or effluent water is used for irrigation an analysis is needed of the water as it will be a contributing factor in the mix. Nutrient levels and types cannot be seen and there are no simple field tests to get the information. Cost of these lab analyses is reasonable and provides a scientific base line data as to nutrient levels. Discuss the results and recommendations with an EPIC representative or EPIC Certified Contractor to formulate a routine.

Annual soil and water lab analysis is recommended to verify, chemically, the precise balance of nutrient supplements to apply to the turf for maximum aesthetics.

Keep records and be observant of change.

Chronological records of chemical applications, formulas used, weather conditions, field usage and stress conditions with recovery times provide invaluable assessment data to deduct cause and affect relationships if challenges occur.

For example the start of a disease infestation a week after a visiting team’s appearance may be related to disease introduction by contamination transfer from athletic cleats. Accurate data availability and subsequent review simplifies investigation and deduction of issues.

Disease

A disease can be defined as an abnormal condition of plants resulting from changes in their physiological processes and morphological development and caused be some adverse environmental factor (s). A disease is the end result of three factors occurring simultaneously:

1) A susceptible host (turf plant),

2) A pathogen capable of infecting the host

3) And environmental conditions that favor the development of disease.

The first indication that something might be wrong with the grass is the appearance of a brown (dead) patch of grass blades, or a patch that shows discoloration. A closer examination may also show that the brown grass blades feel dry and brittle. To zero in on the definitive causes will require a systematic approach that includes:

- closer observation
- literary references
- Process of deduction
- expert consultation
- laboratory microscopic examinations

To illustrate the complexity - a “brown” patch may be caused by:

Lack of moisture	**Too much moisture**	**Fertilizer spill**	**Chemical spill**	**Molds Over 17 species**
Deer urine Rabbit activity At night	**Pet urine Yours or visitor**	**Rodent activity Over 4 species**	**Insect activity Over a 100 species**	**Missing or Imbalance of Nutrients**
Mechanical damage	**Insufficient sunlight**	**Heat stress**	**Cold stress**	**A combination of more than one factor**

Turf Establishment

Establishment Period

Sand-based fields will initially require a more comprehensive fertility program. Most washed sands are initially nutrient poor in some elements necessary for good plant growth. These nutrients must be added to the sand profile. Daily periodic inspections must be performed to assure optimum moisture levels are maintained. The Establishment Period is the most critical step towards high quality turf grass.

Figure- Capillary rise witnessed at surface as level EPIC field is charged from inlet header to outlet header.

PREPARATION

- Smooth dry finish grade sand with drag mat
- Begin charging of all EPIC inlets
- Verify capillary irrigation moisture as reached all areas of each flow pattern
- Apply establishing fertilizer nutrients granules on surface

FIRST WEEK

- Keep the pump on 24/7 to maintain the EPIC water level at the maximum saturation level. This will reveal moisture within 25mm of the surface.

SECOND WEEK.

- Use a USGA Standard Sized Golf Cup Cutter or a soil probe to check root growth.
- Reduce pump inlet operation to EPIC system from 24/7 to 24/3.

THIRD WEEK.

- Root growth should be well established, the sod should not lift when pulled or tugged with hands.
- Use a USGA Standard Golf Cup Cutter or a soil probe to check root growth.
- After root growth reaches an average of 150mm reduce pump operation cycle to 24/2 (see below)
- Program the pump timer to be on for 24 hours, off for 72 hours, on for 24 hours, and off for 48 hours to complete the weekly cycle.
- Check the flow rates in the 15 inlet units
- Confirm flow of water reaches the 15 observation drain units

FOURTH WEEK.

- Mow new growth removing not more than 1/3 of the plants total height per mowing.
- Allow two (2) days resting time between mowing **(**standard practices until desired finish grass height is achieved.

SIXTH – EIGHTH WEEK.

- Core aeration operation of the field is recommended with a piston driven core aerator. **Aeration is critical** to avoid anaerobic conditions within the sand profile. An analogy would be laying a piece of plastic over the top of the field. This “capping” affect will prevent the exchange of gases and infiltration of water in the fields sand profile which will result in a steady decline of turf quality. A typical indication of anaerobic conditions is a BPL (Black Plug Layer) that is a grey – black color and smells like sulfur or “rotten eggs”.

Jonas Sipaila 12/8/11 4:32 AM
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Time	Material/Procedure	Rationale
All months	**Maintain grass height to 20mm height or as recommended by sod grower for selected species**	**Mow at least once per week in the early and late months and twice per week during the peak growing season with a sharp mower. Mow in alternating patterns. If mowing is required more often to maintain the routine of mowing only one-third of the grass blade, schedule more mowings.**
All months	**Maintain adequate and proper moisture levels based on seasonal and daily weather fluctuations.**	**Normal operating level is operating the pump 24 hrs. / 1-2 times per week.**
All Months	**Fertility**	**Observe and test for fertility requirements, fertilize as needed from soil tests and visual plant inspections. *Sand-based fields will require a more comprehensive fertility program***
Seasonally	**Aeration** **Over seeding**	**Sand fields grow aggressively. Aeration is critical to keep airflow in and out of the system and avoid anaerobic conditions. A typical indication of anaerobic conditions is a BPL (Black Plug Layer) that is a grey – black color and smells like sulfur or "rotten eggs".** **Occasional overseeding may be required in high traffic areas. A key to successful overseeding is to get the seed down into the sand. This can be accomplished using a hollow tined aerator or slit seeder. NO overhead irrigation is required. Seeding right after aeration is recommended.**

Whether the source of the element and compound is derived naturally or artificially, if plants are to do their best, they must be supplied with a proper balance of all the essential inorganic substances. If any one of the inorganic substances is deficient, its lack will soon be manifested in the growth of the plant regardless of how much of all the other substances may be available.

Figure - Kentucky Blue Grass 30 days after seeding in ordinary sand.
(Left) No nutrients added (right) Addition of balanced nutrients

Research has alluded to importance of other factors as soil and water pH, Cation Exchange Capacity (CEC), Base saturation levels, Zinc and other trace elements etc. The latest trends are experimentation with microrhizomes, humic acid levels, and microbial density indexes (MDI).

PLANTINGS

TURF SEED

- Before seed is applied, owner must inspect the field. Seed shall not be applied until further settling is not apparent.
- Seed shall be applied with a mechanical device such as a Brillion Seed Drill with minimum58mm spacing. All applications must be in two directions, (90 degrees across) applying one half of the seed in each direction.

Figure - EPIC seed germination @ 8 days

- Apply1.4 kg of seed per 1,000m²
- In the event that there is washing or erosion from irrigation or rainfall, the Contractor shall reseed areas that are not uniform.
- EPIC system must be adjusted so that moisture is present in the top 6mm of the surface.

TURF SOD

Use only high quality sod of known genetic origin that is free of noxious weeds, disease, and insect problems. It should appear healthy and vigorous and should conform to the following:

- Sod should have been grown in soil comprising at a minimum 85% sand, or bare rooted sod grown with soil less techniques.
- Sod should be machine cut at a uniform

Figure- Turf Sod at Westside Park, Los Angeles, CA

depth of 13-51mm – excluding shoot growth and thatch.

- Sod should not have been cut in excessively wet or dry weather.
- Sections of sod should be a standard size (as determined by the supplier), uniform and untorn.
- Sections of sod should be strong enough to support their own weight and retain their size and shape when lifted by one end.
- Harvest, delivery, and installation of sod should take place within a period of 36 hours.

Sodding procedure

- Moistening sod after it is unrolled helps maintain viability. Store it in the shade during installation.
- Rake the soil surface to break the crust just before laying sod. During the summer, the sand should be wet on the surface before laying the sod to cool the sand and reduce root burning and dieback.
- Do not sod on gravel or soils that may have been recently treated with sterilants or herbicides.
- Lay the first row of sod in a straight line with subsequent rows placed parallel to and butting tightly against each other. Stagger strips in a brick- like pattern. Be sure that the sod is not stretched or overlapped and that the joints are butted tightly to prevent voids. Use a knife or sharp spade to trim and fit irregularly shaped areas.
- As sodding of clearly defined areas is completed, roll sod to provide firm contact between roots and sand.
- After rolling, irrigate until the soil is wet 100 mm below sod.
- Keep sodded areas moist to a depth of 100 mm until the grass takes root. This can be determined by gently tugging on the sod – resistance indicates that rooting has occurred.
- Mowing should not be attempted until the sod is firmly rooted, usually 3-4 weeks.

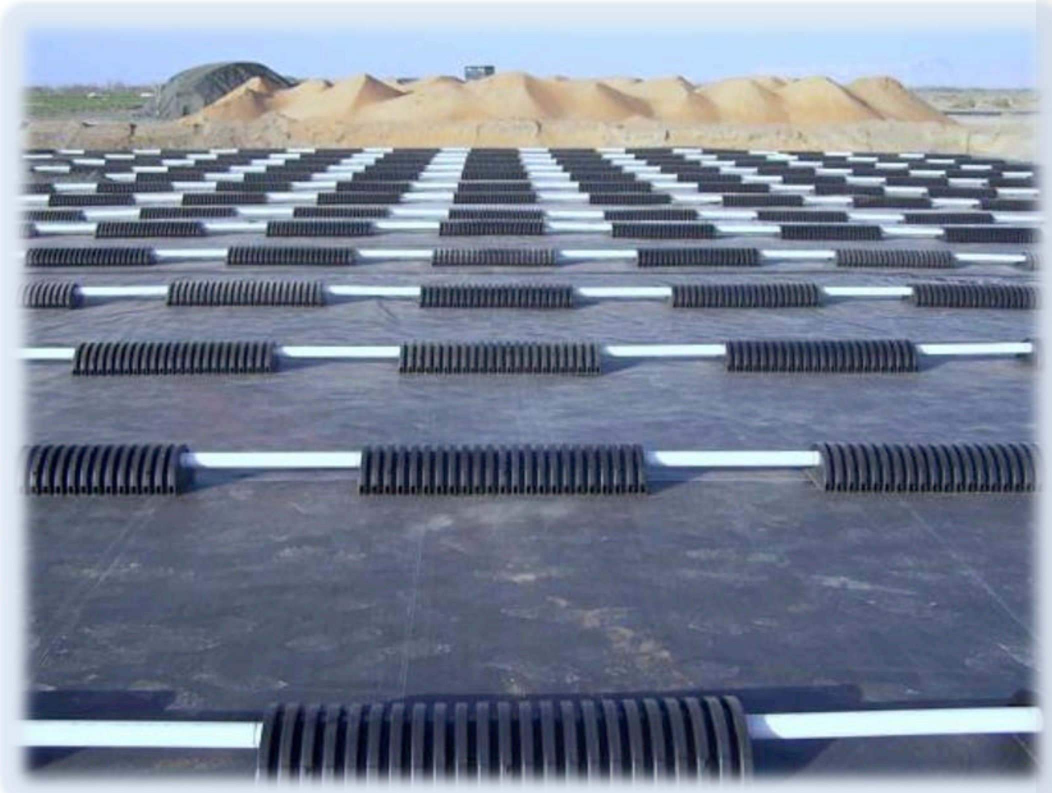
Flowers | Shrubs

- Recommend to dig out appropriate sand volume to receive root ball of nursery stock shrubs, perennials, and annuals
- Remove nursery shipping container, loosen root ball and discard any loose greenhouse planting media from plant. Do not damage existing root structure and only discard surrounding soil that falls off easily.

- Plant directly in sand and refill and press excavated sand around root ball of plant. Press down firmly around planting and smooth out sand surface after planting. Crown of plant shall be below the finished sand surface.

Trees

- Insert specified nutrient spikes around tree and pushed in to be 15cm below sand surface. Recommend watering 20 Liters around fill area of tree trunk for additional settling of sand fill, add additional sand to finish grade to balance settling.



[*WWW.EPIC-GREEN.COM*](http://www.epic-green.com)

CLOSING SUMMARY

It is not within the scope of this manual neither to provide a definite identification guide nor to provide the solutions to all the problems. The subject is too complex with twists and variations that can at times even confound the "best" experts.

Some general "words of wisdom" to turf grass managers are offered below:

1. Don't take it as necessarily a failure of management practices. While no management or poor management programs can initiate stressed grass conditions, problems will occur at times even in the best managed programs. A lush green, vast area of sports turf may be the ultimate goal, but to nature it merely becomes an attractive smorgasbord of "food" for various opportunistic pests.

2. While we cannot control weather conditions, be aware of weather conditions. Applying fertilizers just before a rain event may be beneficial; applying it when the grass is still wet may not be a good idea. Some Fungicides and Pesticides on the other hand may be washed away and be useless if applied just before a rain event.

3. Be flexible. A tight schedule of maintenance activities shows determination and order, but it should have the ability to be overridden by common sense. Do not mow the grass if the grass is still wet. Do not use or even walk on the field if the frost is still on the grass blades.

4. Don't jump to conclusions. Be systematic and analytical in analyzing problems. Stressed grass conditions, as mentioned, can have many culprits. Some insects and fungi are invisible to the naked eye, others are not. A lot of damage may be occurring underground before it shows at the surface. No one person knows everything all of the time. Rely and obtain second and third opinions. Just when you know everything, Mother Nature can throw you a surprise.

Be patient. In a world of instant gratification - grass response is a misfit. Even on the best of conditions it will still take 5 to 10 days for grass seed to germinate, several more weeks to "look" green and several months to be ready to stand up to abuse. It may take several days and up to a week for pesticides and herbicides to be effective, and then only if we have chosen the right formula.

APPENDIX G – EDUCATIONAL MATERIALS

TIPS

for

WEATHERING THE STORM

BEFORE

Clean debris from your home's gutters and downspouts

Create an emergency preparedness kit

Secure trash bins and objects in your yard

DURING

Turn off sprinklers and continue to conserve water

Avoid major waterways, flooded streets and downed power lines

Report clogged catch basins and flooded streets to
(800) 974-9794

AFTER

Keep out of the ocean for 72 hours

Clean up fallen branches and debris

Empty open containers of stagnant water to stop mosquitoes

WE'RE SOCIAL!

Visit us at LAStormwater.org
LAStormwater@lacity.org

CITY OF LOS ANGELES
FOUNDED 1781

CONSEJOS

para

PROTEGERTE ANTE UNA TORMENTA

ANTES

Limpie los escombros de las alcantarillas
y bajantes de su vivienda

Cree un kit de preparación en caso de emergencia

Asegure los contenedores de basura y objetos en su patio

DURANTE

Apague los aspersores o irrigadores
y continúe conservando el agua

Evite grandes canales de agua, calles inundadas
y líneas eléctricas caídas

Reporte cuencas obstruidas y calles inundadas a través del
(800) 974-9794

DESPUÉS

Manténgase fuera del océano durante 72 horas

Limpie las ramas caídas y escombros

Vacíe los recipientes que contengan agua
estancada para evitar mosquitos

¡ESTAMOS EN LAS REDES SOCIALES!

Visítenos en LAStormwater.org
LAStormwater@lacity.org

CITY OF LOS ANGELES
FOUNDED 1781

LID

LOW IMPACT DEVELOPMENT

What is the LID Ordinance and how does it apply to you?

The City of LA needs your help to build sustainable projects that capture, treat and reuse rainwater to help make neighborhoods greener.

What is LID?

Low Impact Development (LID) is a leading stormwater management strategy that seeks to mitigate the impacts of runoff and stormwater pollution as close to its source as possible. Urban runoff discharged from municipal storm drain systems is one of the principal causes of water quality challenges in most urban areas. It can contain pollutants such as trash and debris, bacteria and viruses, oil and grease, sediments, nutrients, metals, and toxic chemicals that can adversely affect the ocean, rivers, plant and animal life, and public health.

LID consists of site design approaches and Best Management Practices (BMPs) that are designed to address runoff and pollution at the source. These LID practices can effectively remove nutrients, bacteria, and metals while reducing the volume and intensity of stormwater flows.

The Ordinance was developed by LA Sanitation in collaboration and coordination with community members, environmental organizations, business groups and the building industry.

Photo taken at the WaterMarke Tower in Downtown Los Angeles. City staff and the building developers devised creative solutions that made it possible for this property to be water friendly, such as the green roof you see featured in this picture. It's a great example of how every project, regardless of green space limitations, can incorporate LID practices.

How does the LID Ordinance affect me?

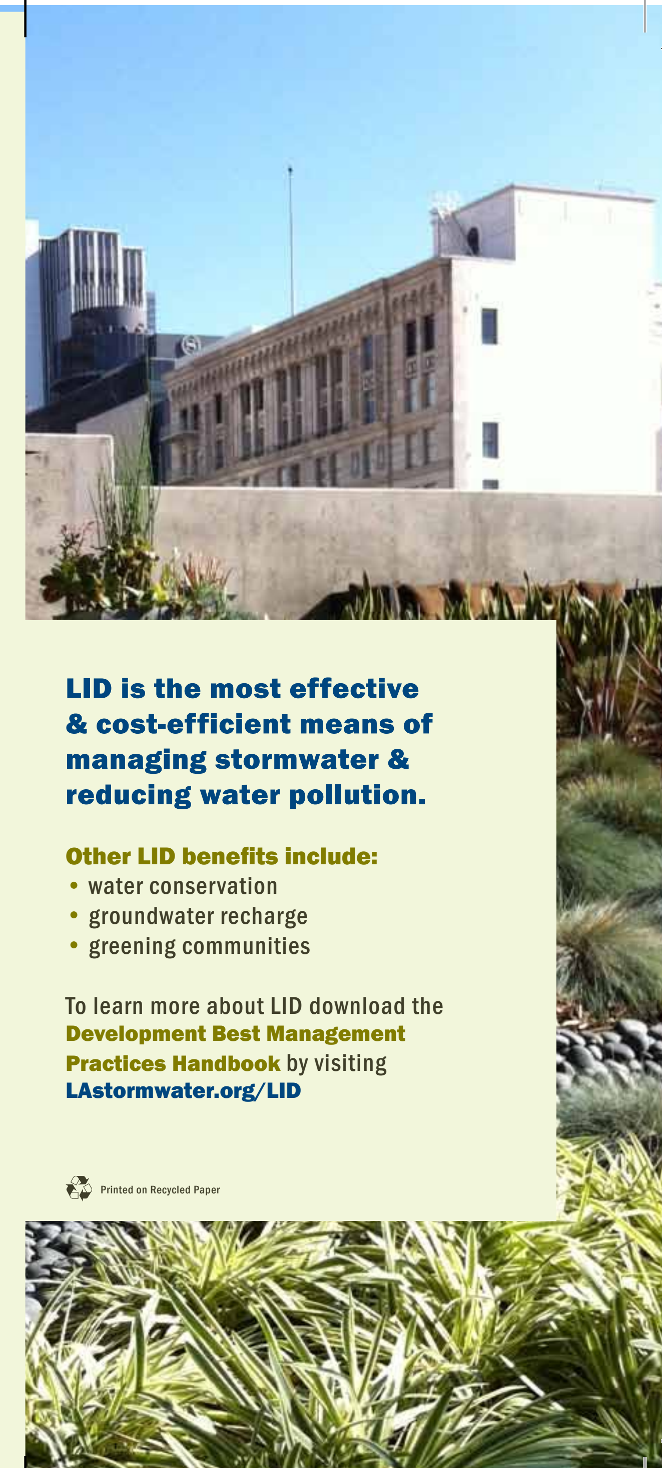
The LID ordinance requires rainwater from a three-quarter inch rainstorm to be captured, infiltrated and/or used onsite at most developments and redevelopments where more than 500 square feet of hardscape is added. Most single family residences can comply in even simpler ways by installing adequate Best Management Practices (BMPs) such as rain barrels, permeable pavement, rainwater storage tanks, or infiltration swales to contain the water.

When did the LID Ordinance become effective?

The ordinance was adopted in November 2011 and will officially become effective on May 12, 2012. The main purpose of the LID Ordinance is to ensure that development and redevelopment projects mitigate runoff in a manner that captures rainwater at its source, while utilizing natural resources.

How is LID different from the Standard Urban Mitigation Plan [SUSMP]?

The LID Ordinance requires stormwater mitigation for a larger number of development and redevelopment categories than was previously required under SUSMP. All development and redevelopment projects that create, add, or replace 500 square feet or more of impervious area need to comply with the LID Ordinance.



LID is the most effective & cost-efficient means of managing stormwater & reducing water pollution.

Other LID benefits include:

- water conservation
- groundwater recharge
- greening communities

To learn more about LID download the **Development Best Management Practices Handbook** by visiting **LAstormwater.org/LID**

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What is the plan approval process?

The City of LA will review all plans for new development and redevelopment projects to ensure that the appropriate BMPs are incorporated to address stormwater pollution prevention goals. During the review process, the plans will be reviewed for compliance with the City's General Plans, zoning ordinances, and other applicable local ordinances and codes, including stormwater requirements. The reviewer will also determine if project designs need to be modified to address stormwater pollution prevention objectives. Depending on the scale and the type of the project, the review and approval process can take between 2-6 weeks. .

Aunque resulte difícil de creer,

las hojas, el césped y demás desperdicios de los jardines pueden resultar dañinos para la vida marina cuando la manguera del jardín los empuja a los desagües y al sistema de alcantarillado de agua pluvial y van a parar al océano. Además, los pesticidas y fertilizantes que se desprenden del césped y de los jardines se suman a la mezcla de desperdicios urbanos y resultan tóxicos para la vida marina.

Estos son algunos métodos que puede tomar para asegurar un medio ambiente sano tanto para su barrio como para nuestros canales de aguas locales:

Utilice una escoba para limpiar la acera o la salida de autos. No use la manguera.

Utilice fertilizantes orgánicos o no tóxicos.

Ahorre agua cuando riegue el césped o el jardín.

Lea las etiquetas y utilice los pesticidas y fertilizantes siguiendo las indicaciones. No utilice más de lo necesario.

Convierta en abono los desperdicios de su jardín o recíclelos en el bote verde para reciclado que otorga la Ciudad de Los Angeles.

Deshágase de las sustancias tóxicas del hogar llevándolas a un SAFE Center. Llame al (888) 253-2652 para información sobre el lugar más cercano.

3-1-1 One Call to City Hall

Para información adicional llame al Teléfono de Información sobre el Alcantarillado de Agua Pluvial al: **(800) 974-9794,** o visite el sitio: **www.LAstormwater.org.**

STORMWATER PROGRAM
CITY OF LOS ANGELES

Water Pollution Solutions For Gardeners and Landscapers

The Ocean Begins In Your Neighborhood

Department of Public Works

Believe it or not,

leaves, grass and other yard wastes can be harmful to marine life when your garden hose washes them into the gutter and through the storm drain system straight out to the ocean. Also, garden pesticides and fertilizers washed off lawns and gardens add to the urban runoff mix and are toxic to sea life.

Here are a few simple practices you can follow to assure a healthy environment for both your neighborhood and our local waterways:

Use a broom to clean your driveway or sidewalk. Do not use a hose.

Use organic or non-toxic fertilizers.

Conserve water while irrigating your lawn and garden.

Read labels and use pesticides and fertilizers as directed—do not over-apply.

Compost green waste or recycle it in your City of Los Angeles-issued green recycling container.

Dispose of household toxics at a SAFE Center. Call (888) CLEAN-LA for the nearest location.

STORMWATER PROGRAM CITY OF LOS ANGELES

3-1-1 One Call to City Hall

For more information, call the City of Los Angeles Stormwater Program at: **(800) 974-9794.** And be sure to visit **www.LAstormwater.org.**

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Cómo Prevenir La Contaminación De Las Aguas Si Es Usted Jardinero

El Océano Empieza En Su Vecindad

Departamento de Obras Públicas

Small actions make a Huge difference

Do something good for LA

You make a difference

What you can do:

Toss trash in the garbage can

Recycle everything possible

Avoid buying anything with a "toxic" or "warning" label

Donate your old phone and computer

Pick up after your dog

Host a neighborhood cleanup

Volunteer:
Non-profits like Heal the Bay, TreePeople and Friends of the LA River need you

We're Social!

LAStormwater.org
(800) 974-9794 option #3

FERTILIZER SAFETY TIPS

Many fertilizers contain toxic chemicals harmful to people and the environment. To keep your yard healthy and children safe, take these easy steps.

- Read the product label and use only as directed.
- Avoid over-fertilizing.
- It may be unsafe for children and pets to be in the area after applying chemical fertilizers. Read the directions on the product.
- Avoid over-watering after fertilizing, so excess water doesn't run into the street and carryfertilizer with it.
- Never apply fertilizer before a rain.
- Never dump unwanted fertilizer into the trash, gutter, or storm drain. Take unwanted lawn or garden chemicals to a Household Hazardous Waste Collection Event.

Call 1(888)CLEAN LA or visit www.LAstormwater.org

A message from the City of Los Angeles Department of Public Works.

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¿SABIA USTED QUE...

Fertilizantes contienen químicas tóxicas que pueden ser peligrosas para la gente y al medio ambiente. Para mantener su yarda saludable y niños sanos, tome estos pasos sencillos.

- Lea la etiqueta del producto y siga las instrucciones indicadas.
- Evite de fertilizar excesivamente.
- Puede ser peligroso para los niños y animales estar en el área después de aplicar fertilizantes. Lea las instrucciones en el producto.
- Evite regar después de aplicar fertilizantes, para que el exceso de agua no corra a la calle y lleve fertilizantes.
- Nunca aplique fertilizantes antes de que llueva.
- Deshágase de fertilizantes llevándolos a un Evento de Recolección de Desperdicios Peligrosos del Hogar.

Llame al 1(888)CLEAN LA o visite www.LAstormwater.org

Un mensaje del Departmento de Obras Públicas de la Ciudad de Los Angeles.

Impreso en papel reciclado.

Como una entidad cubierta bajo el Titulo II del Acto de Americanos con incapacidades, la Ciudad de Los Angeles no discrimina basado en incapacidad y, si lo requiere, proporcionará el alojamiento razonable para asegurar el acceso igual a sus programas, servicios, y actividades.

PESTICIDE SAFETY TIPS

Pesticides contain chemicals harmful to people and the environment. To keep your garden green and children safe, take these simple steps.

- Read the product label and use only as directed.
- Use pesticides sparingly by spot applying rather than blanketing an area.
- It may be unsafe for children and pets to be in the area after applying pesticides. Read the directions on the product.
- When watering your lawn, use the least amount of water possible, so it doesn't run into the street and carry pesticides with it.
- Never apply pesticides before a rain.
- Never dump pesticides into the trash, gutter, or storm drain. Take unwanted lawn or garden chemicals to a Household Hazardous Waste Collection Event.

Call 1(888)CLEAN LA or visit www.LAstormwater.org

A message from the City of Los Angeles Department of Public Works.

PROJECT Pollution PREVENTION

Printed on recycled paper.

¿SABIA USTED QUE...

Pesticidas contiene químicas que pueden ser peligrosas para la gente y al medio ambiente. Para mantener su jardín verde y niños sanos, tome estos pasos sencillos.

- Lea la etiqueta del producto y siga las instrucciones indicadas.
- Use pesticidas con moderación, aplique al área afectada solamente.
- Puede ser peligroso para los niños y animales estar en el área después de aplicar pesticidas. Lea las instrucciones en el producto.
- Cuándo riegue el césped, use lo menos cantidad de agua posible, para que no corra a la calle y lleve pesticidas.
- Nunca aplique pesticidas antes de que llueva.
- Nunca descargue de pesticidas en el arroyo ni alcantarillas.
- Deshágase de productos para el cuidado del jardín llevándolos a un Evento de Recolección de Desperdicios Peligrosos del Hogar.

CITY OF LOS ANGELES FOUNDED 1781

Llame al 1(888)CLEAN LA o visite www.LAstormwater.org

Un mensaje del Departamento de Obras Públicas de la Ciudad de Los Angeles.

PROJECT Pollution PREVENTION

Impreso en papel reciclado.

What are TMDLs?

A Total Maximum Daily Load (TMDL) is the amount of a specific pollutant – such as trash, bacteria or pesticides – that is allowed in specific bodies of water such as rivers, creeks or the ocean. State and federal laws require the City of Los Angeles to comply with various TMDLs to protect our region's water resources.

What are Water Quality Standards?

Water quality standards include three basic elements:

- *Protection of beneficial uses such as boating and swimming, fishing (sport and commercial) and aquatic life in specific bodies of water such as rivers, creeks and oceans*
- *Water quality objectives (goals) necessary to protect beneficial uses*
- *Measures to prevent degradation of existing water quality*

The Los Angeles Regional Water Quality Control Board (Regional Board) is responsible for establishing water quality standards in the Los Angeles area. These standards are described in the Los Angeles Water Quality Control Plan (Basin Plan) and other Regional Board documents. The Regional Board places all bodies of water that do not meet water quality standards on a list of "impaired" waters. The list is re-evaluated every two years.

How are TMDLs Developed?

Once a body of water is declared impaired, the Regional Board determines the priority and schedule for the development of TMDLs, which includes the following key steps:

- *Examine pollutant-specific water quality issues*
- *Identify the sources of pollution*
- *Define how much of a pollutant a body of water can receive and still meet the water quality standards*
- *Allocate pollutant loads ("total maximum daily loads") to each identified pollutant source*
- *Develop implementation plans to achieve TMDL targets*
- *Monitor and evaluate water quality to determine success*

CREST

The City of Los Angeles Department of Public Works, Bureau of Sanitation is leading a stakeholder group called "Cleaner Rivers Through Effective Stakeholder TMDLs" or CREST. CREST is committed to working with the Regional Board and USEPA in developing TMDLs for Ballona Creek and the Los Angeles River.

Measure O

In November 2004, nearly 76% of City of Los Angeles voters supported Measure O. Measure O is a general bond measure that authorizes $500 million in bonds to build improvements designed to address the regulatory requirements of the federal Clean Water Act and improve water quality, protect public health and the environment. Measure O will help provide funds for TMDLs and other projects to remove trash, bacteria and other stormwater pollution from our rivers, lakes, beaches and the ocean.

History of TMDLs:

1987 Amendments to the federal Clean Water Act resulting in a National Pollutant Discharge Elimination System (NPDES) permit for stormwater similar to that for wastewater treatment plants

1990 Regional Board issued first NPDES municipal stormwater permit to Los Angeles County and 84 incorporated cities (including the City of Los Angeles)

1996 Porter-Cologne Water Quality Act mandates water quality standards for surface and groundwaters in California, requiring states to establish a priority ranking for impaired waters and to develop and implement TMDLs

1999 Consent Decree requiring all TMDLs in the Los Angeles region be adopted within 13 years

2001 Regional Board adopted current Los Angeles municipal stormwater NPDES Permit, including TMDL implementation requirements

2002 U.S. EPA approval of Trash TMDL for Los Angeles River and Ballona Creek

2003 U.S. EPA approval of Santa Monica Bay Beaches Wet Weather and Dry Weather Bacterial TMDLs

2004 U.S. EPA approval of Bacteria (Dry/Wet Weather) at Marina del Rey Harbor, Mothers' Beach and Back Basins; Nitrogen Compounds in Los Angeles River

For additional information, please contact:

1 (800) 974-9794 and/or
www.LAstormwater.org

CITY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS

¿Qué son TMDLs?

Una Carga Diaria Total Máxima (TMDL, por sus siglas en inglés) es la cantidad de un contaminante específico, como basura, bacteria o pesticidas, permitida en masas de agua específicas como océanos, ríos o arroyos. Las leyes estatales y federales disponen que la Ciudad de Los Angeles debe cumplir con varias TMDLs para proteger los recursos acuíferos de nuestra región.

¿Cuáles son las Normas de la Calidad del Agua?

Las normas de la calidad del agua incluyen tres elementos básicos:

- Protección de los usos beneficiosos como los paseos en bote y la natación, la pesca (deportiva y comercial) y la vida acuática en las masas de agua específicas como ríos, arroyos y océanos
- Los objetivos de la calidad del agua (metas) necesarios para proteger los usos beneficiosos
- Las medidas para prevenir la degradación de la calidad existente del agua

La Junta Regional del Control de la Calidad del Agua (Junta Regional) tiene la responsabilidad de establecer las normas de la calidad de agua en el área de Los Angeles. Estas normas se describen en el Plan de Control de Calidad del Agua de Los Angeles (Plan de la Cuenca) y en otros documentos de la Junta Regional. La Junta Regional coloca todas las masas de agua que no reúnen las normas de calidad del agua en una lista de las aguas "afectadas". La lista se reevalúa cada dos años.

¿Cómo se desarrollan las TMDLs?

Una vez que una masa de agua se declara estar afectada, la Junta Regional determina la prioridad y programa el desarrollo de las TMDLs, lo cual incluye los siguientes pasos clave:

- Examinar los problemas específicos de la contaminación de la calidad del agua
- Identificar las fuentes de contaminación
- Definir la cantidad de un contaminante que puede recibir una masa de agua y aún así cumplir con las normas de la calidad del agua
- Asignar las cargas contaminantes ("cargas diarias máximas totales") a cada fuente identificada de contaminantes
- Desarrollar planes de implementación para alcanzar las metas de las TMDL
- Monitorear y evaluar la calidad del agua para determinar el éxito alcanzado

CREST

La Oficina de Salubridad del Departamento de Obras Públicas de la Ciudad de Los Angeles está dirigiendo a un grupo de interesados llamado "Ríos más Limpios a través de Personas y Entidades Interesadas y Eficientes" o CREST. CREST está comprometida a trabajar con la Junta Regional y USEPA para desarrollar las TMDLs de Ballona Creek y del Río de Los Angeles.

Medida O

En noviembre del 2004, casi el 76% de los electores de la Ciudad de Los Angeles apoyaron la Medida O, una medida general de bono que autoriza la utilización de $500 millones en bonos para llevar a cabo mejoras diseñadas de manera que se puedan cumplir los requisitos reguladores de la Ley Federal para un Agua Limpia y mejoren la calidad del agua, protejan la salud del público y el medio ambiente. La Medida O ayudará a proporcionar fondos para las TMDLs y otros proyectos para eliminar la basura, bacteria y otro tipo de contaminación de las aguas pluviales de nuestros ríos, lagos, playas y el océano.

Historia de las TMDLs:

1987 Enmiendas hechas a la Ley Federal para un Agua Limpia que dieron como resultado que se otorgara el permiso para el Sistema Nacional de Eliminación de Descarga de Contaminantes (NPDES, por sus siglas en inglés) para las aguas pluviales, permiso similar al de las plantas para el tratamiento de las aguas residuales

1990 La Junta Regional emitió el primer permiso municipal NPDES para las aguas pluviales del Condado de Los Angeles y 84 ciudades incorporadas (incluyendo la Ciudad de Los Angeles)

1996 La Ley Porter-Cologne para la Calidad del Agua exige normas de la calidad del agua subterránea y la de la superficie en California, requiriendo a los estados que establezcan una clasificación de prioridad para las aguas afectadas, así como para desarrollar y poner en práctica las TMDLs

1999 El Decreto por Consentimiento exige que se adopten todos las TMDLs en la región de Los Angeles dentro de un período de 13 años

2001 La Junta Regional adoptó el Permiso actual del NPDES municipal para las aguas pluviales de Los Angeles, incluyendo los requisitos para la implementación de la TMDL

2002 Aprobación por la EPA de Estados Unidos de las TMDLs de basura para el Río de Los Angeles y Ballona Creek

2003 Aprobación por la EPA de Estados Unidos de las TMDLs Bacteriales de la Época de Lluvias y de la temporada seca de las Playas de la Bahía de Santa Mónica

2004 Aprobación por la EPA de Estados Unidos de la Bacteria (época de lluvias y de la temporada seca) en el puerto de Marina del Rey, en Mother's Beach y las Cuencas; los Compuestos de Nitrógenos en el Río de Los Angeles

Como entidad cubierta bajo el Título II de la Ley para Americanos con Discapacidades, la Ciudad de Los Angeles no discrimina debido a una discapacidad y, en el momento en el que se solicite, proporcionará las adaptaciones razonables para garantizar un igual acceso a sus programas, servicios y actividades.

IMPRESO EN PAPEL RECICLADO

Para mayor información por favor comuníquese al:

1 (800) 974-9794 o visite **www.LAstormwater.org**

CIUDAD DE LOS ANGELES
DEPARTAMENTO DE OBRAS PÚBLICAS