Appendix E.3 Final LID Report

kpff Consulting Engineers

CITY OF LA
LOW IMPACT DEVELOPMENT
(LID)

HARVARD-WESTLAKE SCHOOL
PARKING STRUCTURE
3700 Coldwater Canyon Ave.
Studio City, CA 91604
KPFF Job # 109046

April 10, 2015

CLIENT:

Innovative Design Group
17848 Sky Park Circle, Suite
Irvine, CA 92614

PREPARED BY:

KPFF Consulting Engineers
6080 Center Drive, Suite 750
Los Angeles, California 90045
(310) 665-2800

TABLE OF CONTENTS

Page No.

I. INTRODUCTION..... 1
- A. Project Description
- B. Drainage Characteristics
- C. Peak Mitigated Discharge Values

II. BEST MANAGEMENT PRACTICES (BMPs)..... 2-3
- A. Structural BMPs
  - 1. Kristar FloGard Plus Catch Basin Filter Insert
  - 2. Flow-through Planter Box
- B. Non-structural BMPs
  - 1. Maintenance Areas
  - 2. Education and Training
  - 3. Landscaping
  - 4. Monitoring and Maintenance

EXHIBIT

EXHIBIT 1 Preliminary LID Plan

APPENDICES

Appendix "A" LID Calculations
Appendix "B" Operation &Maintenance Plan
Appendix "C" Storm Drain Stenciling and Signage

REFERENCES

Development Best Management Practices Handbook, 4th Edition. City of Los Angeles Public Works, May 2012.

Los Angeles County Standard Urban Storm Water Mitigation Plan. Los Angeles County Department of Public Works, September 2002.

I. INTRODUCTION

A. Project Description

The project consists of the design and construction of a new parking structure with an athletic field for Harvard-Westlake School at 3700 Coldwater Canyon Avenue, in Studio City, California. The new parking structure will be on the west side of Coldwater Canyon Avenue and will be connected to the existing campus via a pedestrian bridge that will span over Coldwater Canyon Avenue. A new athletic field and small facilities building will be included on the top level of the parking structure.

The project includes reconfiguration of the existing main campus entrance on the east side of Coldwater Canyon Avenue, as required to accommodate the pedestrian bridge access tower and reconfigured entrance roadway.

The City of Los Angeles B-permit will be required to improve approximately 1,300 linear feet of Coldwater Canyon Avenue along the project frontage. B-permit work will include street widening for new turn lanes, relocation of an existing signal and access road, and new driveways for the proposed parking structure.

B. Drainage Characteristics

- Total drainage area including tributary run-ons = 15.34 acres
- Project site area = 6.66 acres
- Disturbed area for new improvements and grading = 3.2 acres
- New hardscape area = 2.0 acres
- New driveway and road = 0.36 acres (considered to be pervious concrete pavement)

Refer to the project Hydrology Study for the entire drainage area and runoff calculations.

The site is on an ascending hill with areas of steep and gradual slopes, which generally sloped from southwest to northeast direction. The drainage area is currently composed of natural landscape, driveways, small building facilities and exposed soil. The proposed development area is approximately 65.3% impervious and 34.7% pervious. The existing runoff drains towards the northeast direction to Coldwater Canyon Avenue.

With the construction of the parking structure, new athletic field and small facilities building, the proposed drainage system of the area is described as follows:

The surface runoff will be collected at multiple points through catch basins with filter inserts. The runoff generated from the exposed surfaces will be collected by drains and directed into flow-through planters. The flow-through planters are sized to treat the first flush volume of storm water, which is the greater of the first 0.75 inches of rainfall and the 85^{th} percentile rainfall both multiplied by a factor of 1.5. The factor of 1.5 is a result of the infeasibility of infiltration due to the hillside grading ordinance. Flow-through planters are designed to treat and detain runoff without allowing seepage into the underlying soil. Pollutants are removed as the runoff passes through the soil layer and is collected in an underlying layer of gravel or drain

rock. A perforated pipe underlain is piped to a storm drain which outlets to the street via 4" curb drain. See attached Exhibit 1 for potential location of flow-through planters.

Pollutants of concern include trash, dried leaves, twigs from the trees and shrubs, silt, pesticides and fertilizers in the planter areas.

C. Peak Mitigated Discharge Values

The peak mitigated discharge value (Q_{PM}) has been calculated to be 1.48 cfs or an equivalent volume of 10,296 cf. The values were determined based on the Los Angeles County Department of Public Works method for calculating standard urban stormwater mitigation plan flow rates and volumes using the greater of the first 0.75 inches of rainfall and the 85th percentile rainfall both multiplied by a factor of 1.5. The factor of 1.5 is a result of the infeasibility of infiltration due to the hillside grading ordinance.

Table 1: Summary of Flow-through Planter Box Calculations

Area Disturbed (Acres)	Flow to be Treated (CFS)	Volume to be Treated (CF)	Planter Box Required (SF)	Planter Box Provided (SF)
3.2	1.48	10,296	7,676	9,100

Detailed input parameters and calculations are shown in Appendix "A".

II. BEST MANAGEMENT PRACTICES (BMPs)

The following is a list of all BMP's to be implemented onsite:

A. Structural BMPs

1. Kristar FloGard Plus Catch Basin Filter Inserts

Kristar Catch Basin Filter Inserts, LA City research reference RR#5591 and LA City approval reference RR#5584, by KriStar Enterprises, Inc. will be installed in catch basins as structural BMPs for removal of silt and debris in storm water runoff. These filter inserts have been selected to accommodate, up to and including, the 85th percentile storm event multiplied by a factor of 1.5.

2. Flow-through Planter Box

In addition to the catch basin filter insert, a flow-through planter box is proposed as a structural BMP for the removal of silt and debris in storm water runoff. The flow-through planter box has been designed to accommodate, up to and including, the 85th percentile storm event multiplied by a factor of 1.5. See Exhibit 1 and Appendix "A" for details and calculations.

3. Permeable Pavement

Pervious concrete pavement along with permeable brick pavers will be considered in the final design to assist with decreasing the post-construction impervious areas. It is important to note

that these pavement sections will require a geotextile liner along with an under-drain system to mitigate large storm events.

B. Non-structural BMPs

1. Open Paved Areas and Planter Areas

a. Regular sweeping of all open and planter areas, at a minimum, on a weekly basis in order to prevent dispersal of pollutants that may collect on those surfaces.

b. Regular pruning of the trees and shrubs in the planter areas to avoid formation of dried leaves and twigs, which are normally blown by the wind during windy days. These dried leaves are likely to clog the surface inlets of the drainage system when rain comes, which would result to flooding of the surrounding area due to reduced flow capacities of the inlets.

c. Trash and recycling containers shall be used such that, if they are to be located outside or apart from the principal structure, are fully enclosed and watertight in order to prevent contact of storm water with waste matter, which can be a potential source of bacteria and other pollutants in runoff. These containers shall be emptied and the wastes disposed of properly on a regular basis.

2. Education and Training

The owners shall be made aware of the structural BMPs installed in the project. Information materials, such as brochures, shall also be provided for their complete information. They shall also be briefed about chemical management and proper methods of handling and disposal of wastes and should understand the on-site BMPs and their maintenance requirements.

3. Landscaping

Minimize the use of pesticides and fertilizers to the maximum extent practical.

4. Monitoring and Maintenance

a. All BMPs shall be operated, monitored, and maintained for the life of the project and at a minimum, all structural BMPs shall be inspected, cleaned-out, and where necessary, repaired, at the following minimum frequencies: 1) prior to October 15th each year; 2) during each month between October 15th and April 15th of each year and, 3) at least twice during the dry season (between April 16 and October 14 of every year).

b. Maintenance procedures and recommendations outlined by KriStar Enterprises, Inc. shall be followed by the owner to ensure proper performance of the filter insert.

c. Debris and other water pollutants removed from structural BMPs during cleanout shall be contained and disposed of in a proper manner.

d. The drainage system and the associated structures and BMPs shall be maintained according to manufacturer's specification to ensure maximum pollutant removal efficiencies (see Appendix "B").

EXHIBIT 1

PRELIMINARY LID PLAN

POTENTIAL LOCATION OF
FLOW–THRU PLANTER BOX
(±7800 SF)

POTENTIAL LOCATION OF
FLOW–THRU PLANTER BOX
(±1300 SF)

COLDWATER CANYON AVENUE

SIDEWALK

PEDESTRIAN BRIDGE
ABOVE @ L2

ROLLING SECURITY
GATE

FENCE

SIDEWALK

RAMP DN 5%

HARVARD-WESTLAKE SCHOOL
PARKING STRUCTURE

EXHIBIT 1 - PRELIMINARY LID PLAN
04/10/15

0 15' 30'
SCALE: 1"=30'

kpff
Consulting Engineers

APPENDIX A

LID CALCULATIONS

Calculation Steps for Determining Peak Mitigated Flow Rate Post Construction
Only the development areas are considered (Sub-Areas 4, 7 & 8 per Hydrology Study)

Soil Type: 16

85th Percentile
24 hour storm

1. Assume an initial Tc value between 5 and 30 minutes.
Tc = 10 minutes

2. Using Table 1, look up the assumed Tc value and select the corresponding Ix intensity in inches/hour.
Ix = 0.495 in/hr

3. Determine the value for the Undeveloped Runoff Coefficient, Cu, using the runoff coefficient curve corresponding to the predominant soil type.
Cu = 0.10

4. Calculate the Developed Runoff Coefficient, Cd = (0.9 * % Imp.) + [(1.0 - % Imp.) * Cu)
% Imp. = 65.3%
Cd = 0.62

5. Calculate the value for Cd * Ix
Cd * Ix = 0.308

6. Calculate the time of concentration, $Tc = 10^{-0.507} * (Cd * Ix)^{-0.519} * Length^{0.483} * Slope^{-0.135}$
Length = 150.8 ft
Slope = 3.20%
Calculated Tc = 10.3 minutes

7. Calculate the difference between the initially assumed Tc and the calculated Tc, if the difference is greater than 0.5 minutes. Use the calculated Tc as the assumed initial Tc in the second iteration. If the Tc value is within 0.5 minutes, round the acceptable Tc value to the nearest minute. If Tc is greater than 30 minutes, Use 30.

Iteration No.	Initial Tc (min.)	Ix (in/hr)	Cu	Cd	Cd * Ix (in/hr)	Calculated Tc (min)	Difference
1	10	0.4953555	0.10	0.62	0.308	10.3	0.3

Acceptable Tc Value = 10 minutes

8. Calculate the Peak Mitigation Flow Rate;
Qpm = Cd * Ix * Atotal * (1.008333 ft^3-hour / acre-inches-seconds)

Atotal = 3.20 acre

Qpm =	**0.99**	**cfs**	**x1.5 =**	**1.48 CFS**

9. Vm = (3448.5 ft3 / acre) * [(Ai) (0.9) + (Ap + Au) (Cu)]

Ai = 2.09 acres
Ap = 1.11 acres
Au = 0 acres

Vm =	**6863.89**	**cf**	**x1.5 =**	**10295.84 CF**

Planter Box Sizing

Note: Red values to be changed by user.
Black values are automatically calculated.

Only the development areas are considered (Sub-Areas 4, 7, & 8 per Hydroloy Study)

[1]	Total Area (SF)		139204
[2]	Impervious Area (SF)		91062
[3]	Pervious Area (SF)	**[1]-[2] =**	48142
[4]	Catchment Area (SF)	**([2]*0.9)+([3]*0.1) =**	86770
[5]	Design Rainfall Depth (in)	**Greater of 0.75", 85th percentile**	1.15
[6]	V_{design} (CF)	**1.5*[5]/12*[4] =**	12473
[7]	$K_{sat,media}$ (in/hr)		5.0
[8]	FS	**Use 6 if no geotech investigation**	2.0
[9]	$K_{sat,design}$ (in/hr)	**[7]/[8] =**	2.5
[10]	d_{p_max}, Max. Ponding Depth (ft)	**MIN(1, [9]*48/12) =**	1.0
[11]	d_p, Ponding Depth (ft)	**1' max.**	1.0
[12]	T_{fill} (hr)		3
[13]	**A_{min} (sq. ft)**	**[6]/([9]*[12]/12 + [11])**	**7676**

Source: LID Handbook, City of LA (May 2012)

APPENDIX B

OPERATION AND MAINTENANCE PLAN

Operation and Maintenance Plan

a. All BMPs will be operated, monitored, and maintained for the life of the project and at a minimum, all structural BMPs shall be inspected, cleaned-out, and where necessary, repaired, at the following minimum frequencies: 1) prior to October 15th each year; 2) during each month between October 15th and April 15th of each year and, 3) at least twice during the dry season (between April 16 and October 14 of every year).

b. Debris and other water pollutants removed from structural BMPs during cleanout will be contained and disposed of in a proper manner.

Specific Operation and Maintenance Plan for Flow-Through Planter

The inspection and maintenance program will include the following key components: Filtration planters remove storm water pollutants through a combination of overland flow through vegetation, surface detention, and filtration through soil. Frequent inspection and maintenance is required until vegetation becomes established. Thereafter, routine maintenance requirements are considered minimal.

Typical routine maintenance consists of the following:

a. Inspect soil and plantings. Remove weeds, prune vegetation and replenish mulch as needed. Clear any obstructions and remove any accumulation of sediment.
b. Inspect side slopes for evidence of instability or erosion and correct as necessary.
c. Observe soil at the bottom of the ponding area for uniform percolation throughout. If portions of the area do not drain within 48 hours after the end of a storm, the soil should be tilled and replanted. Remove any debris or accumulated sediment.
d. Examine the vegetation to ensure that it is healthy and dense enough to provide filtering and to protect soils from erosion. Confirm that irrigation is adequate and not excessive. Replace dead plants and remove invasive vegetation.
e. Abate any potential vectors by filling holes in the surface and around the ponding area. If mosquito larvae are present and persistent, contact the County Vector Control District for information and advice. Mosquito larvicides should be applied only when absolutely necessary and then only by a licensed individual or contractor.

Specific Operation and Maintenance Plan for Catch Basin Filter Inserts

-See attached Manufacturer's recommendations.

FloGard Catch Basin Insert Filter

Inlet Filtration

Removes pollutants from runoff prior to entering waterways

Efficient
catches pollutants where they are easiest to catch, at the inlet.

Variable Design
applications with the ability to be retrofitted or used in new projects.

Treatment Train
can be incorporated as part of a "Treatment Train".

No Standing Water
helps to minimize vector, bacteria and odor problems.

Focused Treatment
removes petroleum hydro-carbons, trash, and TSS.

Maximum Flexibility
available in a variety of standard sizes to fit round and square inlets.

Economical
Receive a higher return on investment.

Two-part insert to filter solids and oil/grease

Easy to install, inspect and maintain, even on small and confined sites

By the Numbers*:

- Filter shall remove 80% of total suspended solids (TSS)
- Capture at least 70% of oil and grease and 40% of total phosphorus (TP) associated with organic debris.

**approx. for urban street application*

Catch Basin Filter Test Results Summary

Testing Agency	% TSS Removal	% Oil & Grease Removal	% PAH Removal
UCLA	80	70 to 80	
U of Auckland Tonking & Taylor, Ltd. (for City of Auckland)	78 to 95		
U of Hawaii (for city of Honolulu)	80		20 to 40

Oldcastle Stormwater Solutions™

INLET FILTRATION

Multipurpose Catch Basin Insert designed to capture sediment, debris, trash & oils/grease from low (first flush) flows, even during the most extreme weather conditions.

The FloGard® Catch Basin Insert Filters provide solids filtration through a filter screen of filter liner, and hydrocarbon capture shall be effected using a non-leaching absorbent material contained in a pouch or similar removable restraint. They are recommended for areas subject to silt and debris as well as low-to-moderate levels of petroleum hydrocarbons (oils and grease). Examples of such areas are vehicle parking lots, aircraft ramps, truck and bus storage yards, business parks, residential and public streets.

Catch Basin Filter Competitive Feature Comparison

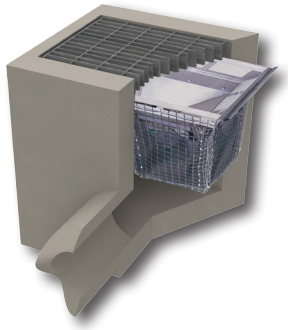
Evaluation of Catch Basin Filters (Based on flow-comparable units) (Scale 1-10)	Oldcastle Stormwater	Other Insert Filter Types**
Flow Rate	10	7
Removal Efficiency*	80%	45%
Capacity - Sludge & Oil	7	7
Service Life	10	3
Installation - Ease of Handling / Installation	8	6
Ease of Inspections & Maintenance	7	7
Value	**10**	**2**

*approximate, based on field sediment removal testing in urban street application **average

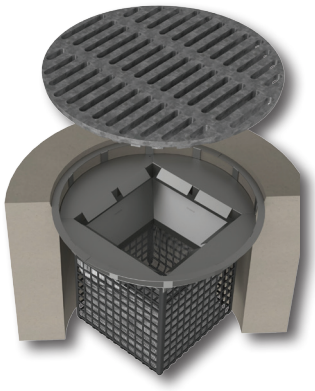
Long-Term Value Comparison (Based on flow-comparable units) (Scale 1-10)	Oldcastle Stormwater	Other Insert Filter Types
Unit Value - Initial ($/cfs treated)	10	4
Installation Value ($/cfs treated)	10	7
Absorbant replacement (annual avg ($/cfs treated)	10	2
Materials replacement Value (annual avg ($/cfs treated)	10	10
Maintenance Value (annual avg ($/cfs treated)	10	7
Total first yr ROI ($/cfs treated)	10	5
Total Annual Avg Value ($/cfs treated, avg over 20 yrs)*	**10**	**5**

Captured debris from the Catch Basin Filter, Dana Point, CA

Combination Inlet



Flat Grated Inlet



Circular Frame Catch Basin

GENERAL SPECIFICATIONS FOR MAINTENANCE OF
***FLO-GARD+PLUS*® CATCH BASIN INSERT FILTERS**

SCOPE:

Federal, State and Local Clean Water Act regulations and those of insurance carriers require that stormwater filtration systems be maintained and serviced on a recurring basis. The intent of the regulations is to ensure that the systems, on a continuing basis, efficiently remove pollutants from stormwater runoff thereby preventing pollution of the nation's water resources. These specifications apply to the FloGard+Plus® Catch Basin Insert Filter.

RECOMMENDED FREQUENCY OF SERVICE:

Drainage Protection Systems (DPS) recommends that installed Flo-Gard+Plus® Catch Basin Insert Filters be serviced on a recurring basis. Ultimately, the frequency depends on the amount of runoff, pollutant loading and interference from debris (leaves, vegetation, cans, paper, etc.); however, it is recommended that each installation be serviced a minimum of three times per year, with a change of filter medium once per year. DPS technicians are available to do an on-site evaluation, upon request.

RECOMMENDED TIMING OF SERVICE:

DPS guidelines for the timing of service are as follows:

1. For areas with a definite rainy season: Prior to, during and following the rainy season.
2. For areas subject to year-round rainfall: On a recurring basis (at least three times per year).
3. For areas with winter snow and summer rain: Prior to and just after the snow season and during the summer rain season.
4. For installed devices not subject to the elements (washracks, parking garages, etc.): On a recurring basis (no less than three times per years).

SERVICE PROCEDURES:

1. The catch basin grate shall be removed and set to one side. The catch basin shall be visually inspected for defects and possible illegal dumping. If illegal dumping has occurred, the proper authorities and property owner representative shall be notified as soon as practicable.
2. Using an industrial vacuum, the collected materials shall be removed from the liner. (Note: DPS uses a truck-mounted vacuum for servicing Flo-Gard+Plus® catch basin inserts.)
3. When all of the collected materials have been removed, the filter medium pouches shall be removed by unsnapping the tether from the D-ring and set to one side. The filter liner, gaskets, stainless steel frame and mounting brackets, etc. shall be inspected for continued serviceability. Minor damage or defects found shall be corrected on-the-spot and a notation made on the Maintenance Record. More extensive deficiencies that affect the efficiency of the filter (torn liner, etc.), if approved by the customer representative, will be corrected and an invoice submitted to the representative along with the Maintenance Record.
4. The filter medium pouches shall be inspected for defects and continued serviceability and replaced as necessary and the pouch tethers re-attached to the liner's D-ring. See below.
5. The grate shall be replaced.

REPLACEMENT AND DISPOSAL OF EXPOSED FILTER MEDIUM AND COLLECTED DEBRIS

The frequency of filter medium pouch exchange will be in accordance with the existing DPS-Customer Maintenance Contract. DPS recommends that the medium be changed at least once per year. During the appropriate service, or if so determined by the service technician during a non-scheduled service, the filter medium pouches will be replaced with new pouches. Once the exposed pouches and debris have been removed, DPS has possession and must dispose of it in accordance with local, state and federal agency requirements.

DPS also has the capability of servicing all manner of catch basin inserts and catch basins without inserts, underground oil/water separators, stormwater interceptors and other such devices. All DPS personnel are highly qualified technicians and are confined space trained and certified. Call us at (888) 950-8826 for further information and assistance.

APPENDIX C

STORM DRAIN STENCILING AND SIGNAGE

Sample Stencil 1