ECOLOGY CONTROL INDUSTRIES

A Full Service Environmental Company

June 17, 2020

Mr. Leo Cosentini
Municipal Storm Water Unit
California State Water Resources Control Board
1001 – I Street, 15th Floor
Sacramento, CA 95814

Re: Amended Fact Sheet for Trash Treatment Control Device – Vector Access Approval for ECI-1 Debris Dam (Catch Basin Insert) For Curb Inlet Design Catch Basins

Dear Mr. Cosentini,

Ecology Control Industries is pleased to present this revised fact sheet to the California State Water Resources Control Board (SWRCB) for the ECI-1 Debris Dam. Consistent with your email correspondence dated June 18, 2019, the Catch Basin Insert has already been approved as a Full Capture Trash Treatment Control Device and will not be required to go through the Certification process.

The purpose of this fact sheet is to underscore the Device's compliance, specifically for vector control requirements (Please see Section 4.4 in the attached Fact Sheet) and for Mosquito Vector Control Association of California (MVCAC) verification. This fact sheet has been revised to incorporate SWRCB comments of April 9, 2020. The documentation for this amendment is being submitted according to the "Trash Treatment Control Device Application Requirements" dated July 10, 2019. This includes the following six sections:

1. Cover Letter;
2. Physical Description;
3. Installation Information;
4. Operation and Maintenance Information;
5. Reliability Information; and
6. Field/Lab Testing Information and Analysis.

Thank you for your consideration of this amended fact sheet. Please do not hesitate to contact me if you have any questions.

Respectfully submitted,

Ron Flury, Chairman
Ecology Control Industries, Inc.

Todd Waters, Operations Manager
Ecology Control Industries, Inc.

Cc: Mr. Jaime Favila

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FACT SHEET for ECI-1 Debris Dam

1. Cover Letter

The ECI-1 Debris Dam catch basin insert has already been approved as a Full Capture Trash Treatment Control Device and appears on the State Water Resources Control Board list of certified full-capture device.

This fact sheet is to underscore the Device's compliance, specifically for vector control requirements (see Section 4.4) and for Mosquito Vector Control Association of California (MVCAC) verification, and to present information in a format according to the "Trash Treatment Control Device Application Requirements" dated July 10, 2019. This fact sheet describes the ECI-1 Debris Dam, its operation and vector control accessibility for installation in curb inlet design catch basins only. This fact sheet does not describe the ECI-1 Debris Dam operation and installation in drop inlet or grate inlet catch basins.

1.a General Description of the Device

The ECI – 1 Debris Dam (Debris Dam) is a perforated screen insert for curb inlet design catch basins. The screen is installed inside the catch basin directly in front of the outlet pipe. The insert has been verified by the Regional Water Quality Control Board – Los Angeles Region (RWQCB) as a full capture device (i.e., it captures all particles that are 5 millimeters (mm) or greater and has a design treatment capacity to treat the storm flow of a 1-year/1-hour storm). The insert is manufactured from 304 stainless steel sheets with 5-mm diameter circular openings. The insert shields the entire opening of the outlet pipe and extends to the top of the base of the catch basin curb opening. The vertical insert maximizes the trash capture area by leaving most of the original catch basin containment volume intact. The insert has an excess overflow area located at the top. This device has several benefits: 1) it lessens the time of maintenance of the insert and catch basin; 2) it minimizes flooding potential; and 3) it allows for the vertical section of the insert to be larger in height allowing for greater storage capacity. The function of the device is to capture all trash greater than 5-mm while maintaining drainage capacity of the catch basin. If a storm event of greater intensity occurs (greater than the 1-year/1-hour storm event), flow will proceed into the excess overflow area located at the top of the insert and into the mainline storm drain, thus preventing any flooding of the street.

1.b The Device Owner and Owner Representative Contact Information

Ron Flury, Chairman
Ecology Control Industries
15707 South Main Street
Gardena, CA 90248
(310) 354-9999 (Office)
www.ecologycontrol.com

Todd Waters, Operations Manager
Ecology Control Industries
15707 South Main Street
Gardena, CA 90248
(310) 466-0515 (mobile)
Email: twaters@ecologycontrol.com

1.c The Device Manufacturing Location

The ECI-1 Debris Dam is manufactured in several locations in the Southern California area, U.S.A., allowing ECI to provide customers with best value, workmanship, and timely delivery for their products.

1.d A Brief Summary of any Field/Lab Testing Results that Demonstrates the Device Functions as described within the Application

The ECI – 1 Debris Dam, a 5-mm perforated connector pipe screen, was field tested and evaluated in 2006 by the City of Los Angeles, Department of Public Works, Bureau of Sanitation to be a full capture device meeting all requirements of the Los Angeles Regional Water Quality Control Board (RWQCB). Since 2006, the City of Los Angeles has successfully installed approximately 10,000 ECI – 1 Debris Dam units in their high-trash generation rate land-use areas. The City of Los Angeles submitted the final field report to the RWQCB in 2006 (see Appendix A for 2007 Certification letter and 2006 report).

1.e A Brief Summary of the Device Limitations, and Operational, Sizing, and Maintenance Considerations

The ECI – 1 Debris Dam has a circular or elliptical configuration design to maximize the trash capture volume of the catch basin. Storage capacity varies depending on catch basin design volume. The Debris Dam is a one piece design that is sized to fit through a 24-inch (in) diameter maintenance hole or a typical curb opening of 8-in and has a minimum vertical height of 2 feet (ft) as measured directly in front of the outlet pipe. It does not hamper the operation of an existing catch basin opening screen cover that swings inward and does not interfere with screen cover appurtenances that may be attached to the catch basin side or front walls. The Debris Dam is self-draining, thus as designed and in theory no standing water should remain in the catchment area. Notwithstanding, the Debris Dam does provide easy vector control access for visual observation and mosquito treatment, if needed.

The vertical no seam design of the insert provides for easy maintenance with existing catch basin cleaning tools already employed by most public agencies. Maintenance of the insert varies depending catch basin volume (size of catch basin – length and depth) and location (land use) of the catch basin. It is recommended that regular inspections occur for the first year of installation to determine a set maintenance schedule, and that maintenance/removal of trash should occur when 40% of the catch basin volume is filled.

1.f A Description or List of Locations, if any, where the Device has been Installed, and Include the Name and Contact Information of as many as Three Municipality(s) Purchasing the Device

The device has been field tested and utilized in municipalities throughout the region, including:

City of Laguna Niguel, California
Hal Ghafari
949-362-4384

Orange County Transit Authority
Chris Damyan
714-502-6498

City of Los Angeles, California
Alfredo Magallanes
213-485-3958

1.g Certification Statement

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluated the information submitted. Based on my inquiry of the person or persons that manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Ron Flury, Chairman
Ecology Control Industries, Inc.

Todd Waters, Operations Manager
Ecology Control Industries, Inc.

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ECI – 1 Debris Dam (Catch Basin Insert) for Curb Inlet Design Catch Basins

ECOLOGY CONTROL INDUSTRIES
A Full Service Environmental Company

Ecology Control Industries
15707 South Main Street
Gardena, CA 90248
(310) 354-9999
www.ecologycontrol.com

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2. Table of Contents

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3. Physical Description

3.a Description on How the Device Works to Trap all Particles that are 5-mm or Greater in Size and How it is Sized for Varying Flow Volumes

The ECI – 1 Debris Dam is a perforated screen insert for curb inlet design catch basins. The screen is installed inside the catch basin directly in front of the outlet pipe. The insert is manufactured from 304 stainless steel sheets with 5-mm diameter circular openings and is designed to treat the storm flow of a 1-year/1-hour storm. The insert shields the entire opening of the outlet pipe and extends to the base of the catch basin curb opening. The vertical insert maximizes the trash capture area by leaving most of the original catch basin containment volume intact. The insert has an excess overflow area located at the top. The function of the insert is to capture all trash greater than 5-mm while maintaining drainage capacity of the catch basin. If a storm event of greater intensity occurs (greater than the 1-year/1-hour storm event), flow will proceed into the overflow area located at the top of the insert and into the mainline storm drain, thus preventing any flooding of the street. The Debris Dam is custom made for each individual installation and its flow volume.

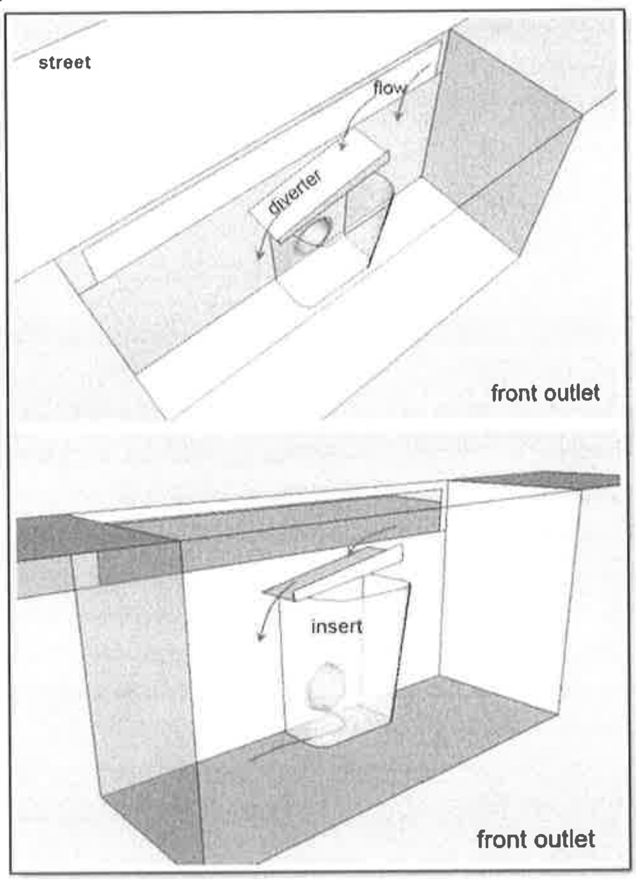


Figure 1. How does it work?

As shown in Figure 1, storm water runoff that potentially carries trash flows from the street over the catch basin opening and diverter, if installed, into the vault. Storm water in the vault then flows through the perforated screen into the storm drain pipe, while trash larger than 5-mm is restricted and prevented from entering the storm drain system.

3.b Design Drawings for all Standard Device Sizes Including Dimensions, and Alternative Configurations

The Debris Dam will be customized per specified catch basin for best functionality and maintenance. In catch basins where: 1) the outlet pipe is away from the street; 2) the outlet pipe is not in close proximity to the curb opening; or 3) other configurations where trash will fall into the catchment area, the Debris Dam may be installed without a diverter.

The Debris Dam will require the installation of a diverter in catch basins where: 1) the outlet pipe is located towards the street; 2) the side outlet pipe is in close proximity to the curb opening; or, 3) other configurations where trash entering the catch basin may fall outside the catchment area. The diverter assists in the performance of the device by directing incoming trash into the catchment area behind the Debris Dam where it will remain.

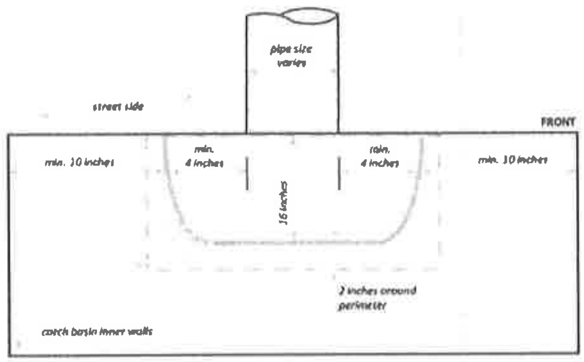
Figure 2 illustrates a typical installation of the Debris Dam with outlet pipe facing the street where diverter installation is required. Figure 3 illustrates installation of the Debris Dam with the outlet pipe away from the street, where diverter installation is not required. The dimensions shown in the illustrations may change based on field conditions.

3.c If the Device is Designed with an Internal Bypass, Explain How the Bypass Only Operates with Flows Greater than the Design Storm

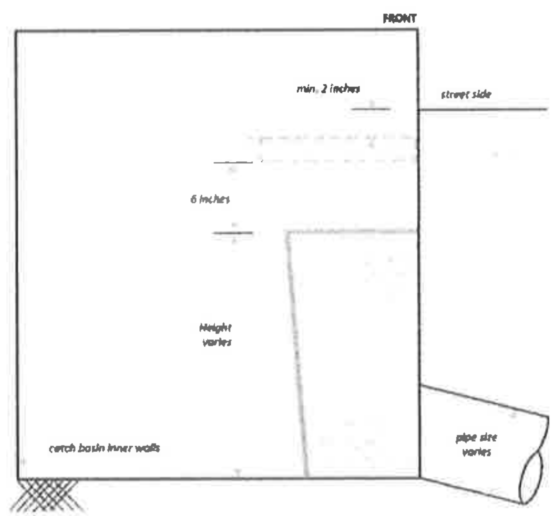
The insert has an excess overflow area located at the top. The function of the insert is to capture all trash greater than 5-mm while maintaining drainage capacity of the catch basin. If the storm event is greater than a 10-year storm, water in the containment box unit will overflow the top of the insert and release previously trapped trash. Assuming a properly maintained catch basin, this internal bypass will only occur in the event of flows greater than the design storm.

3.d Engineering Plans/Diagrams for a Typical Installation

The Debris Dam is available in various configurations to meet the catch basin dimensions and customer specificiations. Diagrams for a typical installation are found in Appendix B.

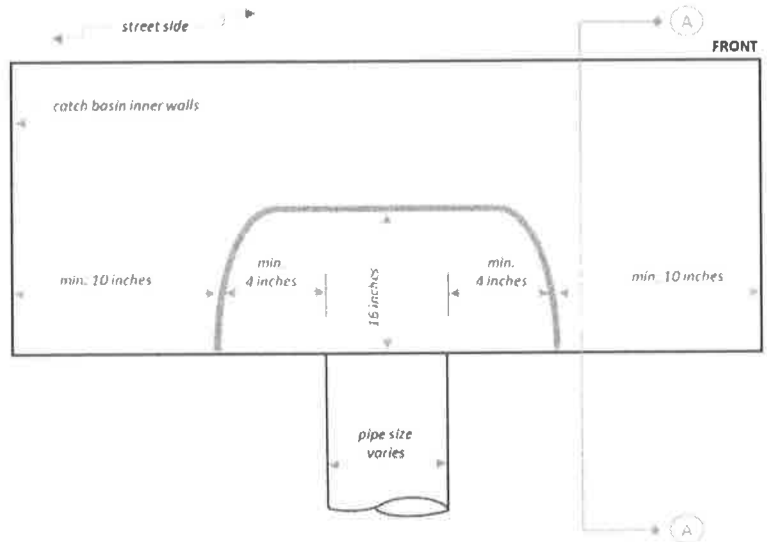


a. Plan view

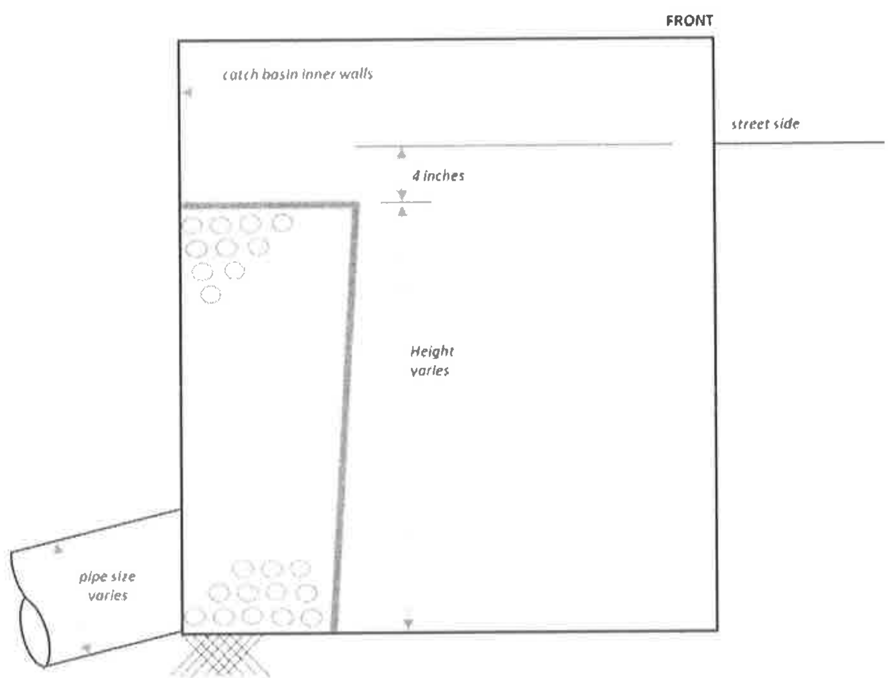


b. Profile view (Section A)

Figure 2. Plan and Profile view of installation where a diverter IS required.



a. Plan view



b. Profile view (Section A)

Figure 3. Plan and Profile view of installation where a diverter IS NOT required.

3.e Photographs, if any, of Pre- and Post-Installation Examples

Figures 4, 5, and 6 illustrate three of various designs to meet the numerous catch basin configurations.

FACT SHEET for ECI-1 Debris Dam

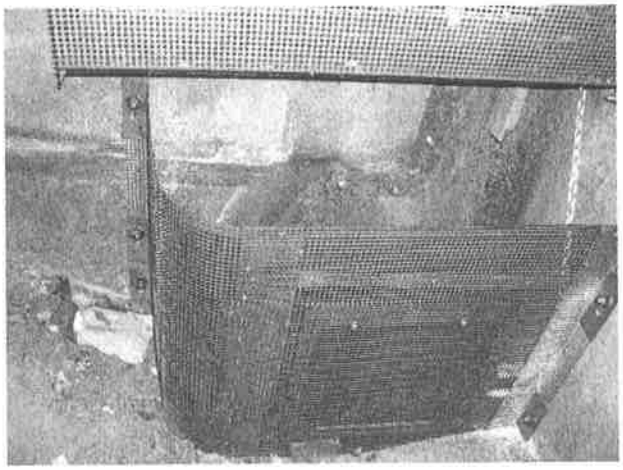


Figure 4. Corner mount for street side pipe and diverter

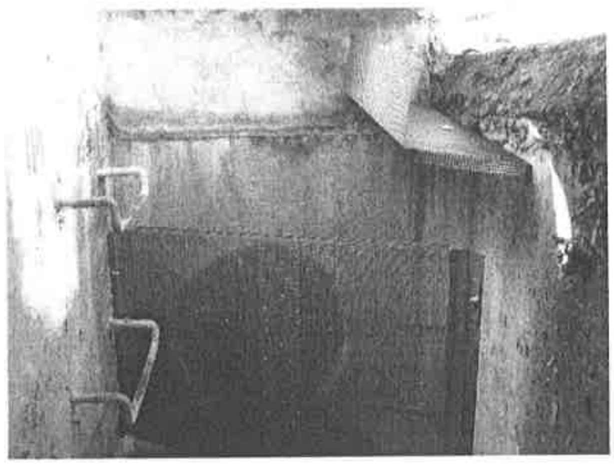


Figure 5. Straight screen for side pipe and street side diverter.

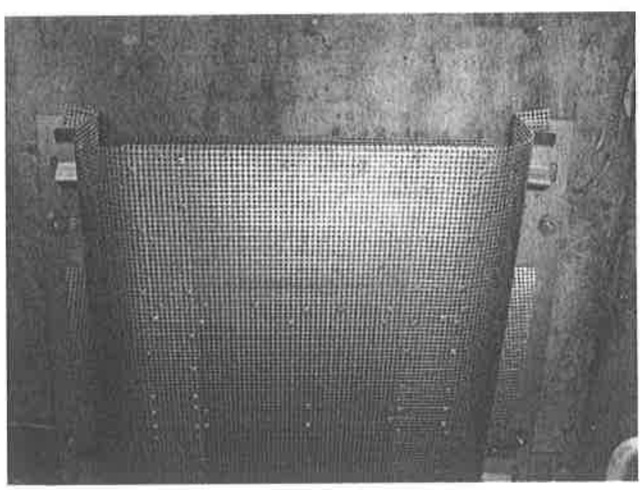


Figure 6. Side mount removable screen insert for pipe in rear of vault.

3.f The Device Maximum Trash Capture Capacity

The maximum trash capture capacity varies depending on catch basin design volume. The insert shields the entire opening of the outlet pipe and extends to the base of the catch basin curb opening. The vertical insert maximizes the trash capture area by leaving most of the original catch basin containment volume available.

3.g The Device Hydraulic Capacity (Flow in cfs) at its Maximum Trash Capture Capacity for all Standard Device Sizes

The hydraulic capacity for a 20-inch wide screen at three standard screen heights: 24, 30, and 36-inches, and at three flow conditions is presented in Table 1. Additional information related to the flow rate can be found in the Debris Dam Flow Rate Study located in Appendix C.

Table 1. Debris Dam Hydraulic Capacity

Flow Rate Through Debris Dam (20 inches wide)			
Screen and Water Column Height (inches)	Flow Rate (cfs)		
	No Blockage	25% Blockage	50% Blockage
24	6.7	2.6	1.7
30	12	4.0	2.1
36	16	4.8	2.9

3.h Each Material and Material Grade Used to Construct the Device (e.g., stainless steel, plastic, etc.)

The Debris Dam insert is manufactured from 14 or 16 gauge 304 stainless steel sheets with 5-mm diameter circular openings. The diverter screen can be manufactured of the same material as the Debris Dam; stainless steel with 5-mm openings or a solid plate with no openings, dependent on customer preferences.

3.i Conditions under which the Device Re-Introduces Previously Trapped Trash

The unit may re-introduce previously trapped trash under the following conditions:

- If the unit is vandalized;
- If the unit is not maintained per maintenance schedule and becomes clogged or full; and

- If the storm event is greater than a 10-year storm, the unit will overflow and release previously trapped trash.

3.j Estimated Design Life of the Device

The design life of the hardware is dependent on housekeeping (cleaning perforations), maintenance, and catch basin service. The estimated design life of 15 years is based on average loading, regular housekeeping, maintenance, and service.

3.k Similarity or Differences of Device

If the device is substantially similar to a device currently listed on the Certified List of Trash Devices, name the certified device(s) and identify the substantial similarities and any minor changes in materials, material thickness, structural assembly, etc. Explain how these minor changes in your device will impact performance as compared to the similar certified device.

The Debris Dam was one of the original full capture devices certified by the Los Angeles Regional Water Quality Control Board and it currently appears on the State's list of certified devices.

3.l Device "OPTIONAL COMPONENTS"

If the device includes 'OPTIONAL COMPONENTS' (e.g., deflector screen, etc.) provide installation diagrams of the device with the optional component(s). Explain how the installation of the optional component impacts the overall performance of the device.

The Debris Dam is available with a diverter. The diverter can be considered an optional component for catch basins where the Debris Dam and outlet pipe are located in the rear of the vault and away from the street.

Diverter installation is mandatory in conditions where: 1) the outlet pipe is located towards the street; 2) the side outlet pipe is in close proximity to the street opening; or, 3) other configurations where trash entering the catch basin may fall outside the catchment area. Installation of the diverter in these conditions is required to divert the incoming trash into the catch basin's inner area where it will remain. The diverter screen can be manufactured of the same material as the Debris Dam, stainless steel with 5-mm openings or a solid plate with no openings, depending on customer preferences. Use of the diverter in these conditions does not impact the overall performance of the device; in fact it assists in the performance of the device by deflecting incoming trash into the catchment area.

Debris Dams installed in the corner and near the street opening with required diverter are shown in Figures 4 and 5. A diagram with typical side mount and diverter is shown in Appendix B.

4. Installation Guidance

4.a Installation Considerations

The Debris Dam screen is a one piece design with an elliptical configuration. The overall profile of the unit is formed via press brake using custom tooling. The Debris Dam has gussets integrated into its design that are formed into the material for additional rigidity. The unit has a bolting surface integrated into the one piece design. Slots are punched into the bolting surface to allow the unit to be affixed to the catch basin wall.

4.b Device Installation Procedures

The installation process of the Debris Dam involves moving the one piece unit through the sidewalk access hole or through the catch basin opening. The base of the screen is molded to the bottom contour of the catch basin and the unit is fit into place. Stainless steel concrete wall anchors (S-304 3/8-in wedge anchors) are imbedded a minimum of 3-in to secure the unit to the wall. A stainless steel "diverter", if needed, is then attached to the wall above the unit. The diverter has a hinged section which allows part of the diverter to be raised for vector control observation and access to the catch basin.

4.c Methods for Diagnosing and Correcting Installation Errors

The Debris Dam is custom made for each individual installation and is installed per customer specifications. All installations are inspected by the customer prior to acceptance thus reducing installation errors and resulting in satisfactory installations. In the rare occasion that a Debris Dam fails to meet installation specifications, the unit will be checked to see if it was designed properly for that particular location. If, on the rare occasion it still does not fit, a new unit could be manufactured to replace the faulty unit.

4.d Device "OPTIONAL COMPONENTS"

If the device includes 'OPTIONAL COMPONENTS' (e.g., deflector screen, etc.) provide installation diagrams of the device with the optional component(s). Explain how the installation of the optional component impacts the overall performance of the device.

This information is provided in Section 3.1.

5. Operation and Maintenance Information

5.a Device Inspection Frequency Considerations, and Inspection Procedures

It is recommended that regular inspections occur for the first year of installation to determine a set maintenance schedule. Land uses with high litter generation rates will potentially require more frequent inspections, and during the wet season, it is recommended that the Debris Dam be inspected after a heavy excessive rainfall event.

5.b Maintenance Frequency Considerations, Maintenance Procedures, and a Description of Necessary Equipment and Materials for Maintenance

The ECI – 1 Debris Dam is a full capture insert device that retains all trash that enters the catch basin containment box. The vertical no seam design of the insert provides for easy maintenance with existing catch basin cleaning equipment already employed by most public agencies. The maintenance hole cover is removed to access the containment box. Cleaning can be performed by using a vacuum or combination truck, and or hand tools. The catchment area of the device should then be inspected for any overflow trash, and any remaining trash collected, if applicable.

The frequency of servicing depends on whether other established best management practices (BMPs) are in place, such as street sweeping. It is recommended that maintenance/removal of trash occur when 40% of the catch basin volume is filled, and just before the wet season. Land uses with high litter generation rates will potentially require more frequent inspections and servicing.

5.c Effects of Delayed Maintenance on Device Structural Integrity, Performance, Odors

The Debris Dam should be maintained on a routine maintenance schedule as determined by the customer. It is suggested that the Debris Dam be maintained once during the dry season and once during the wet season. As each installation is unique to a location, it is the customer's responsibility to determine optimum maintenance frequency that may be more than that recommended. The lack of maintenance does not have an impact on the structural integrity of the Debris Dam. However, lack of maintenance may affect its performance. The Debris Dam is manufactured to meet the design standards of the catch basin which is more than the 1-year, 1-hour storm required for the full capture certification. Since the intent of the Debris Dam is to retain trash entering the catch basin, lack of routine maintenance may result in clogging of the perforations, thereby restricting water flow and increasing the probability of trash being discharged with the overflow. Lack of maintenance may also result in odors at various intensities depending on the type of trash being retained in the vault.

5.d Vector Control Accessibility

This section provides information on the Debris Dam accessibility review by the Mosquito Vector Control Association of California (MVCAC) and their verification of accessibility.

5.d.i Date of Device Application and Verification

Include the date the Device application was submitted to the Mosquito Vector Control Association of California's Review for design verification via email (MVCAC <Trashtreatment@mvcac.org>).

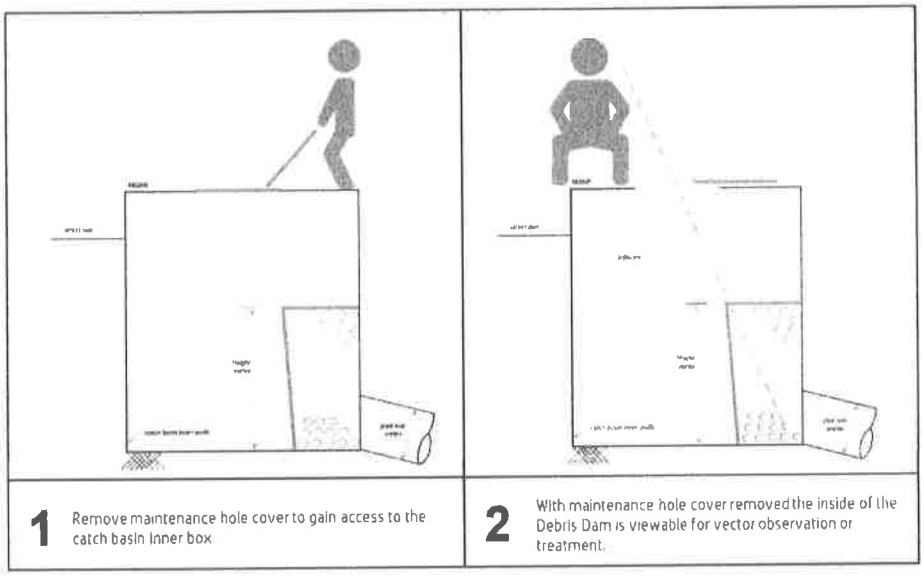
The amended fact sheet was submitted to MVCAC on April 7, 2020.

5.d.ii Mosquito Vector Control Video Link

Provide a video link or depict and describe how mosquito vector control personnel can readily access the bottom of the Device and/or storm water vault for visual observation and mosquito treatment.

The Debris Dam is self-draining, thus as designed and in theory no standing water should remain in the catchment area. Notwithstanding, the Debris Dam does provide easy vector control access for visual observation and mosquito treatment, if needed. PLEASE NOTE THE FOLLOWING PROCEDURES ARE FOR DEBRIS DAM INSTALLATIONS AT CURB INLETS (i.e. NO DROP INLET OR GRATE).

GUIDELINES FOR VECTOR OBSERVATION AND TREATMENT OF THE DEBRIS DAM – OUTLET PIPE AWAY FROM CURB INLET



At the conclusion of vector observation or treatment, replace maintenance hole cover for safety and to bring Debris Dam back to operational status.

Figure 7. Access Point for Debris Dam

To inspect and treat installations with outlet pipe away from the curb inlet, an individual can gain access to the device by lifting and removing the maintenance hole cover. From above, the floor of the catchment area can be observed. The catchment area can be accessed directly from above. Proper arrangement of safety cones need to be placed around the designated work area for health and safety reasons. At the conclusion of vector observation or treatment, the maintenance hole cover will immediately be closed to secure the area for safety and to bring the Debris Dam back to operational status. The steps to access the device for inspection are illustrated in Figure 7.

Figure 8 illustrates the steps to access the device to inspect and treat installations with the outlet pipe toward the curb inlet. Secure the work area with traffic safety cones. Remove the maintenance hole cover. Use a tool such as a maintenance hole cover pole and flip the hinged diverter section upward. From above, the floor of the catchment area can be observed and accessed directly. At the conclusion of vector observation or treatment, fold the diverter section back down to closed position, returning the Debris Dam back to operational status, and replace the maintenance hole cover for safety.

Details of the folding diverter's open and closed position are illustrated in Figure 9.

5.d.iii Letter of Verification from MVCAC

Provide the letter of verification from MVCAC the Mosquito Vector Control Association of California as soon as it becomes available. This letter shall verify that the design provisions have been included and allow full visual access to all areas for presence of standing water and/or treatment of mosquitoes when necessary.

Please see verification letter in Appendix D.

5.e Repair Procedures for the Device's Structural Components

The Debris Dam is an integrated one-piece unit with built-in indentations that provide its structural support both in the vertical and horizontal direction. In the event the Debris Dam fails, not due to environmental misuse, and its performance is compromised, a new unit would be available for replacement.

6. Reliability Information

6.a Estimated Design Life of Device Components before Major Overhaul

The Debris Dam hardware design life of 15-years is based on the unit and catch basin receiving average loading, regular housekeeping, maintenance, and service.

6.b Device Sensitivity to Loadings other than Trash (e.g., leaves, sediment, etc.)

The Debris Dam has been tested and utilized by the City of Los Angeles for over 20 years. ECI has worked with the City and other end users to ensure the device is effective in achieving trash removal. Leaves will flow over the diverter if installed and be held in the vault by the vertical insert screen. Sediment will not cause any concern with removal effectiveness, as any particle larger than 5-mm will remain in the vault.

6.c Warranty Information

ECI provides a warranty covering one year workmanship and 3 years parts and material.

GUIDELINES FOR VECTOR OBSERVATION AND TREATMENT OF THE DEBRIS DAM – OUTLET PIPE TOWARDS CURB INLET

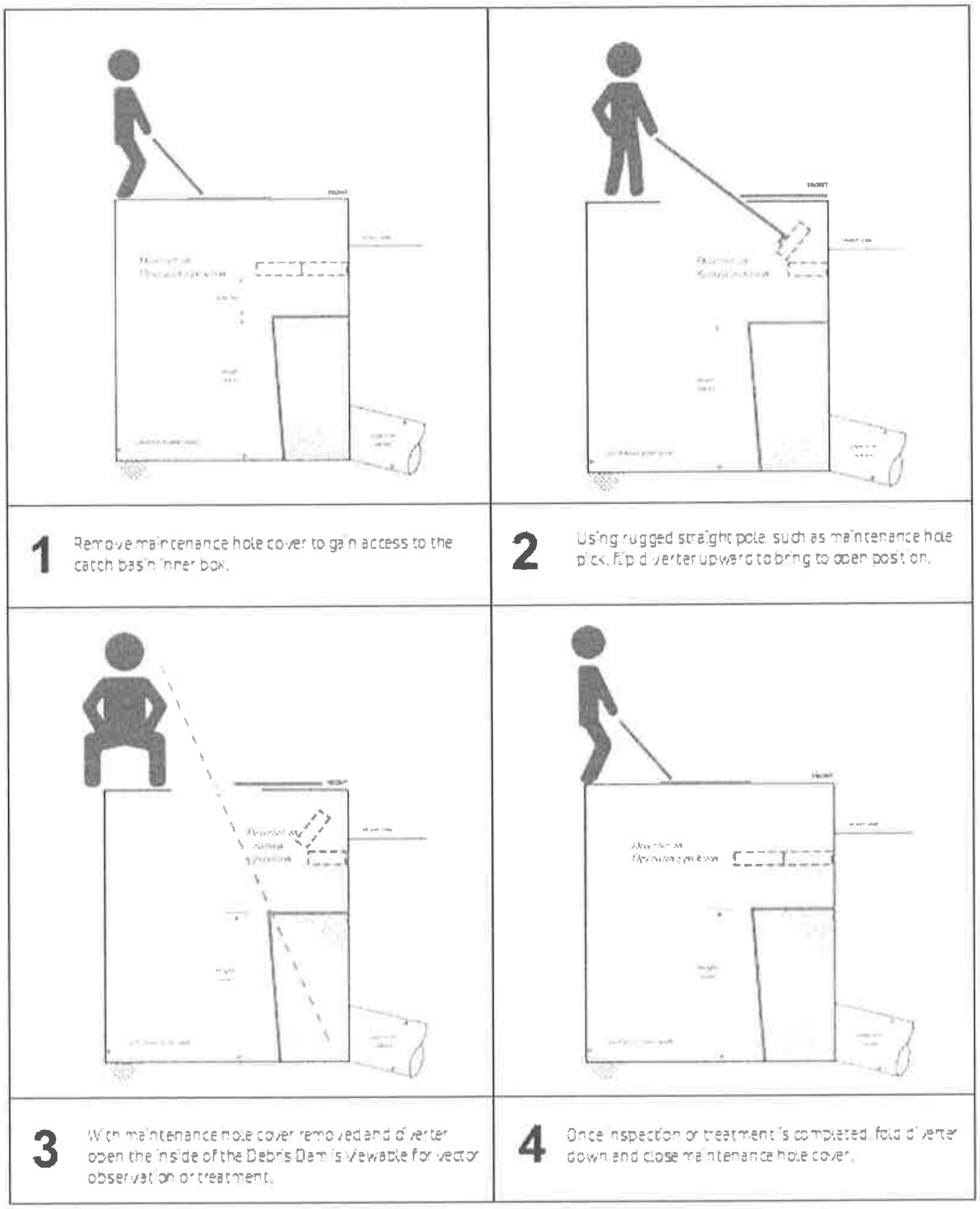
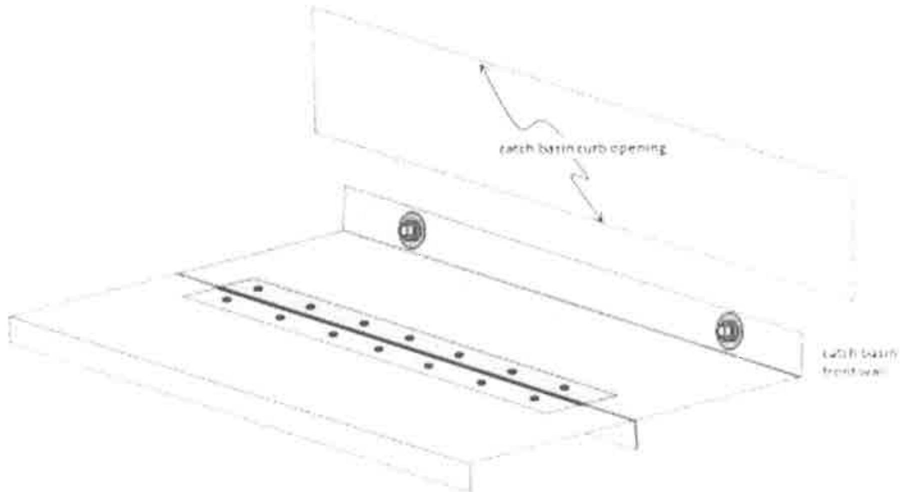
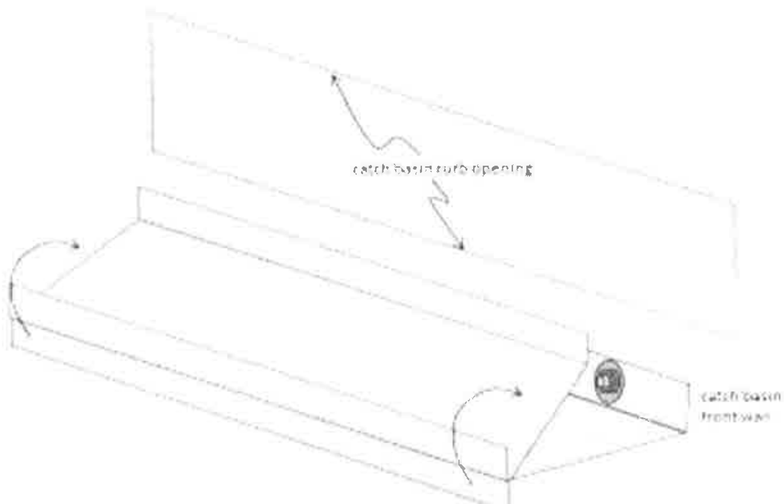


Figure 8. Access Point for Debris Dam with Diverter.



Debris Dam Vector Inspection Diverter – Close Position



Debris Dam Vector Inspection Diverter – Open Position

Figure 9. Folding Diverter Positions

6.d Customer Support Information

Todd Waters, Operations Manager
Office (310) 354-9999
Cell (310) 466-0515
Email twaters@ecologycontrol.com
www.ecologycontrol.com

7. Field/Lab Testing Information and Analysis

Provide all available field or lab testing information that demonstrates the Device functionality and performance. If the Device does not include a 5 mm screen within its design, the Applicant must provide adequate testing results that demonstrates the Device traps trash particles of 5 mm or greater.

The ECI – 1 Debris Dam (Connector Pipe Screen) was field tested and evaluated by the City of Los Angeles, Department of Public Works, Bureau of Sanitation in 2006 to be a full capture device meeting all requirements of the RWQCB. Since 2006 the City of Los Angeles has installed successfully approximately 10,000 ECI – 1 Debris Dam units in their high trash generation land use areas. The City of Los Angeles submitted the final field report to the RWQCB in 2006.

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Appendix A

Certification Letter and Report

California Regional Water Quality Control Board
Los Angeles Region
320 W. 4th Street, Suite 200, Los Angeles, California 90013
Phone (213) 576-6600 FAX (213) 576-6640 · Internet Address: http://www.waterboards.ca.gov/losangeles
Linda S. Adams
Cal/EPA Secretary
Arnold Schwarzenegger
Governor

April 25, 2007

Shahram Kharaghani, Ph.D, P.E.
City of Los Angeles, Department of Public Works
Bureau of Sanitation, Watershed Protection Division
1149 South Broadway, 10th Floor
Los Angeles, CA 90015

CERTIFICATION OF CATCH BASIN INSERT SCREEN DEVICES AS FULL CAPTURE SYSTEMS FOR TRASH REMOVAL

Dear Dr. Kharaghani:

We have reviewed the City of Los Angeles' (City) October 19, 2006, letter requesting "Full Capture Certification" for trash capture devices in two different configurations - a horizontal trash capture device and a vertical trash capture device. Subsequent to receiving this letter, additional information was provided to the Los Angeles Regional Water Quality Control Board (Los Angeles Water Board) staff during meetings between our respective staff on January 31, 2007 and February 21, 2007.

The purpose of this letter is to inform you of our approval of both configurations of your catch basin trash capture devices as "Full Capture Systems."

The definition of "full capture system" for the Ballona Creek Trash Total Maximum Daily Load (TMDL) was amended per Resolution No. 04-023 adopted on March 4, 2004 by the Los Angeles Regional Water Quality Control Board. It is likely that this definition will be applicable in future revisions of the Los Angeles River Trash TMDL. As a result, the Los Angeles Water Board staff has also analyzed your Report for compliance with the Ballona Creek Trash TMDL's full capture system definition. The definition of a "full capture system" as defined in the Resolution No. 04-023 as the following:

" A full capture system is any single device or series of devices that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate (Q) resulting from a one-year, one-hour, storm in the subdrainage area. Rational equation is used to compute the peak flow rate: Q = C x I x A, where Q = design flow rate (cubic feet per second, cfs); C = runoff coefficient (dimensionless); I = design rainfall intensity (inches per hour, as determined per the rainfall isohyetal map in Figure A), and A = subdrainage area (acres)."

The Los Angeles Water Board's criterion for certification as a full capture device is that it must trap all particles retained by a 5-mm mesh screen, and have a treatment capacity exceeding peak flow rate resulting from a one-year, one-hour, storm in the subdrainage area. In addition, the following requirements must be met: 1. End-of-Pipe Configuration - Certain BMPs, which can create a pressure drop, must have an end-of-pipe configuration and not rely on diversion weirs; 2. Adequate Pipe Sizing - The pipes carrying the flows from the subdrainage area should be able to handle peak flows; and 3. Regular Inspections and Maintenance - The full capture system must be regularly inspected and serviced to continually maintain adequate flow through capacity.

The City of Los Angeles' installations

1. The horizontal screen inserts and vertical trash capture screen inserts were installed in the City of Los Angeles in the area of Exposition Park and the LA Coliseum with a watershed of approximately 138 acres, in an effort to comply with the Ballona Creek and Los Angeles River Trash TMDLs. Based on the City's Pilot Study as submitted on October 19, 2006 and revised in February 2007, (Report), the above 2 types of devices meet the performance criteria for full capture certification.

Summary of City of Los Angeles Information Submitted

- Based on the City's Report, both inserts have a 5 mm mesh screen and meet the particle capture criteria for a full capture system. These inserts are designed for greater than a 1-year, 1-hour peak flow, and therefore satisfy the minimum 1-year, 1-hour design criteria;

- The flow capacity is greater than the estimated flow rate, therefore the inserts meet the design criteria for a full capture system;

- The drainage criterion is not part of the definition for a full capture system. However, it is important to note that the inserts do not retain storm water and therefore avoid any vector issues; and

- The Gross Solids Storage Capacity ranges depending on the size of each catch basin and its configuration. Some trash capture screen inserts may require cleaning more than once per year.

Based on the above information, the City of Los Angeles' trash capture screen inserts meet the definition of full capture system and are certified as a full capture system under the following conditions:

1. Adequate Pipe Sizing: The pipes carrying the flows from the subdrainage area should be able to handle peak flows.

2. Regular Inspections: The trash capture screen inserts should be visually inspected before and after rain events to allow for cleaning for optimal performance.

3. Regular Maintenance: The trash capture screen inserts shall be adequately maintained and cleaned ensure full capture of trash during the design storm.

This letter serves as a determination that the vertical and horizontal trash capture screen inserts, when installed and maintained in appropriately sized catch basins, satisfy the full capture definition of the trash TMDL and will allow the systems to be used elsewhere in the region. However, all parties installing these devices will have an on-going obligation to demonstrate that the installation of a particular system is appropriately sized and meets the intent of this program. Likewise, dischargers will be responsible for on-going maintenance to ensure the systems perform to design specifications. The Regional Water Board will review and consider performance data on a continuing basis. In the event data demonstrate that the systems are not performing to the full capture design standard established by the trash TMDL, this Los Angeles Water Board Executive Officer reserves the right and ability to rescind the certification for subsequent installations deemed non-conforming or inappropriate.

If you should have any questions regarding this Full Capture Certification, please feel free to contact Carlos Urrunaga at (213) 620-2083.

Sincerely,

Jonathan S. Bishop, P.E.
Executive Officer

Attachment

cc: Mr. Michael Levy, Office of the Chief Counsel, State Water Resources Control Board
Mr. Terry Fleming, Water Division, U.S. Environmental Protection Agency, Region 9
Mr. Eugene Bromley, U.S. Environmental Protection Agency, Region 9
Mr. Mark Pestrella, Los Angeles County Department of Public Works
Mr. Tom Leary, City of Long Beach
All Los Angeles County Municipal Storm Water Permittees
All Ventura County Municipal Storm Water Permittees

CITY OF LOS ANGELES

CALIFORNIA

ANTONIO R. VILLARAIGOSA
MAYOR

DEPARTMENT OF
PUBLIC WORKS
BUREAU OF SANITATION

RITA L. ROBINSON
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EXECUTIVE OFFICER
VAROUJ S. ABKIAN
TRACI J. MINAMIDE
ASSISTANT DIRECTORS

WATERSHED PROTECTION DIVISION
PUBLIC WORKS BUILDING
1149 S. BROADWAY STREET, 10TH FLOOR
LOS ANGELES, CA 90015

October 19, 2006

Mr. Jonathan Bishop, Executive Officer
Los Angeles Regional Water Quality Control Board
320 W. Fourth Street, Suite 200
Los Angeles, CA 90013

Attention: Xavier Swamikannu

REQUEST FOR FULL CAPTURE CERTIFICATION OF A CATCH BASIN INSERT

Last September 29, 2006, the City submitted to your Board the *Compliance Report for the Trash TMDL in the Ballona Creek and Wetland – Year 2006* in which we requested that your office assess the performance of our catch basin (CB) inserts as Full Capture Devices. Through subsequent discussions with your staff, it was recommended that the City makes a formal request for Certification of the catch basin insert as a Full Capture System. Therefore, **we are formally requesting that the Regional Board certify the use of the catch basin insert described in the attachments as a Full Capture System in the City of Los Angeles.**

The catch basin insert being deployed in the City of Los Angeles meets the Board's definition of a Full Capture Device as described in the Trash TMDL. Attachment A is the white paper analysis of the hydraulic capacity of the CB insert. The white paper concluded that the CB inserts used by the City, meet the Trash TMDL definition of a full capture system, specifically the inserts are manufactured of 5 millimeter perforated sheets and treat the storm flow of a 1-year, 1-hour storm. Attachment B is the pilot study conducted by the City this past wet season reaffirming that the CB insert does meet the definition of a Full Capture Device in actual field conditions. The pilot study concluded that the CB inserts manufactured from 5 millimeter perforated sheets retain 99% of the trash that enters the CB over the course of a year.

We look forward to receiving your approval, and will be eager to discuss any of the information presented herein. Should you have any questions, please contact Shahram Kharaghani, Stormwater Program Manager, at (213) 485-0587, or Morad Sedrak, TMDL Implementation Manager at (213) 485-3951.

Sincerely,

RITA L. ROBINSON, Director
Bureau of Sanitation

SK/MS/AM:a
WPDCR 8291

Attachments

c:

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Catch Basin Inserts:

Method to Determine CB Inserts Act as Full Capture Devices

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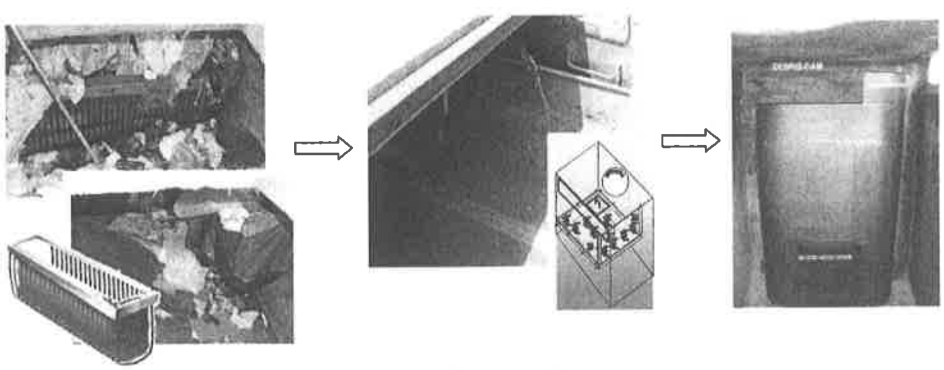
Catch Basin Inserts:

Method to Determine CB Inserts Act as Full Capture Devices

Background

The intent of this paper is to present a method to determine if the existing configurations of the City of Los Angeles' catch basin (CB) inserts with 5 millimeter openings meet the definition of a full capture device as defined in the Trash Total Maximum Daily Loads (TMDLs) documents.

The City has explored several configurations of catch basin inserts in order to select one that met the regulatory requirements and had minimal impact on its existing storm drain system. Figure 1 below shows the evolution of CB inserts that the City investigated during the past 4 years.



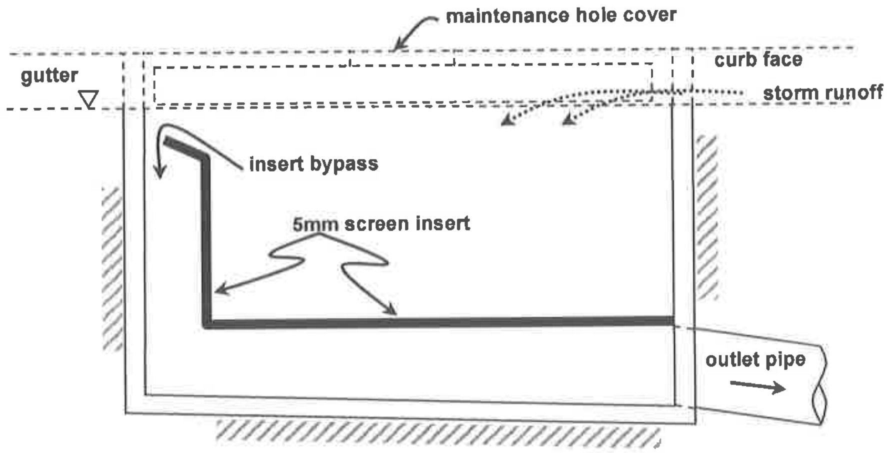
a) hanging basket b) horizontal c) vertical

Figure 1. Evolution of catch basin inserts in the City of Los Angeles

As can be seen, the City has examined three distinct configurations of inserts. The hanging basket type insert was examined in pilot installations with discouraging results. The demise of the basket insert is its limited capacity for trash capture and the associated tedious maintenance requirements. The City did not proceed with extensive installations of this insert but opted to proceed with that of the horizontal and vertical insert that are described below. The approach described herein will apply to both the horizontal and vertical inserts.

The horizontal insert (See Figure 2) was considered because it addressed the City's concern for increasing trash capture and improving maintenance. The inserts are manufactured from hot dipped galvanized steel or 316-stainless steel sheets with 5 millimeter (0.197 inch) diameter circular openings. Inserts installed in curb opening catch basins encompass the entire width and approximately 85% of the entire length of the basin. An overflow is provided to alleviate hydraulic conditions from major rain events to ensure public safety. Figure 2 depicts typical insert installation in curb opening catch basins. Those installed in grated inlets fit the entire opening. The City has installed several hundred of these inserts in the high trash areas.

The vertical insert is the last in the evolution of inserts that the City is deploying in the high trash areas. The inserts are manufactured from 304-stainless steel, gauge 14, screen sheets with 5 millimeter (0.197 inch) diameter circular openings. These inserts only have a vertical component and are installed just outside the outlet pipe of the catch basin. See Figure 3 for typical insert installation. The insert extends vertically to approximately 2-inches to 3-inches below the bottom lip of the curb opening. This insert has an overflow to alleviate hydraulic conditions from major rain events to ensure public safety. The absence of a horizontal screen allows for increase trash capture volume and lessens the frequency of inserts' maintenance. The City has installed several thousands of these inserts in the high trash areas.



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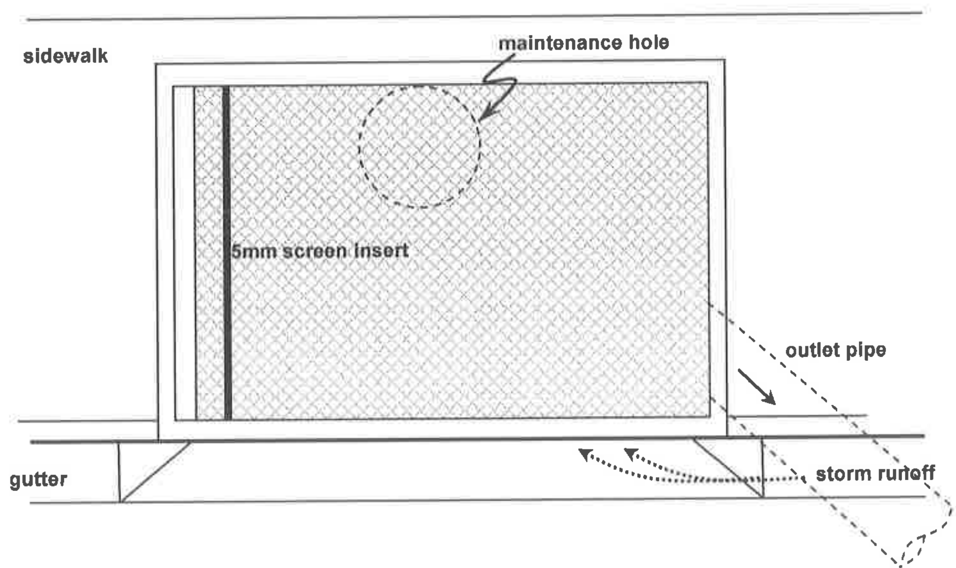
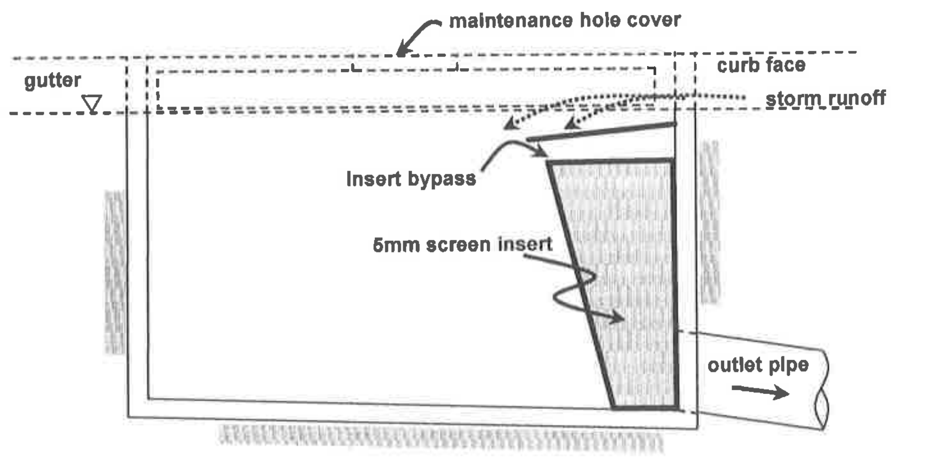


Plan

Figure 2. Typical City of Los Angeles horizontal insert installation



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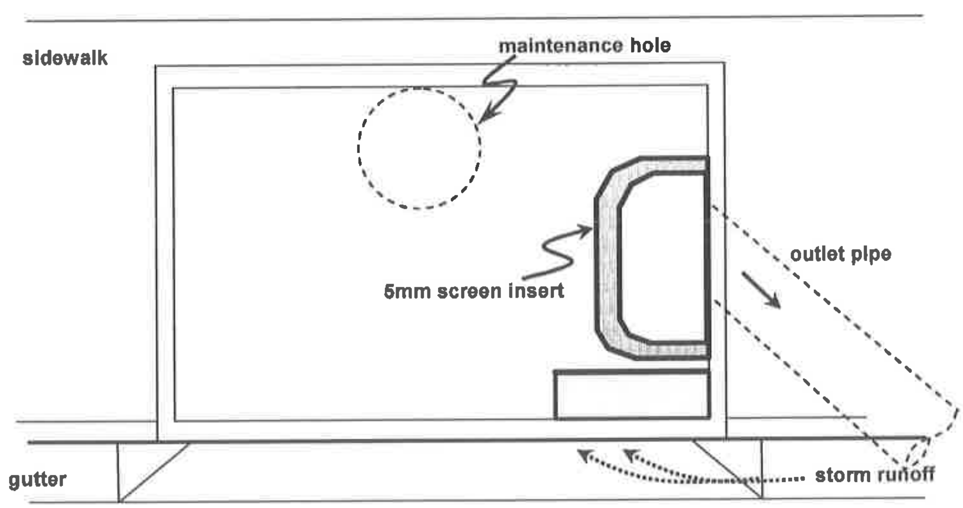

Plan

Figure 3. Typical City of Los Angeles vertical insert installation

Method

The following assertions are made:

1. Catch basins in the City of Los Angeles have been designed to intercept runoff from a ten-year storm. (Source: City of Los Angeles, Bureau of Engineering, Storm Drain Design Manual, Part G, Section G222, June 1969).

2. Catch basin outlet pipes have been designed to be a minimum of 18 inches. (Source: City of Los Angeles, Bureau of Engineering, Storm Drain Design Manual, Part G, Section G353, June 1969).

The following steps are taken to determine if the inserts with 5 millimeter are full capture devices, i.e., will treat flows from a 1-year, 1-hour storm.

1. Determine the gross area of the CB insert installed within the catch basin, both horizontal and vertical sections.

2. Determine the percentage (%) open area of the CB insert. Percentage was provided by the manufacturer.

3. Determine the net area of the CB insert. This is done by multiplying the gross area by the percentage of the open area.

4. Determine an effective pipe diameter based on the net area of the CB insert. This is done by using the area of a circle equation and solving for the diameter.

5. Interpretation of effective pipe diameter:
   a. Greater than 18 inches would indicate that the CB insert can treat more flow than existing CB outlet pipe, thus it will pass flow from a ten-year storm.
   b. Less than 18 inches would indicate the CB insert is unable to pass more flow than existing CB outlet pipe, thus it will not pass flow from a ten-year storm.
      i. Proceed in calculating the 1-year, 1-hour storm flow for the CB of concern using the Rational Method and using the rain intensity as determined by the County of Los Angeles intensity isohyetal map for Los Angeles County.
      ii. Determine an effective pipe diameter that would transport the 1-year, 1-hour flow determined above.
      iii. Compare effective pipe diameter with actual outlet diameter. If actual outlet diameter is smaller than effective pipe diameter, insert is a full capture device.

Example – Horizontal Insert

The example below is presented to illustrate the sequence of the method proposed.

Problem: *Determine if the* ***horizontal*** *insert acts as a full capture device.*

Given:

1. CB insert dimensions
   horizontal section is 3.5 feet by 3.6 feet
   vertical section is 1.5 feet by 3.5 feet
2. Tributary area of CB is 120 feet by 150 feet (0.41 acres)
3. Rainfall intensity is 0.52 in/hr
4. Percent open area of insert is equal to fifty percent (50%)
5. Street slope is 0.002 ft/ft

Solution:

1. Determine Gross Area:

   horizontal section = $3.5 ft \times 3.67 ft = 12.85 ft^2$

   vertical section = $1.5 ft \times 3.67 ft = 5.5 ft^2$

   Total Gross Area = $12.85 ft^2 + 5.5 ft^2 = 18.35 ft^2$

2. Percent open area of insert:
   Open area = 50%

3. Determine Net Area of Insert:

   Net Area = $18.35 ft^2 \times 50\%$

   Net Area = $9.18 ft^2$

4. Determine Effective Pipe Diameter (d_{new}):

   Area of Circle = $\pi d^2 / 4$

   $$d_{new} = \left[4 \times area / \pi \right]^{\frac{1}{2}}$$

   $$d_{new} = \left[4 \times 9.18 ft^2 / \pi \right]^{\frac{1}{2}}$$

   $$d_{new} = 3.42 ft$$

5. Interpretation of Effective Pipe Diameter:
   The *effective pipe diameter* resulted in 3.42 ft. This diameter is greater than 18 inches, thus CB insert can pass/treat more flow than the existing outlet pipe which is designed for a 10-

year storm, so at this point we can stop and conclude that this insert is a full capture device.

Example – Vertical Insert

The example below is presented to illustrate the sequence of the method proposed.

Problem: *Determine if the* ***vertical*** *insert acts as a full capture device.*

Given:

1. CB insert dimensions
   vertical section is 1.5 feet by 3.5 feet
6. Tributary area of CB is 120 feet by 150 feet (0.41 acres)
7. Rainfall intensity is 0.52 in/hr
8. Percent open area is equal to fifty percent (50%)
9. Street slope equals 0.002 ft/ft

Solution:

1. Determine Gross Area:

   vertical section = $1.5ft \times 3.67ft = 5.5ft^2$

   Total Gross Area = $5.5ft^2$

2. Percent open area of insert:
   Open area = 50%

3. Determine Net Area of Insert:

   Net Area = $5.5ft^2 \times 50\%$

   Net Area = $2.75ft^2$

4. Determine Effective Pipe Diameter (d_{new}):

   Area of Circle = $\pi d^2 / 4$

   $$d_{new} = \left[4 \times area / \pi \right]^{\frac{1}{2}}$$

   $$d_{new} = \left[4 \times 2.75ft^2 / \pi \right]^{\frac{1}{2}}$$

   $$d_{new} = 1.87ft$$

5. Interpretation of Effective Pipe Diameter:
   The *effective pipe diameter* resulted as 1.87 ft. This diameter is greater than 18 inches, thus CB insert can pass more flow than the existing outlet pipe which we assume was designed for a 10-year storm, so at this point we can stop and say that this insert indeed is a full capture device.

Discussion

The above approach provides a method that can be easily applied to the inserts currently being used by the City to demonstrate their use as full capture devices. The initial calculations, allow us to see if placement of the catch basin (CB) insert would hinder the existing conditions of the CB. In the example above, the dimensions given are for a shallow basin found in the City's storm drain system and thus the insert installed would have the smallest opened surface area that could be expected. One would expect the open area of the inserts to increase for larger CBs with longer curb openings (varying from 7 ft to 48 ft long) and depth varying from 4 ft to 12 ft. The example illustrates that even inserts with minimal opened surface area that could be expected in shallow CBs are adequate to handle the 10-year flow that the CB is designed to intercept, but as well can easily accommodate the 1-year, 1-hour rain intensity.

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CITY OF LOS ANGELES

Technical Report:

Assessment of Catch Basin Inserts

JUNE 2006

REVISED 02/21/07

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WATERSHED PROTECTION DIVISION / CITY OF LOS ANGELES

Technical Report:
Assessment of Catch Basin Inserts

JUNE 2006

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Executive Summary

Introduction

The intent of this report is to present the results obtained by the City of Los Angeles through a pilot study to determine the trash capture effectiveness of the insert during the wet season. The inserts were sized to accommodate the existing 10-year storm design of City-owned catch basins.

In compliance with the Federal Clean Water Act (CWA) and existing consent decree between the U.S. EPA and the environmental groups, the Los Angeles Regional Water Quality Control Board (RWQCB) approved the Trash Total Maximum Daily Loads (TMDLs) for the Los Angeles River and Ballona Creek and Wetlands on September 19, 2001. This Trash TMDL requires a reduction of 10% of trash per year for a ten-year period starting from the year 2005. The RWQCB has based compliance on a three-year rolling average, with the first milestone in September 2006 when the City must achieve a 20% trash reduction.

Pilot Study

The inserts being used in this pilot study are made of galvanized steel plates with 5 mm openings. They have been confirmed to meeting the requirements of the RWQCB for a full capture device, i.e., the ability to treat the storm flow of a 1-year, 1-hour storm. This was determined by calculating the surface area of an insert and translating it into *effective pipe diameter* and comparing it to the existing size of the outlet pipe for a catch basin. All catch basins in the City have been designed to intercept runoff from a ten-year storm with outlet pipes designed to be a minimum of 18 inches (Source: City of Los Angeles, Bureau of Engineering, Storm Drain Manual, Part G, Section G222 and Section G353, June 1969). If the *effective pipe diameter* of the insert is greater than 18 inches, then the insert can pass more flow than the existing outlet pipe, thus it will pass flow from a ten-year storm, above and beyond the 1-year, 1-hour storm criterion for a full capture device. Supplementary analysis further showed that if the insert area progressively becomes blocked, only a small percentage of that area will be required to remain open to pass the 1-year, 1-hour storm.

The sole purpose of the pilot study was to determine the trash capture effectiveness of catch basin (CB) inserts during a typical calendar year. The pilot study location is adjacent to the Coliseum/Exposition Park area in the City of Los Angeles and has a drainage area of approximately 138 acres. Stormwater runoff from this area is captured by a total of 50 catch basins and a CDS unit located at the base of this drainage area. All 50 catch basins were retrofitted with inserts having a mesh opening of 5 millimeters (0.197 inch) that capture trash mobilized by storm flow. Field measurements from both the catch basins and the CDS unit were obtained during the past wet season, FY 2005/06, by crews from the Wastewater Collection Systems Division after every storm greater than 0.25 inches.

Conclusion

The study objective was to determine the trash capture effectiveness during the wet season for inserts sized to accommodate the existing 10-year storm design of City-owned catch basins. These inserts were deemed to have a 92 to 97 percent trash capture effectiveness during storms greater than 0.25 inches. For dry days the trash capture effectiveness of the inserts is 100 percent, given that no flow is generated.

It should be noted that the City of Los Angeles during a typical year experiences twenty five (25) wet days and three hundred forty (340) dry days. **Therefore, the year-round effectiveness of the tested insert is calculated to be 99.2% to 99.7% (e.g., {340X(100%) + 25X(92%)}/365 = 99.2%).**

Since the tested insert was sized for a 10 year storm, a set of calculation was performed afterwards to calculate the performance of the insert for a 1 year, 1 hour storm event. This was done by comparing the flow rates for both storm events. It became evident that the flow rate of the 10 year storm is approximately 70% higher than the 1yr / 1hr flow (2.01cfs versus 2.01cfs). An adjustment factor was then applied to the test results to reflect the adjustment in performance. The CB insert capture effectiveness for the 1 year /1 hour storm was deemed to be 100% effective.

CHAPTER

1

PILOT STUDY

Background

The intent of this report is to present the results gathered by the City of Los Angeles through a pilot study to determine insert trash capture effectiveness during the wet season for inserts sized to accommodate the existing 10-year storm design of City-owned catch basins .

In compliance with the CWA and existing consent decree between the U.S. EPA and the environmental groups, RWQCB approved the TMDLs for the Los Angeles River and Ballona Creek and Wetlands on September 19, 2001. This Trash TMDL requires a reduction of 10% of trash per year for a ten-year period. The RWQCB has based compliance on a three-year rolling average, with the first milestone in September 2006 when the City must achieve a 20% trash reduction.

The RWQCB further identified trash in urban runoff that is conveyed through the storm drain as a primary source of pollution reaching the Los Angeles River and Ballona Creek. Trash that gets into the water bodies can cause water quality problems. Settleables, such as glass, cigarette butts, rubber, and construction debris, can be a problem for bottom feeders and can contribute to sediment contamination. Some debris, such as diapers, medical and household waste, is a source of bacteria and toxic substances. The Trash TMDL identified the following beneficial uses as being impaired due to trash in these waterbodies: 1) contact recreation like bathing and swimming; 2) non-contact recreation such as fishing, hiking, jogging, and bicycling; and 3) habitat for aquatic life and bird life.

The inserts being used in this pilot study are made of galvanized steel plates with 5 mm openings. They have been confirmed to meeting the requirements of the RWQCB for a full capture device, i.e., the ability to treat the storm flow of a 1-year, 1-hour storm. This was determined by calculating the surface area of an insert and translating it into *effective pipe diameter* and comparing it to the existing size of the outlet pipe for a catch basin. All catch basins in the City have been designed to intercept runoff from a ten-year storm with outlet pipes designed to be a minimum of 18 inches (Source: City of Los Angeles, Bureau of Engineering, Storm Drain Manual, Part G, Section G222 and Section G353, June 1969). The method states that if the *effective pipe diameter* of the insert is greater than 18 inches, then the insert can pass more flow than the existing outlet pipe, thus it will pass flow from a ten-year storm, above and beyond the 1-year, 1-hour storm criterion for a full capture device. Supplementary analysis further showed that if the insert area progressively becomes blocked, only a small percentage of that area will be required to remain open to pass the 1-year, 1-hour storm.

Throughout the study the word "trash" has been used to represent sediment, debris, vegetation and litter and should not be misconstrued to represent only anthropogenic trash.

Description of Study Area

The catch basins retrofitted with inserts were located southwest of the downtown Los Angeles Civic Center adjacent to the Coliseum/Exposition Park area of the City (See Figure 1.1). The drainage area is approximately 138 acres, with three-quarters commercial land use and the remaining multi-family residential land use (see Figure 1.2). This area is regarded as a high trash generation area within the City.

Catch Basin and CDS Details

The physical parameters of the fifty (50) catch basins (CBs) included in the study were consistent. Table 1 shows the parameters for each CB. As the Table shows, over two-thirds of the CBs had a curb opening length of 3.5 feet and curb opening height of eight (8) to ten (10) inches. Additionally, many of the CBs had a depth that was shallow to moderate. The catch basin drainage area in which these catch basins are found had a hydrodynamic system installed on the downstream end of the mainline storm drain located at Vermont and 43rd Street. The system being used is a CDS Technologies Continuous Deflective Separation (CDS) unit Model PSW 70-70 with treatment design flow rate of 26.5 cubic feet per second (cfs). A CDS unit is recognized by the RWQCB as a full capture device.

Catch Basin Insert Details

The inserts being used in the study have been verified as meeting the requirements of the RWQCB for a full capture device, i.e., the ability to treat the storm flow of a 1-year, 1-hour storm. The CB inserts evaluated for the study have been purchased and installed by Practical Technology, Inc. They are manufactured from hot dipped galvanized steel screen sheets with 5 millimeters (0.197 inch) diameter circular openings. Inserts installed in curb opening CBs encompass the entire width and approximately 80% of the entire length of the basin; whereas, inserts installed in grate CBs fit the entire opening. See Figure 1.3 for typical insert installation and configuration. During a typical rain event trash that has accumulated in the street gutters is washed into the catch basin. The function of the CB inserts is to capture all trash greater than 5 mm while maintaining adequate drainage capacity of the CB and storm drain system. If the storm event is of great intensity, flow will begin to backup into the catch basin causing the floatable trash within the catchment area to rise. Excessive flow will go into the overflow, thus preventing any flooding of the streets.

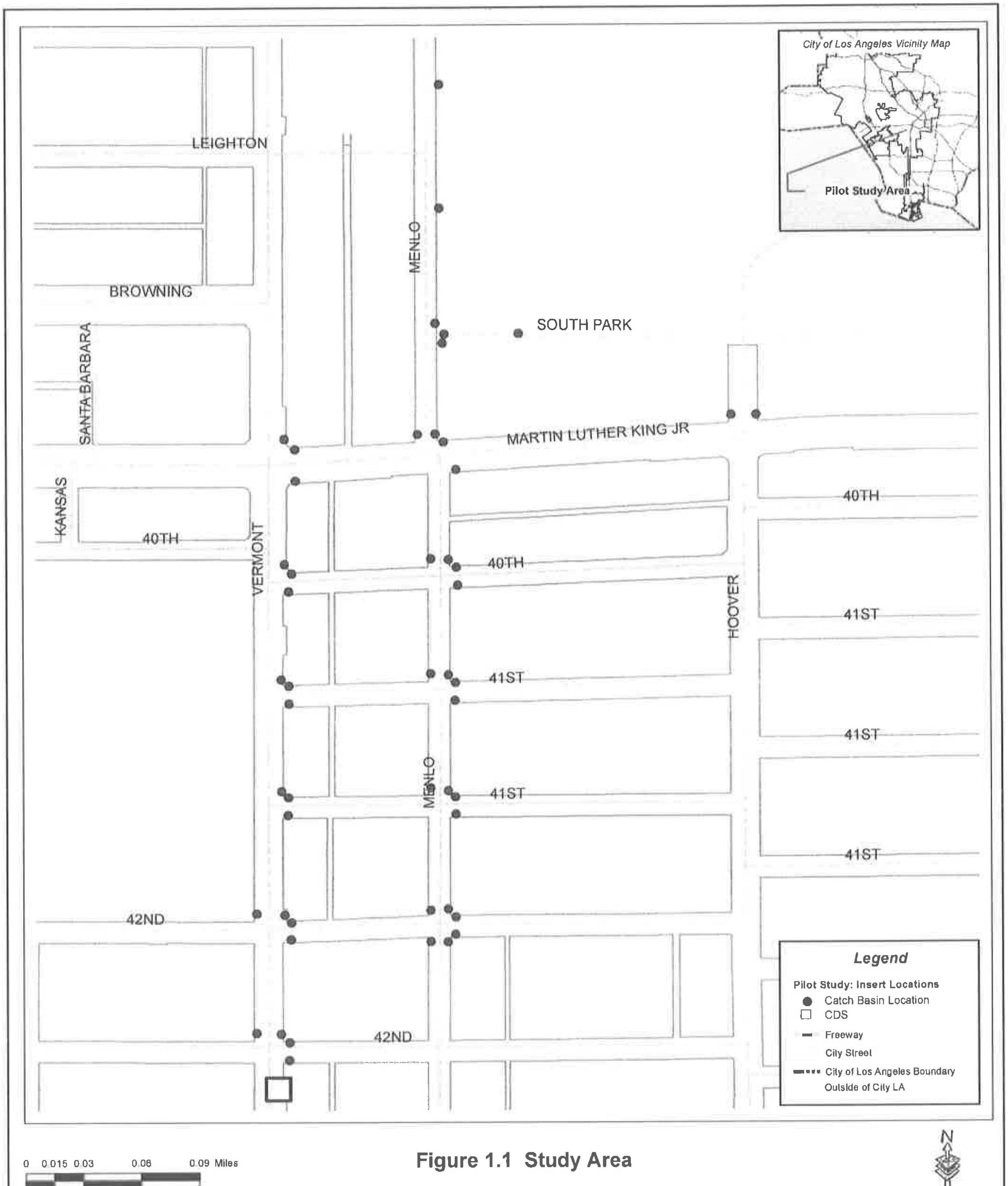

Figure 1.1 Study Area

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DEPARTMENT OF PUBLIC WORKS

RITA L. ROBINSON
DIRECTOR

SHAHRAM KHARAGHANI
PROGRAM MANAGER

FILE-LOC	DRAWN BY:	CHECKED BY:	DATE	
H:/GIS/PilotStudyLocations	AM	MS	05/19/06 DATE REVISED X	This map shall not be copied or reproduced, all or any part thereof, whether for distribution or resale, without the proper written permission of the Dept. of Public Works, City of Los Angeles

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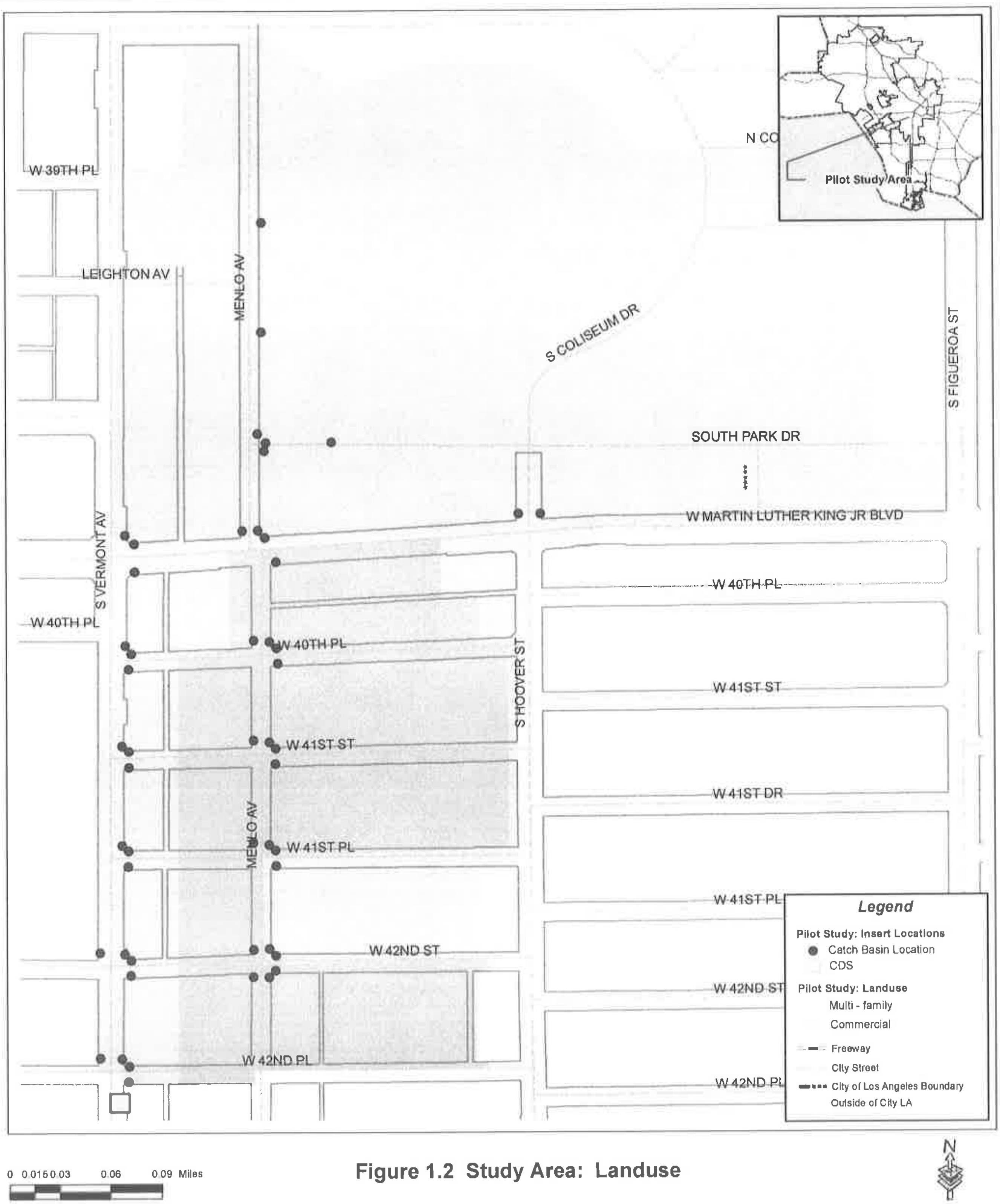
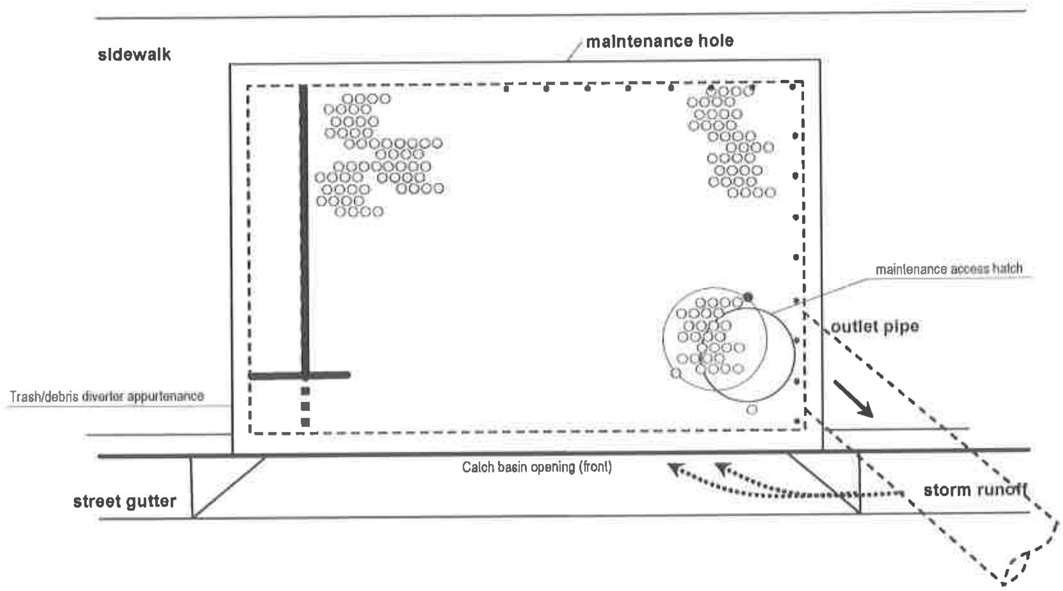


Figure 1.2 Study Area: Landuse

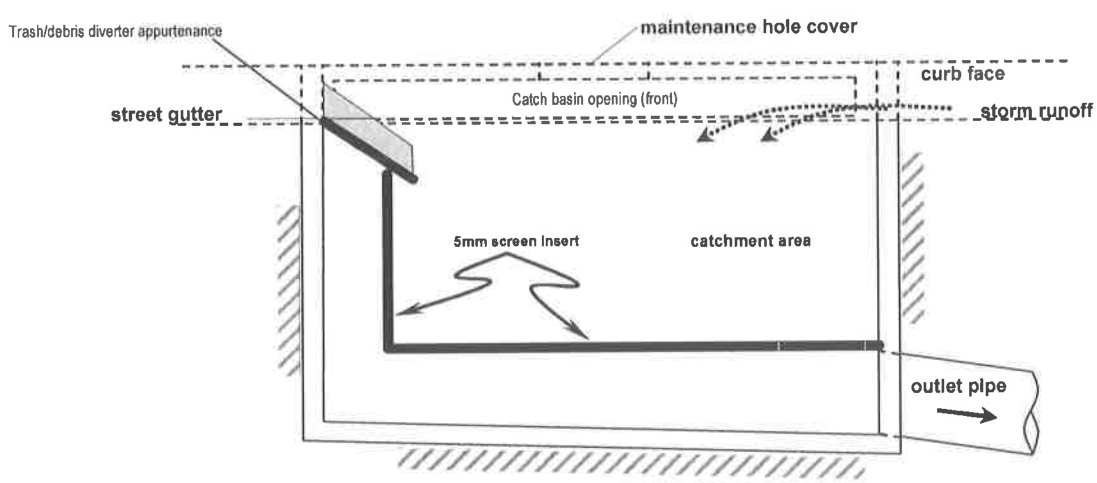
CITY OF LOS ANGELES SANITATION DEPARTMENT OF PUBLIC WORKS	RITA L. ROBINSON DIRECTOR			SHAHRAM KHARAGHANI PROGRAM MANAGER		WATERSHED
	FILE-LOC H/GIS/PilotStudyLanduse	DRAWN BY: AM	CHECKED BY: MS	DATE 05/19/06 DATE REVISED X	This map shall not be copied or reproduced, all or any part thereof whether for distribution or resale, without the proper written permission of the Dept. of Public Works, City of Los Angeles	

Table 1.1 Pilot Study Catch Basin Parameters

No	Address	Location	CLAMMS ID No.	Catch Basin				Street Cleaning Frequency
				Dimensions (ft)			Vol. ft^3	
				Length	Width	Depth		
1	MENLO AVE & LEIGHTON AVE	NE	53608461111100	7.25	3.67	1.75	46.56	Weekly
2	MENLO AVE & LEIGHTON AVE	SE	53608461111104	3.5	3.75	1.33	17.46	Weekly
3	MENLO AVE & MARTIN LUTHER KING JR BLVD	200' E OF MENLO AVE	53612461111012	3.58	3.92	1.5	21.05	Weekly
4	MENLO AVE & MARTIN LUTHER KING JR BLVD	NE 300' N OF MLK	53612461111013	3.67	3.75	1.33	18.30	Weekly
5	MARTIN LUTHER KING JR BLVD & MENLO AVE	EN 300' N OF MLK	53612461111014	3.83	3.75	1.167	16.76	Weekly
6	MARTIN LUTHER KING JR BLVD & MENLO AVE	ES 300' N OF MLK	53612461111015	3.58	3.67	1.83	24.04	Weekly
7	HOOVER ST & MARTIN LUTHER KING JR BLVD	NE	53612461111016	14.75	3.83	2.83	159.87	Daily
8	HOOVER ST & MARTIN LUTHER KING JR BLVD	NW	53612461111017	7.33	1.92	1.92	27.02	Daily
9	MENLO AVE & MARTIN LUTHER KING JR BLVD	NE	53612461111020	14.58	3.83	2.83	158.03	Weekly
10	MENLO AVE & MARTIN LUTHER KING JR BLVD	NW	53612461111022	4.25	3.67	1.08	16.85	Weekly
11	VERMONT AVE & MARTIN LUTHER KING JR BLVD	NE	53612461111025	4	7	2	56.00	Daily
12	MARTIN LUTHER KING JR BLVD & MENLO AVE	EN	53612461111026	7.42	4	1.33	39.47	Daily
13	MARTIN LUTHER KING JR BLVD & VERMONT AVE	EN	53612461111028	7	2.083	1.67	24.35	Daily
14	MARTIN LUTHER KING JR BLVD & MENLO AVE	ES	53612461111030	3.5	3.83	2	26.81	Daily
15	MARTIN LUTHER KING JR BLVD & VERMONT AVE	ES	53612461111031	--	--	--	--	Daily
16	MENLO AVE & 40TH PL	NW	53612461111036	3.583	3.5	1.75	21.95	Weekly
17	MENLO AVE & 40TH PL	NE	53612461111037	3.583	3.667	2.416	31.74	Weekly
18	VERMONT AVE & 40TH PL	NE	53612461111038	3.833	3.75	2.47	35.50	Daily
19	40TH PL & MENLO AVE	EN	53612461111039	3.583	3.75	2	26.87	Weekly
20	40TH PL & VERMONT AVE	EN	53612461111040	3.667	3.75	1.5	20.63	Weekly
21	40TH PL & MENLO AVE	ES	53612461111042	3.583	3.583	1.667	21.40	Weekly
22	40TH PL & VERMONT AVE	ES	53612461111043	3.583	3.667	1.083	14.23	Weekly
23	MENLO AVE & 41ST ST	NW	53612461111047	3.583	3.583	2.63	33.76	Weekly
24	MENLO AVE & 41ST ST	NE	53612461111048	3.667	3.667	1.83	24.61	Weekly
25	VERMONT AVE & 41ST ST	NE	53612461111049	3.667	3.75	1.75	24.06	Daily
26	41ST ST & MENLO AVE	EN	53612461111050	3	3.667	2.083	22.92	Weekly
27	41ST ST & VERMONT AVE	EN	53612461111052	3.667	2.5	1.25	11.46	Weekly
28	41ST ST & MENLO AVE	ES	53612461111054	3.667	3.75	1.417	19.49	Weekly
29	41ST ST & VERMONT AVE	ES	53612461111056	3.25	3.583	1.45	16.88	Weekly
30	MENLO AVE & 41ST DR	NW	53612461111061	3.5	3.583	1.917	24.04	Weekly
31	MENLO AVE & 41ST DR	NE	53612461111062	3.25	3.667	2.25	26.81	Weekly
32	VERMONT AVE & 41ST DR	NE	53612461111063	3.75	3.5	1.25	16.41	Daily
33	41ST DR & MENLO AVE	EN	53612461111064	3.667	3.75	1.167	16.05	Weekly
34	41ST DR & VERMONT AVE	EN	53612461111066	3.667	3.583	1.67	21.94	Weekly
35	41ST DR & MENLO AVE	ES	53612461111068	2	3.667	1.167	8.56	Weekly
36	41ST DR & VERMONT AVE	ES	53612461111069	3.667	3.583	1.67	21.94	Weekly
37	MENLO AVE & 42ND ST	NE	53612461111076	3.5	3.667	2.417	31.02	Weekly
38	MENLO AVE & 42ND ST	NW	53612461111077	3.667	3.75	1.833	25.21	Weekly
39	VERMONT AVE & 42ND ST	NW	53612461111081	3.583	7.4167	1.75	46.50	Daily
40	VERMONT AVE & 42ND ST	NE	53612461111082	--	--	--	--	Weekly
41	42ND ST & MENLO AVE	EN	53612461111083	3.9167	3.75	1.5	22.03	Weekly
42	42ND ST & VERMONT AVE	EN	53612461111086	3.583	3.667	1.5	19.71	Weekly
43	42ND ST & MENLO AVE	ES	53612461111088	3.583	3.667	1.75	22.99	Weekly
44	42ND ST & VERMONT AVE	ES	53612461111090	3.5	3.583	1.833	22.99	Weekly
45	MENLO AVE & 42ND ST	SW	53612461111092	2.75	3.33	2.45	22.44	Weekly
46	MENLO AVE & 42ND ST	SE	53612461111093	3.583	3.667	2	26.28	Weekly
47	VERMONT AVE & 42ND PL	NW	53612461111099	3.1667	2.25	1.25	8.91	Daily
48	VERMONT AVE & 42ND PL	NE	53612461111100	3.5	3.583	2.33	29.22	Daily
49	42ND PL & VERMONT AVE	EN	53612461111101	3.75	3.833	1.83	26.30	Weekly
50	42ND PL & VERMONT AVE	ES	53612461111102	2.25	3.75	1.83	15.44	Weekly



Plan



Profile

Figure 1.3 Typical Insert Installation

CHAPTER 2

Pilot Study – Test Protocol

Goal

The goal of this test protocol is:

1. To determine CB insert trash capture effectiveness during wet weather.

Test Protocol

General

1. The inserts evaluated for the pilot study were purchased from Practical Technology, Inc. They are constructed from hot dipped galvanized steel screen sheets with 5mm openings. Inserts installed in curb opening CBs encompass the entire width and approximately 80% of the entire length of the basin; whereas inserts installed in grate inlet CBs (3 total) fit the entire opening.

2. Wastewater Collection Systems Division (WCSD) crews will perform data collection and measurements after a storm event having an accumulation greater than 0.25 inches as measured at the civic center of the City of Los Angeles. Collection and measurements will be from October 1, 2005 to April 30, 2006.

3. Existing data collection procedures will be employed and amended, if necessary. Data from individual measurements will be recorded in tabular form (see Fig. 2.1), using existing WCSD data collection forms or amended forms provided by Watershed Protection Division (WPD).

4. Existing historical CB and CDS cleaning data will be gathered for comparison with that of the data collection from this study.

5. Data collection and measurements will be performed if the storm events occurred ten or more days apart.

6. Precipitation data of every storm event will be obtained from the County of Los Angeles, Department of Public Works real time rain gauge identified as the Los Angeles-Ducommun (#377, Lat. 34-03-09; Long. 118-14-13; Elev. 306). Data will be analyzed for total rainfall, one-hour maximum rainfall, and 30-minute maximum rainfall (rainfall intensity).

7. The following field conditions will be recorded by WPD staff at the start of the study at each retrofitted CB:
    a. Location;
    b. Volume of insert and size of CB opening;
    c. Height of insert;
    d. Visual observations of street surroundings;
    e. Visual observations of inside of catch basin; and
    f. Street cleaning frequency at CB location.

8. The following field conditions will be recorded during data collection at each retrofitted catch basin:
    a. Existing weather conditions;
    b. Fullness of insert (i.e., none, minimal, ¼ full, ½ full, ¾ full, full);
    c. Visual observations for signs of ponding immediately adjacent to CB opening; and
    d. Other parameters, as the study proceeds.

9. Following each cleaning WCSD will forward the results to WPD for data assessment.

Evaluation of Capture Effectiveness

Determination of an overall trash capture effectiveness of inserts will rely on field measurements and visual observations.

1. WCSD crews will visually monitor the CDS unit for floating trash after every storm event described. If no floating trash is visible, such result shall be recorded, otherwise crews will remove the floating trash.

2. WCSD crews will remove all accumulated trash after every storm from all retrofitted CBs.

3. Trash Capture (TC) effectiveness of inserts will be determined as follows for each set of cleaning data:

$$TC_{Effectiveness} = \frac{\sum_{i}^{n} CB_{trash}}{\sum_{i}^{n} CB_{trash} + CDS_{trash}}$$

Where CB_{trash} and CDS_{trash} are the trash quantities for the CBs and CDS unit, respectively. These quantities will be expressed in both weight (lbs) and in-place-volume based on the height of the trash and cross-sectional area of the units.

WORK ORDER NO:

ENTRY DATE

Originator: Action Code: Routine Maintenance

Requester: Shutdown: No Priority: Normal

Planner: Parts Reqd: No Project:

Reference: Date Req'd:

Late Date: TBM

Description: INSPECT AND CLEAN STRUCTURE AS NECESSARY

Asset Name: CATCH BASIN Revision:

Asset No: W______ Category:

Asset Description:

Location:

Map and Grid

Steps

Step	Crew	Craft	Schedule date	Persons	Hours
1	W387	WW			

INSPECT AND CLEAN
STRUCTURE AS NECESSARY

Record Daily Time

Date:	Employee #:	Hours	Enter:	Date:	Employee #:	Hours	Enter

Completion Date: ______ Reconciliation: ______ Work Sub-Class ______ Failure (Finding/Condition): ______
Cleaning Method

Completed by
Employee # ______ Accepted by Empl # ______

Signature: ______ Signature: ______

Figure 2.1 WCSD data collection form

CHAPTER

3

PILOT STUDY – RESULTS

The intent of this section is to present the results obtained by the WCSD crews during the cleaning of the CBs and CDS unit after every storm greater than 0.25 inch. There were a total of 4 rain events of a magnitude that triggered a cleaning event during the 2005/2006 wet season. Though there were several small rain events (< 0.25 inch) during this wet season, the maintenance crews were not asked to clean either the catch basins or CDS. For these smaller rain events, visual observations, were made by staff and documented through photos. Table 3.1 illustrates the rain event data and the corresponding capture effectiveness based on the Test Protocol procedure.

Table 3.1 CB Insert Capture Effectiveness Per Rain Event > 0.25 inches (Wet Season Only)

Event	Storm Size (in)	Date	Collected Trash (lbs)		Insert % Capture Effectiveness (c)
			CBs (a)	CDS (b)	
1	1.02	10/17-18/05	1,911	128	97
2	2.05	12/31/05- 1/2/06	2,159	160	93
3	.31	2/17-18/06	2,253	160	93
4	.28	3/20-21/06	1,736	142	92

Figures 3.1 through 3.3 below, show typical contents found in the catchment area of the inserts just after a storm event. Depending on the catch basin location, the contents may differ. For example, more sediment and vegetation were found in those CBs in the multi-family landuse, while those in the commercial landuse had more trash (i.e., Styrofoam cups, plastic bags, etc.). Figures 3.4 through 3.5 show the typical contents of the CDS unit after a storm event. This material is what escaped the inserts through the overflow due to large flows mobilizing floatable trash found within the catchment area. As the pictures show, much of the contents are materials that easily float such as Styrofoam cups and containers, light film plastics,

and some paper products. Figures 3.6 through 3.9 show trash captured in the catch basins following rain events.

Figure 3.1 Typical CB insert with trash in catchment area

Figure 3.2 Typical CB insert with vegetation in catchment area

Figure 3.3 Typical CB insert with sediment in catchment area

Figure 3.4 Typical CDS unit contents after storm event

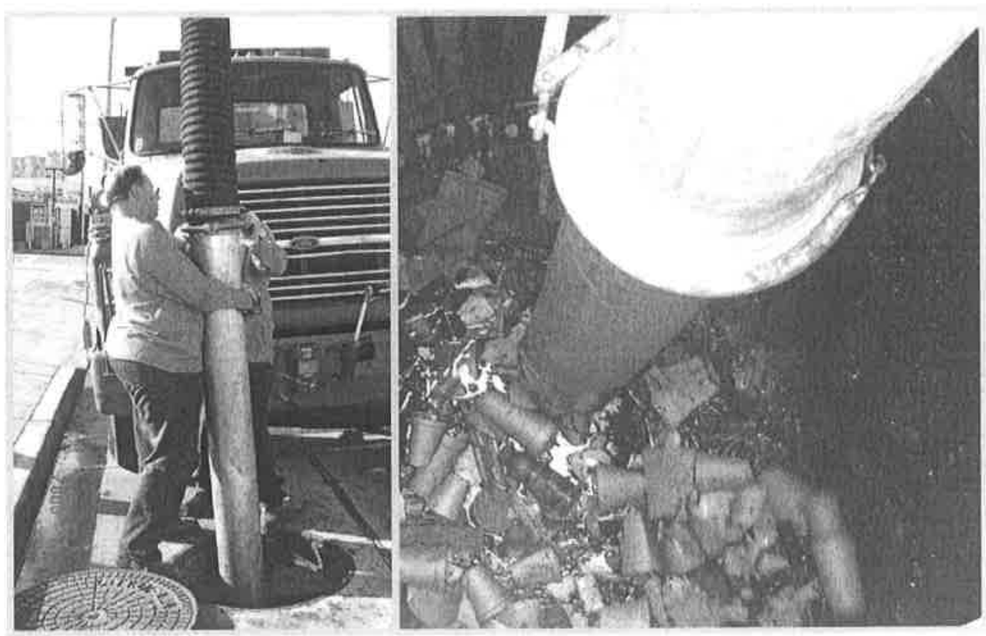
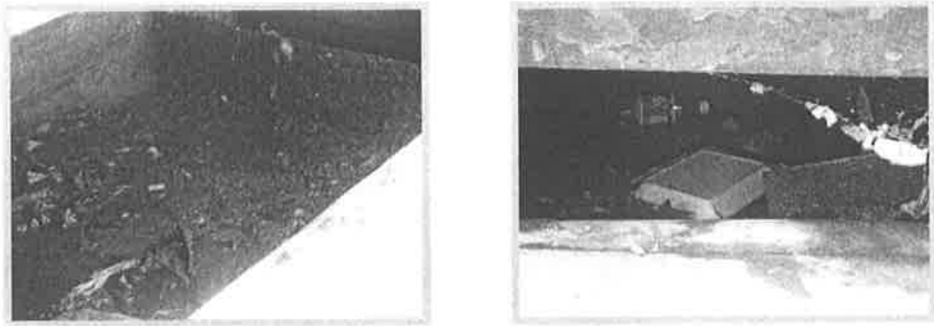
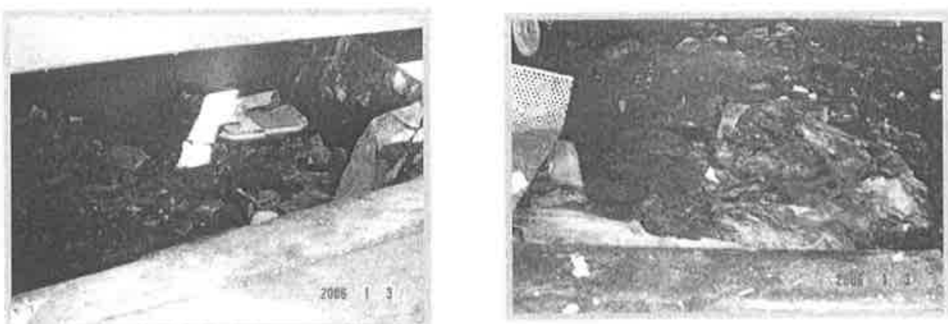


Figure 3.5 WCSD crews cleaning the CDS unit after a storm event



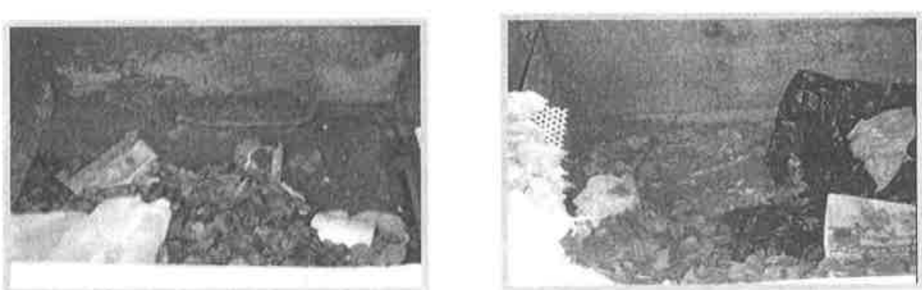
a. 41st and Menlo Ave. b. 42nd and Vermont Ave.

Figure 3.6 Typical debris in CB after rain event No. 1, 10/17-18/2005



a. 41st and Menlo Ave. b. 42nd and Vermont Ave.

Figure 3.7 Typical debris in CB after rain event No. 2, 12/31/2005-01/02/2006



a. 41st and Menlo Ave. b. 42nd and Vermont Ave.

Figure 3.8 Typical debris in CB after rain event No. 3, 02/17-18/2006

a. 41st and Menlo Ave.

b. 42nd and Vermont Ave.

Figure 3.9 Typical debris in CB after rain event No. 4, 03/19-20/2006

CHAPTER

4

Pilot Study
Analysis and Recommendations

Data Analysis

The study objective was to determine the trash capture effectiveness during the wet season for inserts sized to accommodate the existing 10-year storm design of City-owned catch basins. These inserts were deemed to have a 92 to 97 percent trash capture effectiveness during storms greater than 0.25 inches. The only time trash escapes the insert catchment area is when sufficient flow is generated to mobilize floatable trash in the catchment area and push it over the overflow. Hence, for dry days the trash capture effectiveness of the insert is 100 percent, given that no flow is generated.

It should be noted that the Trash TMDL document established a yearly Waste Load Allocation for each municipality within the watershed(s) based on a phased reduction of a 10% per year from the estimated current discharge (baseline) over a 10-year period. In addition, the City of Los Angeles during a typical year experiences twenty five (25) wet days and three hundred forty (340) dry days.

Therefore, the year-round effectiveness of the insert is calculated to be 99.2% to 99.7% (e.g., {(340 X 100%) + (25 X 92%)}/365 = 99.2%).

In accordance with the Trash TMDL document, a full capture device is defined as any single device or series of devices that traps all particles retained by a 5 mm mesh screen and has a design treatment capacity of not less than the peak flow rate of a 1-year/1-hour storm.

Therefore, the inserts piloted herein and deployed by the City in its catch basins clearly satisfy the above definition.

It is also important to point out that the inserts tested were sized for a 10 year storm, therefore their performance under a lesser flow rate, such as, a 1-year/1-hour storm is expected to show higher efficiency than the 92% – 97% documented in this study. This can be demonstrated by the following set of calculations:

The flow rate for a 1 year / 1 hour storm for each catch basin in the pilot study area is calculated as follows:

Q =CiA

C = .95
i = 0.46 in/hr (LADPW isohyetal map, 1yr, 30min)
A = 134 acres (drainage area of Coliseum area)/ 50 (# of catch basins in Coliseum area)
= 2.68 acres

Q = (.95) (.46) (2.68)
= **1.17 cfs**

Similarly, the flow rate for a 10 yr/ 1 hr storm for each catch basin is calculated as follows:

Q =CiA

C = .95
i = .79 in/hr*
A = 2.68 acres

Q = (.95) (.79) (2.68)
= **2.01 cfs**

By comparing both flow rates, it is evident that the flow rate of the 10 year storm is approximately 70% higher than the 1yr / 1hr flow.

*Converting Storm Events for a Given Location

Location: Downtown Los Angeles (See map in Attachment)[1]

Depth for a 50yr-24hr storm event: 6.0 inches[1]

$$\text{Intensity} = \left(\frac{RainDepth}{Duration}\right) = \left(\frac{6\ inches}{24\ hrs}\right) = 0.250\ in/hr$$

Convert from 50yr-24hr storm to 10yr-24 hr storm:

To convert to a 10yr-24 hr storm multiply by LA County 10yr Rainfall Frequency Multiplication Factor.[2]

10yr-24hr factor = 0.714 (See attachment Table 5.3.1)

Therefore, 10yr-24 hr equivalent storm:

$$\text{Depth}_{\text{10yr-24hr}} = 6.0\ in\ *\ 0.714 = 4.28\ in$$

$$\text{Intensity} = \left(\frac{RainDepth}{Duration}\right) = \left(\frac{4.28\ inches}{24\ hrs}\right) = 0.178\ in/hr$$

$$I_{\text{10yr-24hr}} = \mathbf{0.178\ in/hr}$$

Convert from 10yr-24 hr storm to a 10yr-1hr storm:

To convert from a 10yr-24 hr storm to a 10yr-1hr storm, use normalized intensity equation which relates intensity, duration, and frequency (IDF).[3]

$$\frac{I_t}{I_{1440}} = \left(\frac{1440}{t}\right)^{0.47}$$

Where:

I_t = Rainfall intensity for the duration given in inch/hr

t = Converting time in minutes (60 min = 1 hr)

I_{1440} = 24 hr rainfall intensity in inch/hr

$\frac{I_t}{I_{1440}}$ = Peak Normalized intensity, dimensionless

Therefore, Intensity (I) for a 10yr-1hr storm:

$$I_{\text{10yr-60min}} = \left(\frac{1440\,\text{min}}{60\,\text{min}}\right)^{0.47} \bullet\ 0.178\ in/hr$$

$$I_{\text{10yr-60min}} = \mathbf{0.79\ in/hr}$$

Therefore, the surface area of the current insert that is sized to handle the 10 year storm can be reduced by 70% to treat the 1 year / 1 hour storm.

---

[1] Los Angeles County Rainfall data: http://www.ladpw.org/wrd/publication/Rain Depth (50yr_24hr-rain.shp). (See Attachment)

[2] Los Angeles County Department of Public Works, Hydrology Manual, Jan 2006, Chapter 5, Table 5.3.1, Pg. 43 (See Attachment)

[3] Los Angeles County Department of Public Works, Hydrology Manual, Jan 2006, Chapter 5, Equation 5.1.2, Pg. 38.

An adjustment factor as high as 70% may be applied to the test results to reflect the adjustment in performance. Table 4.1 reflects the CB insert capture effectiveness for the two different storm events after applying the adjustment factor for the 1 year /1 hour storm.

Table 4.1 CB Insert Capture Effectiveness Comparison by Storm Flow Rates (Wet Season Only)

Event	Date	Insert % Capture Effectiveness	
		10-year/1-hour (a.)	1-year/1-hour (b.)
1	10/17-18/05	97	100
2	12/31/05- 1/2/06	93	100
3	2/17-18/06	93	100
4	3/20-21/06	92	100

Note:
a. Percent capture effectiveness based on the study.
b. Capture effectiveness = a. X 1.70
Example: 92% X 1.70 = 156%, thus 100%.

Observations

Throughout the study many observations, other than capture effectiveness, were recorded and below are some aspects that need to be considered with the use of this type of insert:

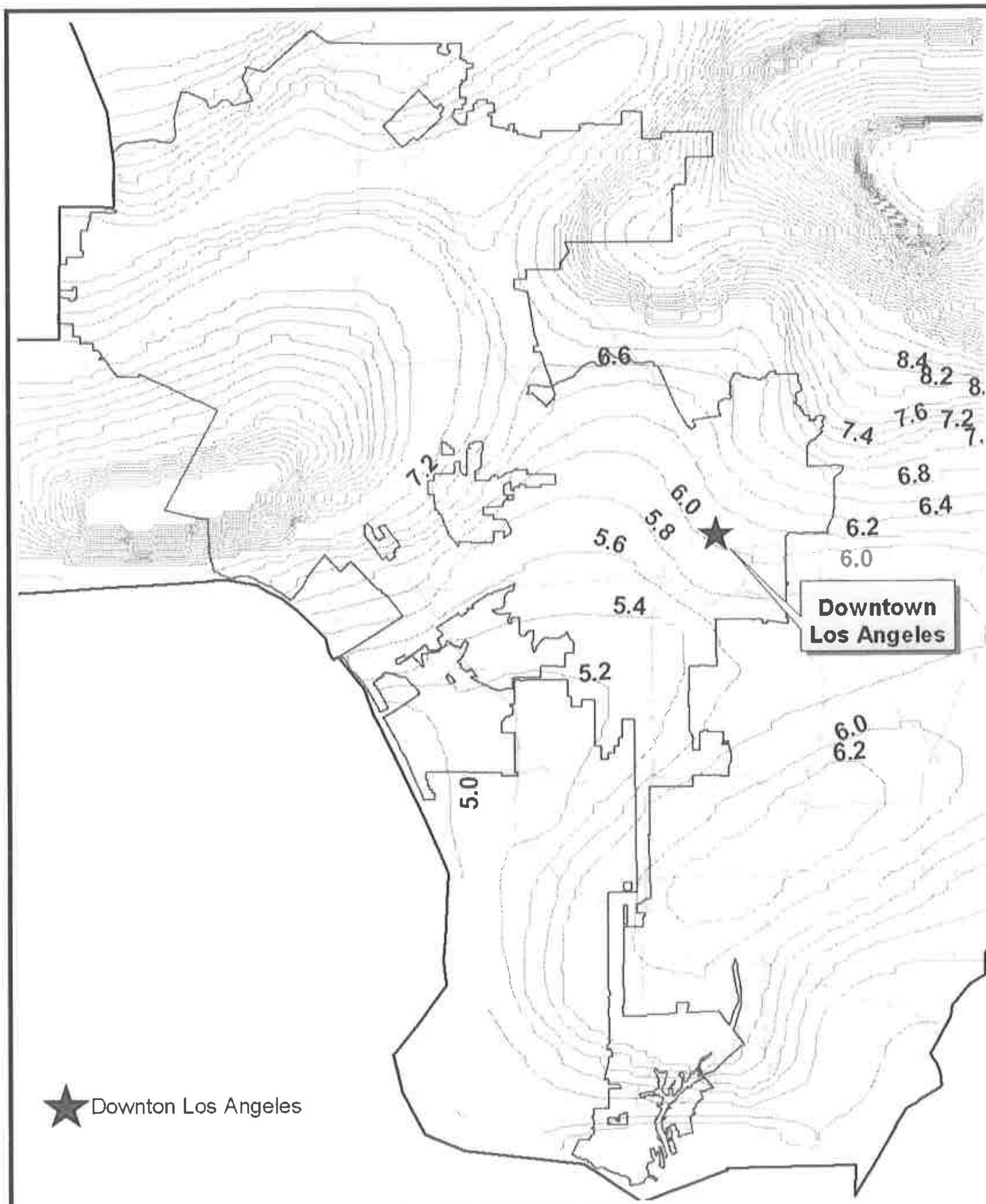
- Appropriate siting of an insert is essential due to the maintenance requirements. As was observed, inserts in areas that are heavy with vegetation (i.e., tree lined streets, parkways with grassy areas, etc.) exacerbate the cleaning requirements of the insert. Lack of cleaning will result in the insert clogging, diminishing it ability to retain trash and increasing the probability of that trash going over the overflow.
- The 5mm screen openings are problematic, in that they tend to close/clog with minimal debris and may result in localized ponding.
- The use of this insert configuration in shallow catch basins is not recommended. The insert significantly decreases the volume of the catch basin.
- Cross bracing shall be provided for inserts having a bottom screen section to avoid failure through shearing around the perimeter anchoring points.
- Inserts having a bottom screen section need to provide a means for access to the CB outlet pipe.

Recommendations

The City should continue to use catch basin inserts in high trash generation areas based on the inserts high trash capture capability. However, the City should continue to evaluate different configurations of inserts based on the following criteria:

- Maximizing trash capture area;
- Minimizing flooding potential;
- Optimizing insert screen material openings; and
- Ease of maintenance.

Attachment

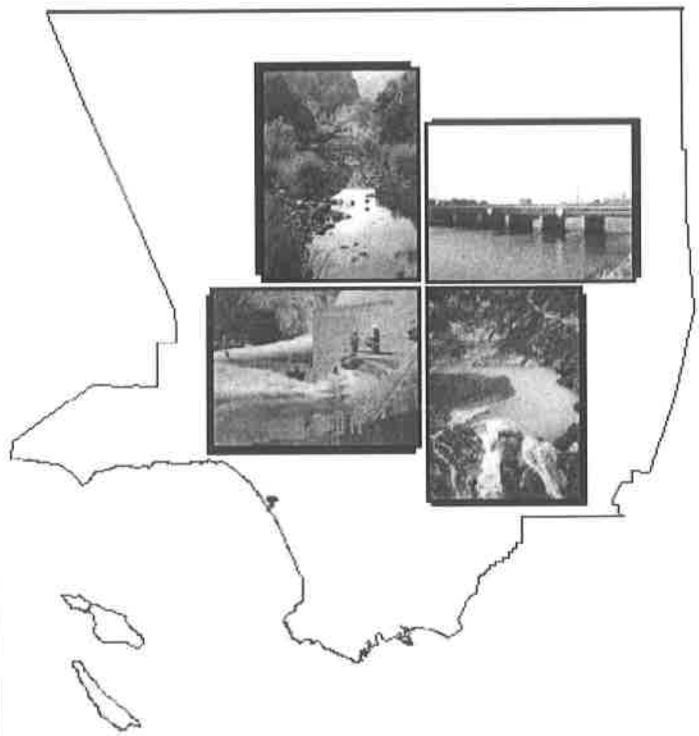


Isohyetal Map

24-hour rainfall depths expected for a 50-yr Storm frequency

Los Angeles County Rainfall data: http //www ladpw org/wrd/publication/Rain Depth (50yr_24hr-rain shp)

HYDROLOGY MANUAL



Los Angeles County Department of Public Works
January 2006

Design decisions often require assigning a probability of occurrence to the rainfall event. Statistical analysis of rainfall intensity data yields a probability that such a rainfall will occur in a given year. The reciprocal of this probability is the frequency. The frequency represents the time between two occurrences of a specific rainfall event. The rainfall frequency is inversely proportional to the size of the event. Large rainfall events are much less common than small rainfall events.[1]

A study of rain gage data provided relationships between intensity, duration, and frequency within the County of Los Angeles. The study analyzed historic records for 107 rain gages and determined the maximum intensities for rainfall durations of 5, 10, 15, 30, 60, 120, 180, 240, 300, 720, and 1440 minutes. The analysis looked at the frequencies associated with the various intensities. Each intensity was assigned frequencies of 2-, 5-, 10-, 25-, 50-, 100-, and 500-years based on the Gumbel extreme value distribution of each gage.

The 1440 minute, or 24-hour duration, was a primary focus of this analysis. Sets of factors were developed to relate the rainfall depths of various frequencies to the 50-year rainfall frequency. Section 5.3 details the development of these factors.

The normalized intensity equation relates the intensity, duration, and frequency (IDF). The Hydrologic Method authorization memorandum outlines development of the equation.[2] Equation 5.1.2 provides the normalized IDF relationship:

$$\frac{I_t}{I_{1440}} = \left(\frac{1440}{t}\right)^{0.47}$$

Equation 5.1.2

Where:
- t = Duration in minutes
- I_t = Rainfall intensity for the duration in in/hr
- I_{1440} = 24-hour rainfall intensity in in/hr
- $\frac{I_t}{I_{1440}}$ = Peak normalized intensity, dimensionless

Table 5.3.1
Rainfall Frequency Multiplication Factors

Frequency	Multiplication Factor
2-yr	0.387
5-yr	0.584
10-yr	0.714
25-yr	0.878
50-yr	1.000
100-yr	1.122
500-yr	1.402

Appendix B contains isohyetal maps for the 50-year, 24-hour rainfall depth. The isohyetal contour lines are spaced at intervals of two-tenths of an inch. The spatial rainfall distributions for the county design storms were converted to grid data for use with Geographic Information System (GIS) compatible hydrologic models.

5.4 DESIGN STORM

The three components of the design storm include the IDF equation, the unit hyetograph curve, and the isohyets. These components are used to define the design storm for a particular location and frequency. As an example, consider the 25-year design storm for the Palmer Canyon watershed in Figure 5.4.1. Subarea 1A of this watershed, shown in Figure 5.4.2, will be used for the sample calculations.

1. Compute the area between successive isohyetal lines and multiply by the average of the isohyet values. Table 5.4.1 shows the areas between isohyets for Subarea 1A.

2. The sum of these precipitation-area values divided by the total subarea area provides the area weighted average rainfall depth. The average rainfall should be calculated to the nearest two-tenths of an inch. Table 5.4.1 contains the calculations for the isohyetal values in this subarea.

It may be noted that for small subareas, the isohyet nearest the centroid of the subarea usually equals the design depth. Selecting the isohyets nearest the subarea centroid is an acceptable method for determining the design rainfall for subareas of approximately 40 acres.

Appendix B

Standard Plans/Diagrams for Debris Dam Unit

Standard Drawing for One of Many Configurations

CITY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS
BUREAU OF SANITATION
WATERSHED PROTECTION DIVISION

Approved [signature] 07/13/04

Catch Basin Insert

Contract No. 58523

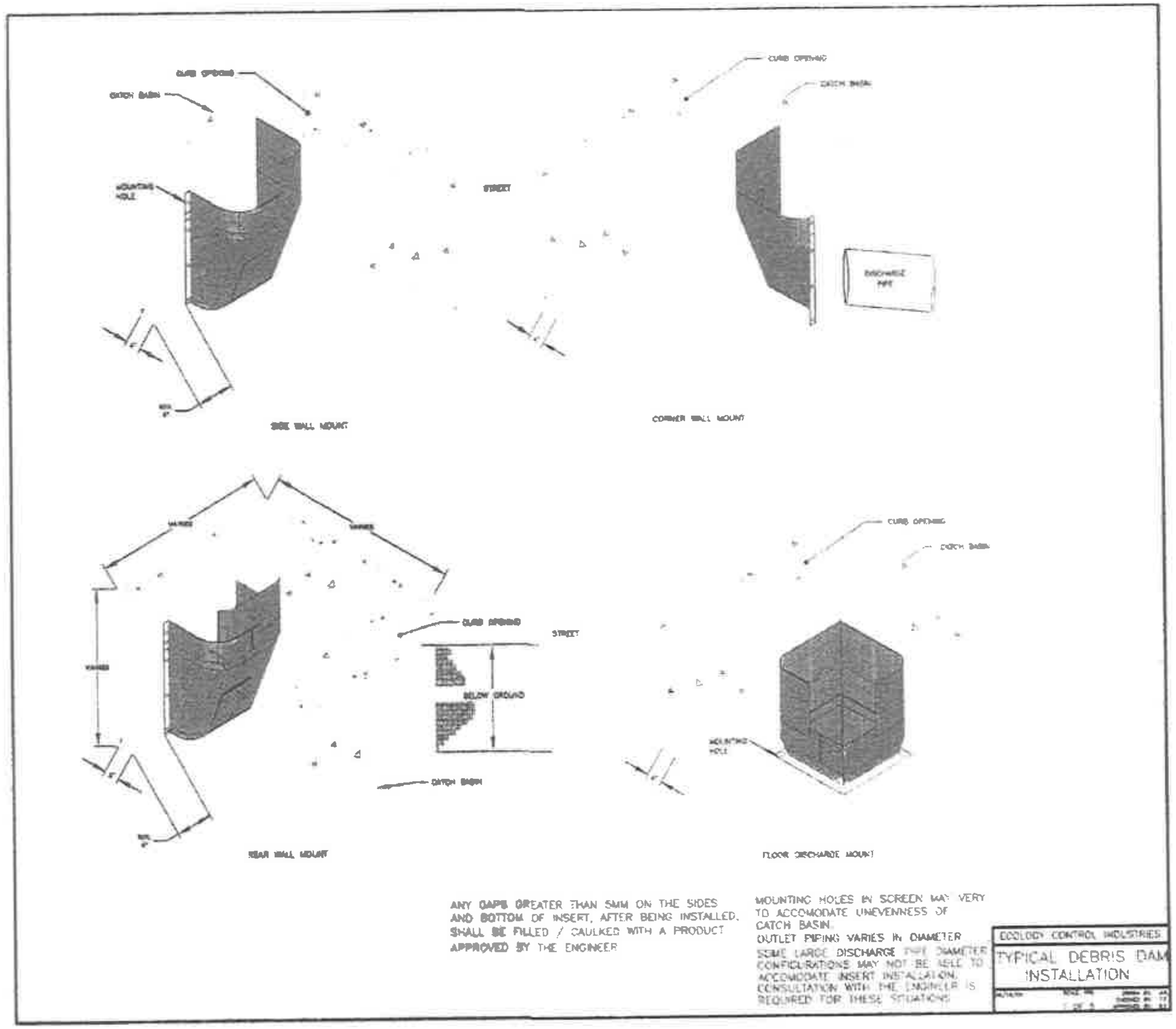
GENERAL NOTES:

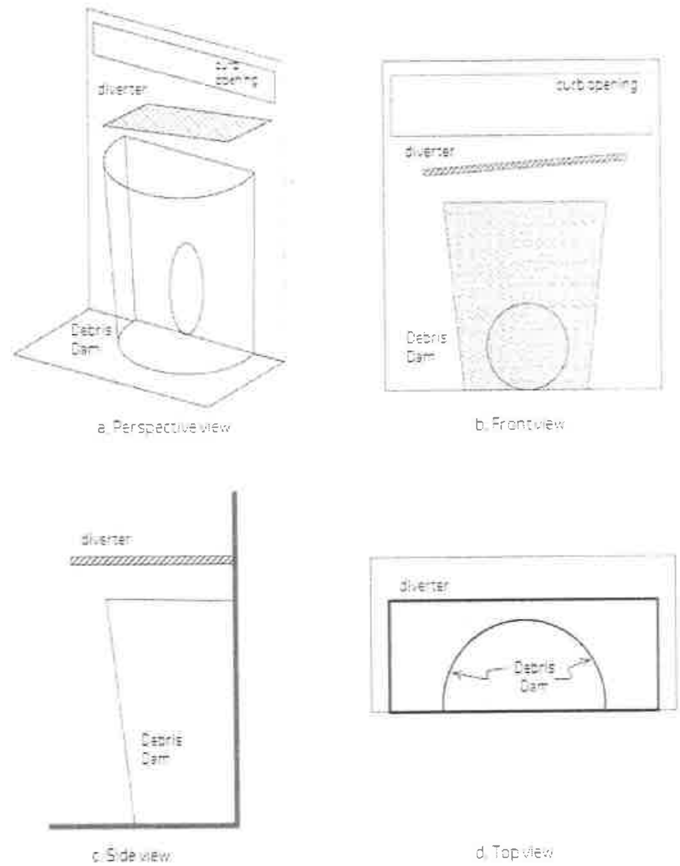
1. Catch basin insert components shall be of 304 stainless steel, gauge 14.
2. Concrete wedge anchor depth, embedment, shall be a minimum of three (3) inches.
3. The diverter shall be placed at a minimum angle of ninety (90) degrees to the catchment area.
4. Height and width of the CB insert varies, depends on field conditions.
5. The perforations of the CB insert shall be 5 mm diameter through out.
6. CB insert shall have a smooth & straight perimeter with no jagged edges.
7. Number of [illegible] will vary from 12 to 20 depending on size of CB insert.
8. CB insert shall not be placed if a minimum of 24" inches of vertical screen can not be provided, excluding the diverter vertical dimension.
9. CB insert shall not be placed in a culvert or low flow.
10. CB insert shall not interfere with the operation of a CB screen cover [illegible].
11. CB insert vertical height shall reach the bottom lip of curb opening. Exceptions will be made on a case by case basis by the engineer.
12. All dimensions vary based on depth & size of catch basin.
13. Floor discharge pipe CB installations will be placed where maintenance crew access can be assured by determination of the engineer.
14. Some large discharge pipe diameter configurations may not be able to accommodate insert installation. Consultation with the engineer is required for these situations.
15. Mounting holes in screen may vary to accommodate unevenness of catch basin.
16. All catch basins having a curb opening length equal or less than 7 (seven) feet, with the discharge pipe located on the front or rear shall have a corner wall mounted insert installed, as shown in sheet 1 (one). Installations in the front, only, shall include a solid or perforated diverter (Gauge 14 or gauge 16) above the insert to direct flow to the catchment area as shown in sheet 5 (five).
17. Based on field conditions, insert configuration and assembly (see sheet 4 and 5) will vary. Contractor shall determine best option based on field conditions.
18. Any gaps greater than 5mm on the sides and bottom of insert, after being installed shall be filled / caulked with a product approved by the engineer.
19. Minimal debris dam varies in height from 18" to 22" inch.

Table of Contents

Submitted By:
ECOLOGY CONTROL INDUSTRIES
AMERICAN STORM WATER DIVISION
20846 NORMANDIE AVENUE
TORRANCE, CA 90502
ECI ///

Standard Drawing for One of Many Configurations





Typical views of a side mount Debris Dam and Diverter in catch basin

Appendix C

Debris Dam Flow Study

DEBRIS DAM FLOW STUDY

for

ADV TECH ENVIRONMENTAL

632 S. Azusa Ave

West Covina, CA 91791

and

City of Los Angeles
Bureau of Sanitation

1149 S. Broadway Street, 10th Floor

Los Angeles, CA 90015

Prepared by:

BRASH
INDUSTRIES

5777 W Century Blvd Suite 925

Los Angeles, CA 90045

Phone: (310) 305-8637

Fax: (310) 574-0875

www.brashind.com

June 12, 2020

BRASH
INDUSTRIES

Debris Dam Flow Study

The Debris Dam Flow Study has been performed by Brash Industries.

M. H. Sachse

REGISTERED PROFESSIONAL ENGINEER
MARVIN HUGH SACHSE
NO. [illegible]
INDUSTRIAL
STATE OF CALIFORNIA

Reviewed by: Marvin H. Sachse, P.E.

Company: Brash Industries

Title: Principal

Date: June 12, 2020

Calculations performed with: Joshua E. Sachse, E.I.T.,

Company: Brash Industries

Title: Project Engineer

Date: June 12, 2020

Contents

Summary:

A study was performed to determine the flow characteristics of water through a catch basin with a Full Capture Debris Dam (Debris Dam).

The flow conditions through the Debris Dam were to be measured under three conditions and for three different water column heights. The test procedure utilized was based upon guidance provided by the City of Los Angeles. The three water column heights were 36 inches, 30 inches, and 24 inches. Each water column height was to have three flow conditions evaluated for full flow, fifty percent blockage and twenty-five percent blockage, through the Debris Dam.

To determine the flow characteristics, a water chamber was fabricated with a depth and length of four feet, and a width of two feet. One end of the chamber was fitted with a fourteen inch by thirty-eight-inch section of Debris Dam material. The Debris Dam material utilized in the chamber's fabrication was provided by Ecology Control Industries (American Stormwater). The Debris Dam insert is a perforated screen that is utilized in the field by installing it directly in front of the storm drain outlet pipe inside of the street catch basin. The stored water was discharged through the screen via a ten-inch-wide opening and was sealed from the exterior by a gate to provide an instantaneous release of water for each test. Water was recycled between each test.

The time was measured from the release of the gate, starting from the required water column height, ending when the water column reached a predetermined height of two or three inches above the lowest discharge level of the water column height. The test times were averaged, and the volume of water and discharge time measurements were utilized as the basis for flow rate calculations.

The Debris Dam Flow Study data is presented in the attached table in cubic feet per second (cfs). The table contains the data from a ten-inch-wide opening that has been extrapolated to a 20-inch-wide opening for the required water column (screen) heights and blockages.

Procedure:

A watertight test chamber measuring four feet long, four feet high and two feet wide was fabricated from plywood. The approximate volume of water contained within the chamber is 32 ft^3 (240 gallons). A 38 x 14 inch section of the screen material was fitted to the inside of the two ft wide end of the flow chamber. The dimensions of the discharge hole measured 36 inches by 10 inches.

Water was pumped into the chamber from a water reservoir. The water was pumped to level slightly higher than the desired release level. The pumps were stopped, and water was allowed to slowly drain from the tank until the water level reached the desired height for each test, at which time the drop gate was opened. The timing commenced at the moment the drop gate was released. The water level was viewed on a water height scale mounted in the interior of the chamber. When the surface of the water reached the end point height, the time was recorded.

The ending water level was predetermined for each test. The slow flow rate of the last 3 inches was omitted, since this would disproportionately affect the data. However, this limit was lowered to 2 inches for tests in which the total drainage time was low. A minimum of three discharge flow measurements were obtained and evaluated for consistency or measurements continued until data consistency was obtained.

The screen material utilized in the flow test was obtained from the Debris Dam Manufacture, Economy Control Industries, and is fabricated from 16 gauge series 304 stainless steel plate. The material tested had in-line, 5.0mm diameter holes, punched into the stainless steel plate. The hole spacing is approximately 7mm on-center which results in a removal of 50% of the material from the solid plate.

The screen blockage was affected with the insertion of a 0.020 plastic sheet fitted to the Discharge Dam material. The hydrostatic pressure of the water column provided sufficient sealing force to preclude water passage around the plastic seal. The height of the plastic seal was modified for each required blockage.

Results:

The results of the individual tests are included in Tables of Raw Data . The average results of the tests are included in Table 1, below, for each set of conditions:

Table 1: Flow Test Results

Initial Height (in)	Blockage %	Blockage Height (in)	End Height (in)	Height Drop (in)	Average Time (sec)
24	0	0	1.75	22.2	25.4
24	25	6	7	17.04	20.9
24	50	12	14	9.96	11.7
30	0	0	3	27	14.7
30	25	7.5	9.5	20.52	15.6
30	50	15	17	12.96	12.6
36	0	0	3	33	14.7
36	25	9	11	24.96	16.1
36	50	18	21	15	10.1

Analysis:

The study called for an evaluation of the flow rate under the initial given conditions. As the implementation of a steady state flow test were beyond the scope of this study, the data was extrapolated based on the time to drain a known volume of water.

Estimates for the flow rate are based on Torricelli's Theorem for estimating the discharge velocity of an open container through a small orifice as:

(1) $$v_d = \frac{1}{\sqrt{1-\left(\frac{A_d}{A}\right)^2}} * \sqrt{2gh}$$

Where **v_d** is the discharge velocity
A_d=w*h is the area, width, and height of the discharge orifice, respectively
A=W*L is the horizontal area, width, and length of the container, respectively
g=32.2 ft/s² is the gravitational force, and
h= the height of the water above the orifice.

Note that the term above in blue is required in cases where the vertical velocity of the fluid is non-zero. However, in cases where the orifice is significantly smaller than the open container surface, this factor becomes negligible.[1]

[1] In the case of this experiment, the maximum error introduced by this term is 5%, and only for the largest test and for the instant at which the test is begun.

Therefore, we can neglect this factor and simplify the equation to:

(2) $$v_d = \sqrt{2gh}$$

The flow through the orifice, then is given by:

(3) $$Q = A_d v_d = w * h * \sqrt{2gh} = w\sqrt{2g}h^{3/2}$$

When the opening is vertically large and the head varies based on this height, the differential flow for each vertical section is the integral of the above equation:

$$Q = \int_{h_U}^{h_L} w\sqrt{2g}h^{3/2}dh$$

$$Q = \frac{2}{3}w\sqrt{2g}\left(h_L^{3/2} - h_U^{3/2}\right) * C_d$$

Where **h_U** and **h_L** are the heights from the top of the container to the upper and lower edges of the orifice, respectively, and
C_d < 1 is a coefficient of discharge to account for viscosity and turbulence, to be obtained from the empirical data.

Since the water level determines the top of the orifice, $h_U = 0$ and $h_L = h$, the equation simplifies to:

(4) $$Q = \frac{2}{3}w\sqrt{2g} * h^{3/2} * C_d$$

In order to solve for C_d, the relationship between the height of the water and time is used. From conservation of mass, the volume of water in the box over time given by:

(5) $$v_{vert} * A = Q$$

Vertical velocity is the change in height over the change in time, and is set equal to Q

$$-\frac{dh}{dt} * A = \frac{2}{3}w\sqrt{2g} * C_d * h^{3/2}$$

(6) $$\frac{dh}{dt} = C * h^{\frac{3}{2}}$$

Where $C = \frac{-w * 2\sqrt{2g} * C_d}{3A}$

(7) $$h^{-3/2} * dh = C * dt$$

Integrating both sides:

$$\int_{h_0}^{h} h^{-3/2} * dh = C * \int_0^t dt$$

$$-2 * \left[h^{-\frac{1}{2}}\right]_{h_0}^{h} = C * t$$

(8) $$\frac{3A}{t*w*\sqrt{2g}}\left(\frac{1}{\sqrt{h}}-\frac{1}{\sqrt{h_0}}\right)=C_d$$

This equation is used to determine the Coefficient of Discharge, C_d, for each case. Equation 4 is copied below with the constants and the width evaluated. Plugging this back into Equation 4 and evaluating the function for $h=h_0$ produces the rate of flow, Q, when the tank is in full flow.

(9) $$Q = 4.46 * h^{3/2} * C_d$$

The results of this analysis are included in the table below:

Initial Height (ft)	Blockage %	End Height (in)	Average Time (sec)	C_d	Flow Rate (CFS)
24	0	1.75	25.4	0.26	3.33
24	25	7	20.9	0.10	1.31
24	50	14	11.7	0.07	0.84
30	0	3	14.7	0.33	5.87
30	25	9.5	15.6	0.11	1.99
30	50	17	12.6	0.06	1.04
36	0	3	14.7	0.35	8.03
36	25	11	16.1	0.10	2.40
36	50	21	10.1	0.06	1.47

Conclusion:

Below is a summary table with the test results. The flow rate scales linearly with the width of the screen and can be extrapolated to widths larger than 10 ft. Following is a table with the values for a 20 inch wide screen, as was requested for the study.

Flow Rate Through Debris Dam (10 in wide)			
Water Column Height (in)	Flow Rate (CFS)		
	No Blockage	25% Blockage	50% Blockage
24	3.3	1.3	0.84
30	5.9	2.0	1.0
36	8.0	2.4	1.5

Flow Rate Through Debris Dam (20 in wide)			
Water Column Height (in)	Flow Rate (CFS)		
	No Blockage	25% Blockage	50% Blockage
24	6.7	2.6	1.7
30	12.	4.0	2.1
36	16.	4.8	2.9

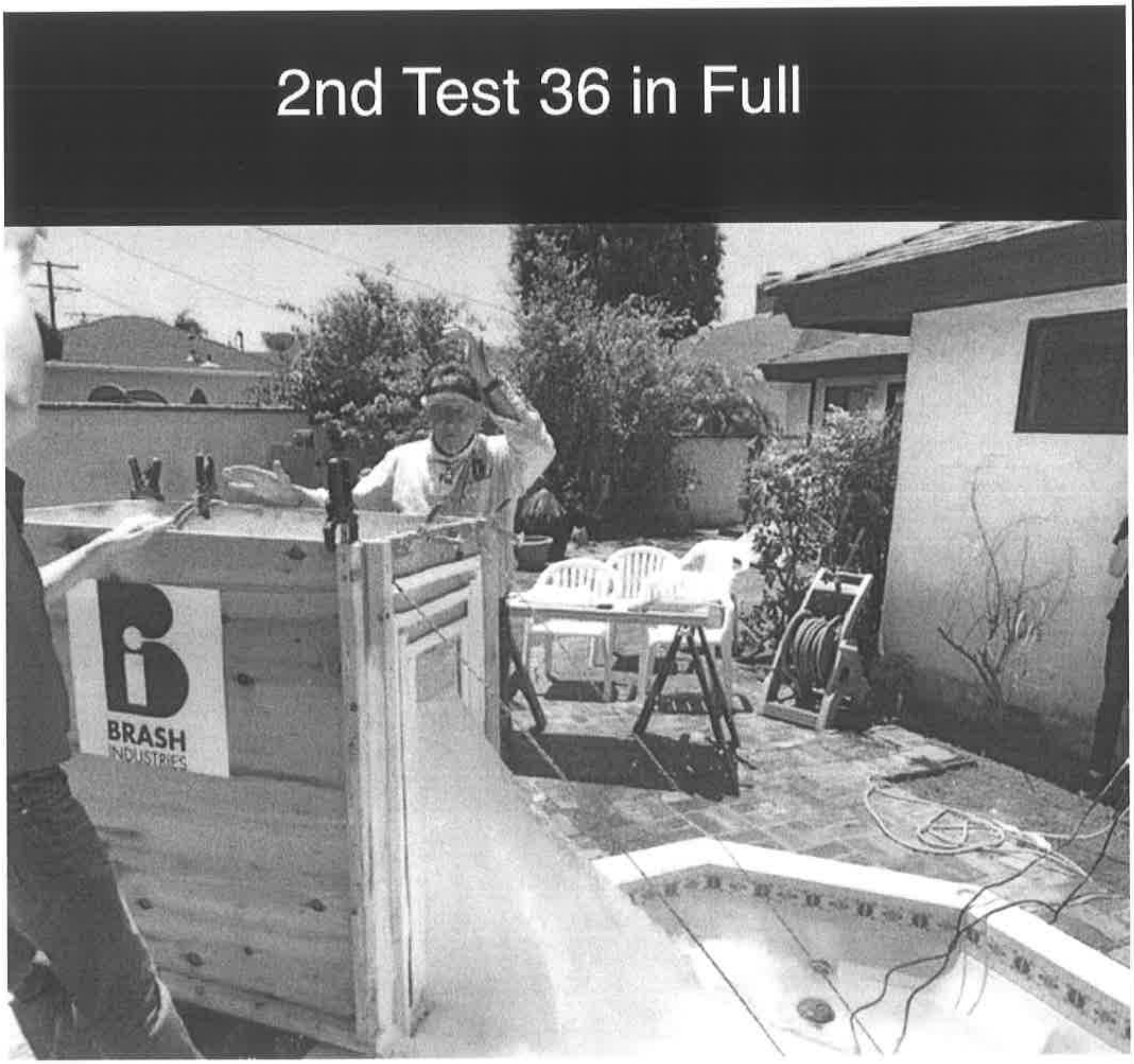
Raw Data:

Start Height (in)	36
Blockage (%)	0
End Height (in)	3
Volume (ft^3)	21
Test #	Time (sec)
1	15.09
2	14.99
3	14.12
Blockage (%)	25
End Height (in)	11
Volume (ft^3)	18.4
Test #	Time (sec)
1	15.91
2	15.08
3	17.2
Blockage (%)	50
End Height (in)	21
Volume (ft^3)	15.9
Test #	Time (sec)
1	11.01
2	11.15
3	9.16
4	9.46
5	9.47

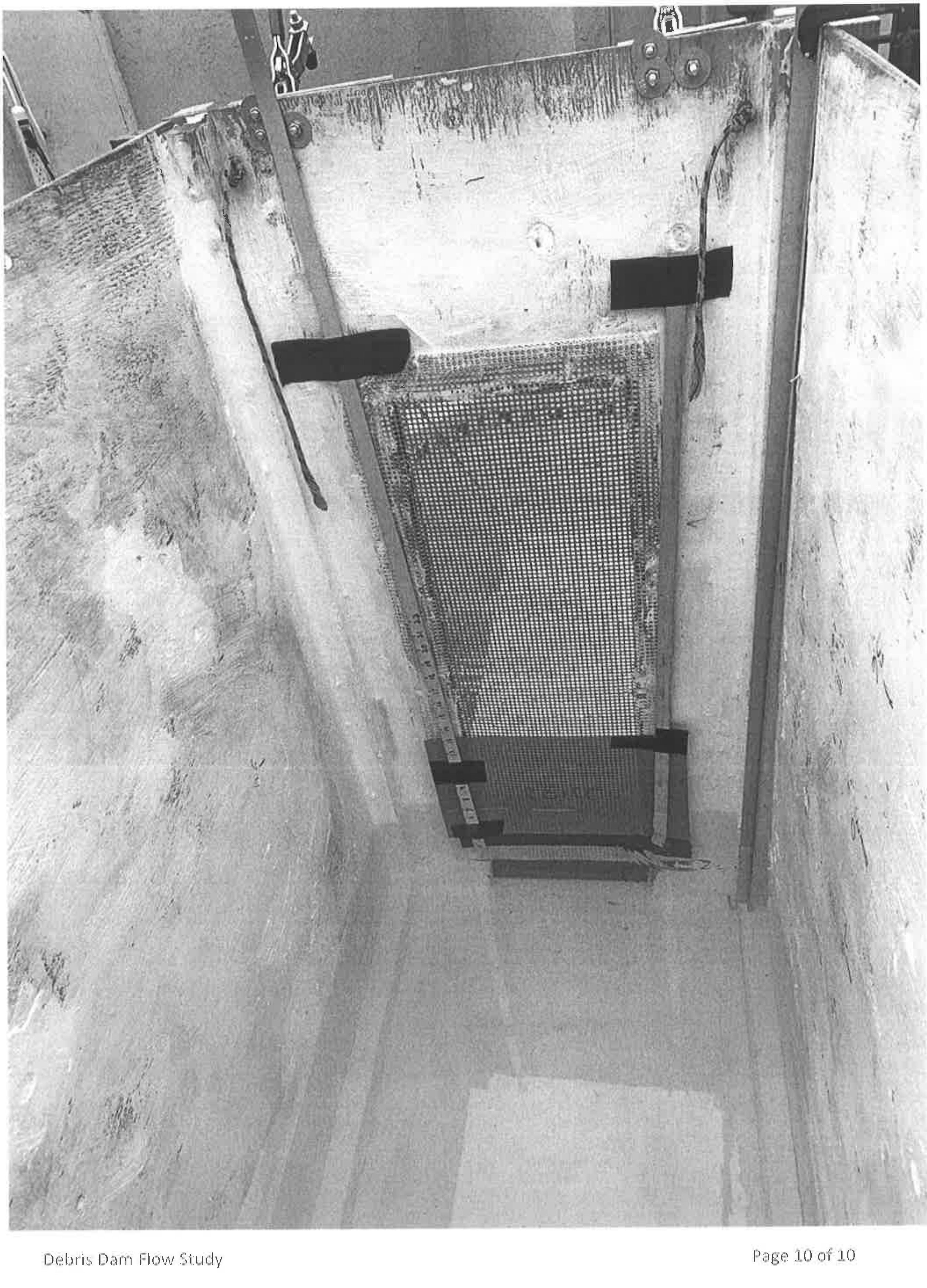
Start Height (in)	30
Blockage (%)	0
End Height (in)	3
Volume (ft^3)	17.2
Test #	Time (sec)
1	15.09
2	14.99
3	14.12
4	15.05
Blockage (%)	25
End Height (in)	9.5
Volume (ft^3)	13
Test #	Time (sec)
1	16.27
2	16.66
3	13.72
Blockage (%)	50
End Height (in)	17
Volume (ft^3)	8.3
Test #	Time (sec)
1	12.72
2	12.55
3	12.61

Start Height (in)	24
Blockage (%)	0
End Height (in)	1.75
Volume (ft^3)	14.1
Test #	Time (sec)
1	24.64
2	25.07
3	26.1
4	25.73
Blockage (%)	25
End Height (in)	7
Volume (ft^3)	10.8
Test #	Time (sec)
1	19.71
2	22.49
3	19.71
4	21.56
Blockage (%)	50
End Height (In)	17
Volume (ft^3)	8.3
Test #	Time (sec)
1	12.72
2	12.55
3	12.61

Photographs:



2nd Test 30 in Full



Appendix D

MVCAC Verification of Access Letter

MVCAC
Mosquito and Vector Control Association of California
One Capitol Mall, Suite 800 • Sacramento, CA 95814 • p (916) 440-0826 • f (916) 444-7462 • e mvcac@mvcac.org

Todd Waters
Ecology Control Industries
15707 South Main Street
Gardena, CA 90248
twaters@ecologycontrol.com – *sent via email*

April 29, 2020

Dear Mr. Waters,

Thank you for the submission of the ECI Debris Dam for review by the Mosquito and Vector Control Association of California pursuant to the SWRCB Trash Treatment Control Device Application Requirements. The Association has reviewed the conceptual drawings for the ECI Debris Dam and verifies that provisions have been included in the design that allow for full visual access to all areas for presence of standing water, and when necessary, allows for treatments of mosquitoes.

While this verification letter confirms that inspection and treatment for the purpose of minimizing mosquito production should be possible with the ECI Debris Dam as presented, it does not affect the local mosquito control agency's rights and remedies under the State Mosquito Abatement and Vector Control District Law. For example, if the installed device or the associated stormwater system infrastructure becomes a mosquito breeding source, it may be determined by a local mosquito control agency to be a public nuisance in accordance with California Health and Safety Code sections 2060-2067.

"Public nuisance" means any of the following:

1. Any property, excluding water that has been artificially altered from its natural condition so that it now supports the development, attraction, or harborage of vectors. The presence of vectors in their developmental stages on a property is prima facie evidence that the property is a public nuisance.
2. Any water that is a breeding place for vectors. The presence of vectors in their developmental stages in the water is prima facie evidence that the water is a public nuisance.
3. Any activity that supports the development, attraction, or harborage of vectors, or that facilitates the introduction or spread of vectors. (Heal. & Saf. Code § 2002 (j).)

Declaration of a facility or property as a public nuisance may result in penalties as provided under the Health and Safety Code. Municipalities and the vendors they work with are encouraged to discuss the design, installation, and maintenance of stormwater trash capture devices with their local mosquito control agency to reduce the potential for disease transmission and public nuisance associated with mosquito production.

Sincerely,

Bob Achermann,
MVCAC Executive Director

Lynnie Almvig

From: WM Chen <w8mchen@gmail.com>
Sent: Wednesday, June 17, 2020 10:34 AM
To: Lynnie Almvig
Cc: Todd Waters; Todd Waters
Subject: Re: Final Debris Dam Fact Sheet

Hi Todd and Lynnie,

I reviewed the document. Just 3 comments:

1. Change the name of the file to something like "ECI CB Insert Fact Sheet Final 6-17-20" before sending. Otherwise may be confusing to the Water Board if filename has "City of LA".

Optional:

2. I noticed some of the drawings in the pdf came out very light. Is it possible to convert the document to a little bit darker print? Or you can send to Water Board as-is, and hopefully it will be acceptable. Just know if not acceptable they may request a darker print later.

3. In the first submittal in April, the signed front page had ECI address on the bottom. You can decide if you want to place on stationary or just type in address on the bottom. Not sure if it is a big deal to Water Board.

Other than that, the document looks good.

Please feel free to call if you have any questions.

Thank you.

Donna

On Wed, Jun 17, 2020 at 9:32 AM Lynnie Almvig <lalmvig@ecologycontrol.com> wrote:

Hi Donna,

Please review the attached Final Debris Dam Fact sheet and let me know if there are additional adjustments needed.

Thank you,

Lynnie Almvig

From: Todd Waters
Sent: Monday, June 15, 2020 8:38 AM
To: Lynnie Almvig
Subject: FW: Final Debris Dam Fact Sheet
Attachments: Fact Sheet - Revised 6-13-20 FINAL.docx; Appendix A City letter RB req cert request & support docs.pdf; Appendix C Debris Dam Flow Study-FINAL.pdf

Good morning Lynnie,

I think this is the final draft, Deanna will assist with Mr. Flury signature on transmittal letter and certification.

From: WM Chen [mailto:w8mchen@gmail.com]
Sent: Monday, June 15, 2020 7:36 AM
To: Todd Waters <TWaters@ecologycontrol.com>
Subject: Final Debris Dam Fact Sheet

Hello Todd,

The Debris Dam Flow Study is done and revisions have been made to the Fact Sheet per State Water Resources Control Board (SWRCB) comments. Also, Vector Control has given a verification letter. The completed Debris Dam Fact Sheet package is attached for signature and for ECI to email to the SWRCB. Please do the following:

1) Put date and Sign transmittal letter - Mr. Flury and you. Should put the letter on ECI stationary (letterhead)

2) Sign Certification - Mr. Flury and you

3) Add separate Attachment A file behind letters currently in Attach A in fact sheet

4) Add separate Attachment C - Debris Dam Flow Study file

5) PDF compiled package

6) Submit to State Water Board:

Leo.Cosentini@waterboards.ca.gov with copy to Jaime.Favila@waterboards.ca.gov,

If you like, you may send the final to me for review before sending it to the SWRCB.

Please feel free to contact me if you have any questions.

Thanks.

Donna