



The City of San Diego

**PRIORITY DEVELOPMENT PROJECT (PDP)
STORM WATER QUALITY MANAGEMENT
PLAN (SWQMP) FOR**

8466 El Paseo Grande – Cardenas Residence
PTS NO. 445629

ENGINEER OF WORK:



Antony K. Christensen, RCE 54021
Provide Wet Signature and Stamp Above Line

PREPARED FOR:

Joseph & Machelles Cardenas
8466 El Paseo Grande
La Jolla, CA 92037

PREPARED BY:

Christensen Engineering & Surveying
7888 Silverton Avenue, Suite "J"
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858-271-9901

June 10, 2016
Revised July 22, 2016

Approved by: City of San Diego

Date

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ACRONYMS

| | |
|---------|---|
| APN | Assessor's Parcel Number |
| ASBS | Area of Special Biological Significance |
| BMP | Best Management Practice |
| CEQA | California Environmental Quality Act |
| CGP | Construction General Permit |
| DCV | Design Capture Volume |
| DMA | Drainage Management Areas |
| ESA | Environmentally Sensitive Area |
| GLU | Geomorphic Landscape Unit |
| GW | Ground Water |
| HMP | Hydromodification Management Plan |
| HSG | Hydrologic Soil Group |
| HU | Harvest and Use |
| INF | Infiltration |
| LID | Low Impact Development |
| LUP | Linear Underground/Overhead Projects |
| MS4 | Municipal Separate Storm Sewer System |
| N/A | Not Applicable |
| NPDES | National Pollutant Discharge Elimination System |
| NRCS | Natural Resources Conservation Service |
| PDP | Priority Development Project |
| PE | Professional Engineer |
| POC | Pollutant of Concern |
| SC | Source Control |
| SD | Site Design |
| SDRWQCB | San Diego Regional Water Quality Control Board |
| SIC | Standard Industrial Classification |
| SWPPP | Stormwater Pollutant Protection Plan |
| SWQMP | Storm Water Quality Management Plan |
| TMDL | Total Maximum Daily Load |
| WMAA | Watershed Management Area Analysis |
| WPCP | Water Pollution Control Program |
| WQIP | Water Quality Improvement Plan |

CERTIFICATION PAGE

Project Name: 8466 El Paseo Grande – Cardenas Residence
Permit Application Number: 445629

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

I have read and understand that the City Engineer has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the Storm Water Standards. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable source control and site design BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by the City Engineer is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.



Engineer of Work's Signature, PE Number & Expiration Date

Antony K. Christensen, RCE 54021

Christensen Engineering & Surveying

07-22-16

Date



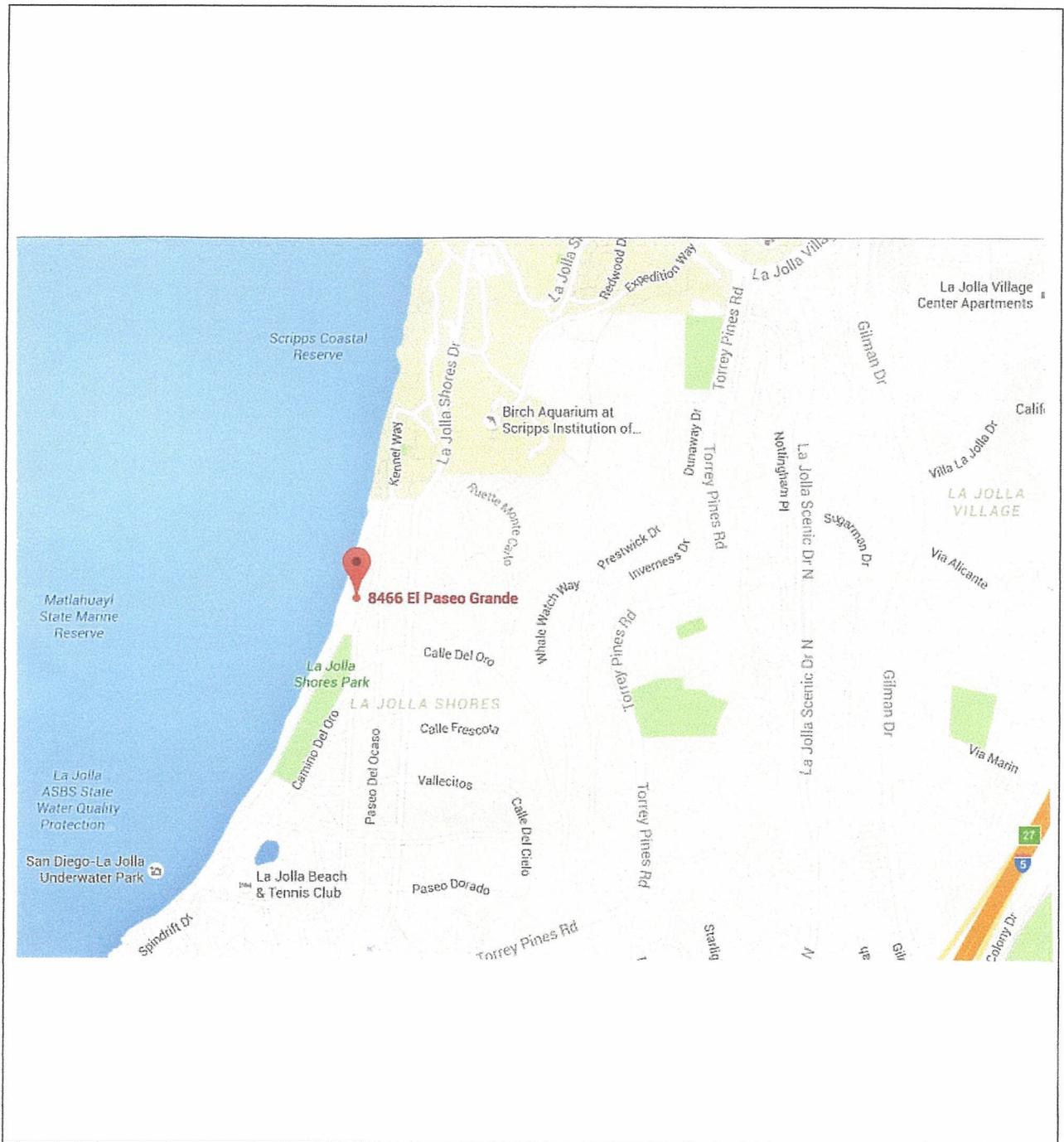
SUBMITTAL RECORD

Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In last column indicate changes that have been made or indicate if response to plan check comments is included. When applicable, insert response to plan check comments.

| Submittal Number | Date | Project Status | Changes |
|------------------|----------|---|-----------------------|
| 1 | | <input checked="" type="checkbox"/> Preliminary Design/Planning/CEQA <input type="checkbox"/> Final Design | Initial Submittal |
| 2 | 07-22-16 | <input checked="" type="checkbox"/> Preliminary Design/Planning/CEQA <input type="checkbox"/> Final Design | Address City Comments |
| 3 | | <input type="checkbox"/> Preliminary Design/Planning/CEQA <input type="checkbox"/> Final Design | |
| 4 | | <input type="checkbox"/> Preliminary Design/Planning/CEQA <input type="checkbox"/> Final Design | |

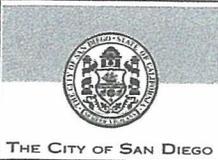
PROJECT VICINITY MAP

Project Name: 8466 El Paseo Grande – Cardenas Residence
Permit Application Number: 445629



STORM WATER REQUIREMENTS APPLICABILITY CHECKLIST

Complete and attach DS-560 Form included in Appendix A.1



City of San Diego
 Development Services
 1222 First Ave., MS-302
 San Diego, CA 92101
 (619) 446-5000

Storm Water Requirements Applicability Checklist

FORM
DS-560
 FEBRUARY 2016

| | |
|--|---|
| Project Address: 8466 El Paseo Grande | Project Number (for City Use Only): 445629 |
|--|---|

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the [Storm Water Standards Manual](#). Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)¹, which is administered by the State Water Resources Control Board.

For all project complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.

1. Is the project subject to California's statewide General NPDES permit for Storm Water Discharges Associated with Construction Activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

- Yes; SWPPP required, skip questions 2-4 No; next question

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity that results in ground disturbance and contact with storm water runoff?

- Yes; WPCP required, skip 3-4 No; next question

3. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as pipeline/utility replacement)

- Yes; WPCP required, skip 4 No; next question

4. Does the project only include the following Permit types listed below?

- Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
- Individual Right of Way Permits that exclusively include only ONE of the following activities: water service, sewer lateral, or utility service.
- Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, pot holing, curb and gutter replacement, and retaining wall encroachments.

- Yes; no document required

Check one of the boxes to the right, and continue to PART B:

- If you checked "Yes" for question 1, a **SWPPP is REQUIRED. Continue to PART B**
- If you checked "No" for question 1, and checked "Yes" for question 2 or 3, a **WPCP is REQUIRED**. If the project proposes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. **Continue to PART B.**
- If you checked "No" for all questions 1-3, and checked "Yes" for question 4 **PART B does not apply and no document is required. Continue to Section 2.**

1. More information on the City's construction BMP requirements as well as CGP requirements can be found at: www.sandiego.gov/stormwater/regulations/index.shtml

PART B: Determine Construction Site Priorit

This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a “high threat to water quality.” The City has aligned the local definition of “high threat to water quality” to the risk determination approach of the State Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **NOTE:** The construction priority does **NOT** change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by city staff.

Complete PART B and continued to Section 2

- 1. **ASBS**
a. Projects located in the ASBS watershed.
- 2. **High Priority**
a. Projects 1 acre or more determined to be Risk Level 2 or Risk Level 3 per the Construction General Permit and not located in the ASBS watershed.
b. Projects 1 acre or more determined to be LUP Type 2 or LUP Type 3 per the Construction General Permit and not located in the ASBS watershed.
- 3. **Medium Priority**
a. Projects 1 acre or more but not subject to an ASBS or high priority designation.
b. Projects determined to be Risk Level 1 or LUP Type 1 per the Construction General Permit and not located in the ASBS watershed.
- 4. **Low Priority**
a. Projects requiring a Water Pollution Control Plan but not subject to ASBS, high, or medium priority designation.

SECTION 2. Permanent Storm Water BMP Requirements.

Additional information for determining the requirements is found in the [Storm Water Standards Manual](#).

PART C: Determine if Not Subject to Permanent Storm Water Requirements.

Projects that are considered maintenance, or otherwise not categorized as “new development projects” or “redevelopment projects” according to the [Storm Water Standards Manual](#) are not subject to Permanent Storm Water BMPs.

If “yes” is checked for any number in Part C, proceed to Part F and check “Not Subject to Permanent Storm Water BMP Requirements”.

If “no” is checked for all of the numbers in Part C continue to Part D.

- 1. Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water? Yes No
- 2. Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces? Yes No
- 3. Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair). Yes No

PART D: PDP Exempt Requirements.

PDP Exempt projects are required to implement site design and source control BMPs.

If “yes” was checked for any questions in Part D, continue to Part F and check the box labeled “PDP Exempt.”

If “no” was checked for all questions in Part D, continue to Part E.

1. Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:
 - Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;
 - Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;
 - Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City’s Storm Water Standards manual?

Yes; PDP exempt requirements apply No; next question
2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the [City’s Storm Water Standards Manual](#)?

Yes; PDP exempt requirements apply No; project not exempt. PDP requirements apply

PART E: Determine if Project is a Priority Development Project (PDP).

Projects that match one of the definitions below are subject to additional requirements including preparation of a Storm Water Quality Management Plan (SWQMP).

If “yes” is checked for any number in PART E, continue to PART F.

If “no” is checked for every number in PART E, continue to PART F and check the box labeled “Standard Development Project”.

1. **New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. Yes No
2. **Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. Yes No
3. **New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface. Yes No
4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater. Yes No
5. **New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).** Yes No
6. **New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site). Yes No

7. **New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). Yes No
8. **New development or redevelopment projects of a retail gasoline outlet (RGO) that create and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day. Yes No
9. **New development or redevelopment projects of an automotive repair shops that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539. Yes No
10. **Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces. Yes No

PART F: Select the appropriate category based on the outcomes of PART C through PART E.

1. The project is **NOT SUBJECT TO STORM WATER REQUIREMENTS.**
2. The project is a **STANDARD DEVELOPMENT PROJECT.** Site design and source control BMP requirements apply. See the [Storm Water Standards Manual](#) for guidance.
3. The project is **PDP EXEMPT.** Site design and source control BMP requirements apply. See the [Storm Water Standards Manual](#) for guidance.
4. The project is a **PRIORITY DEVELOPMENT PROJECT.** Site design, source control, and structural pollutant control BMP requirements apply. See the [Storm Water Standards Manual](#) for guidance on determining if project requires a hydromodification plan management

Name of Owner or Agent (Please Print):

Title:

Joy D. Christensen

Assistant Engineer

Signature:

Date:

Joy D Christensen

June 12, 2016

Applicability of Permanent, Post-Construction
Storm Water BMP Requirements

Form I-1

Project Identification

Project Name: 8466 El Paseo Grande – Cardenas Residence

Permit Application Number: 445629

Date: June 10, 2016

Determination of Requirements

The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements.

Answer each step below, starting with Step 1 and progressing through each step until reaching "Stop". Refer to Part 1 of Storm Water Standards sections and/or separate forms referenced in each step below.

| Step | Answer | Progression |
|---|---|--|
| Step 1: Is the project a "development project"? See Section 1.3 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance. | <input checked="" type="checkbox"/> Yes | Go to Step 2. |
| | <input type="checkbox"/> No | Stop. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below. |

Discussion / justification if the project is not a "development project" (e.g., the project includes only interior remodels within an existing building):

| | | |
|--|---|--|
| Step 2: Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions? To answer this item, see Section 1.4 of the BMP Design Manual (Part 1 of Storm Water Standards) <u>in its entirety</u> for guidance, AND complete Storm Water Requirements Applicability Checklist. | <input type="checkbox"/> Standard Project | Stop. Standard Project requirements apply. |
| | <input checked="" type="checkbox"/> PDP | PDP requirements apply, including PDP SWQMP. Go to Step 3. |
| | <input type="checkbox"/> PDP Exempt | Stop. Standard Project requirements apply. Provide discussion and list any additional requirements below. |

Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:

Form I-1 Page 2

| Step | Answer | Progression |
|---|--|--|
| Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance. | <input type="checkbox"/> Yes | Consult the City Engineer to determine requirements. Provide discussion and identify requirements below. Go to Step 4. |
| | <input checked="" type="checkbox"/> No | BMP Design Manual PDP requirements apply. Go to Step 4. |
| Discussion / justification of prior lawful approval, and identify requirements (<u>not required if prior lawful approval does not apply</u>): | | |
| Step 4. Do hydromodification control requirements apply? See Section 1.6 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance. | <input type="checkbox"/> Yes | PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to Step 5. |
| | <input checked="" type="checkbox"/> No | Stop. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below. |
| Discussion / justification if hydromodification control requirements do <u>not</u> apply: Runoff flows to El Paseo Grande and then southerly to a curb inlet at Camino del Oro and then discharges to the Pacific Ocean. | | |
| Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance. | <input type="checkbox"/> Yes | Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). Stop. |
| | <input checked="" type="checkbox"/> No | Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. Stop. |
| Discussion / justification if protection of critical coarse sediment yield areas does <u>not</u> apply: Verified using Google Earth KMZ file from Project Clean Water. | | |

| Site Information Checklist For PDPs | | Form I-3B |
|--|---|-----------|
| Project Summary Information | | |
| Project Name | 8466 El Paseo Grande – Cardenas Residence | |
| Project Address | 8466 El Paseo Grande La Jolla, CA 92037 | |
| Assessor's Parcel Number(s) (APN(s)) | 346-050-02-00 | |
| Permit Application Number | | |
| Project Watershed | Select One: <input type="checkbox"/> San Dieguito River <input checked="" type="checkbox"/> Penasquitos <input type="checkbox"/> Mission Bay <input type="checkbox"/> San Diego River <input type="checkbox"/> San Diego Bay <input type="checkbox"/> Tijuana River | |
| Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX) | 906.30 | |
| Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way) | <u>0.2727</u> Acres (_____ Square Feet) | |
| Area to be disturbed by the project (Project Footprint) | <u>0.1851</u> Acres (_____ Square Feet) | |
| Project Proposed Impervious Area (subset of Project Footprint) | <u>0.1483</u> Acres (_____ Square Feet) | |
| Project Proposed Pervious Area (subset of Project Footprint) | <u>0.0368</u> Acres (_____ Square Feet) | |
| Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area. | | |
| The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition. | <u>(439 sf increase)</u> <u>3.7% increase</u> | |

Description of Existing Site Condition and Drainage Patterns

Current Status of the Site (select all that apply):

- Existing development
- Previously graded but not built out
- Agricultural or other non-impervious use
- Vacant, undeveloped/natural

Description / Additional Information: Portions of the property is improved with paving for the private road and a single family residence and appurtenances.

Existing Land Cover Includes (select all that apply):

- Vegetative Cover
- Non-Vegetated Pervious Areas
- Impervious Areas

Description / Additional Information: The project site non-vegetated pervious area includes gravel driveway at the front of the existing single family residence.

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):

- NRCS Type A
- NRCS Type B
- NRCS Type C
- NRCS Type D

Approximate Depth to Groundwater (GW):

- GW Depth < 5 feet
- 5 feet < GW Depth < 10 feet
- 10 feet < GW Depth < 20 feet
- GW Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

- Watercourses
- Seeps
- Springs
- Wetlands
- None

Description / Additional Information: A canyon exists onsite.

Description of Existing Site Topography and Drainage:

How is storm water runoff conveyed from the site? At a minimum, this description should answer:

1. Whether existing drainage conveyance is natural or urban;
2. If runoff from offsite is conveyed through the site? If yes, quantification of all offsite drainage areas, design flows, and locations where offsite flows enter the project site and summarize how such flows are conveyed through the site;
3. Provide details regarding existing project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, and natural and constructed channels;
4. Identify all discharge locations from the existing project along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.

Description / Additional Information:

A small offsite area conveys runoff onsite while a small onsite area conveys runoff offsite. The majority of the site conveys runoff to the deck and landscaped area where it is collected and conveyed to an existing sump pump. From there it is pumped in a PCV pipe along the southerly boundary to an area near the easterly boundary where it terminates, above ground, and permits runoff to flow over the surface of the ground to El Paseo Grande. The remainder of the site conveys its runoff westerly. Following construction the same general pattern will persist with the offsite runoff now be maintained on the adjacent property northerly, The small area of onsite runoff that was previously conveyed to the southerly property will now be collected and conveyed to the existing sump pump. From there it will now be conveyed to a Filterra Biofiltration unit and then to catch basin with pump and to a gravity catch basin onsite and from there it will flow by gravity through a sidewalk underdrain to El Paseo Grande. The remainder of the site will continue to flow westerly. All runoff pre and post construction is urban in nature.

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

This project involves the remodel of the existing single-family residence, including the expansion of the lower level, new spa, hardscape and landscape as well as a treatment BMP (Filterra Biofiltration unit) and drainage facilities.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):

Impervious surfaces will include the new building and hardscape patio and walkways and driveway.

List/describe proposed pervious features of the project (e.g., landscape areas):

Landscaped areas will be included in the area at the front of the site and a spa will be added to the rear of the site.

Does the project include grading and changes to site topography?

Yes

No

Description / Additional Information:

Grading will be limited to that required to remove the existing improvements, and to increase the size of the lower level.

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

Yes

No

If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural and constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations.

Description / Additional Information:

The project proposes the construction of onsite drainage improvements including area drains, pumps and a sidewalk underdrains as well as a Filterra biofiltration unit, to treat impervious surface runoff.. See attached Drainage Study for additional information.

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply):

- On-site storm drain inlets
- Interior floor drains and elevator shaft sump pumps
- Interior parking garages
- Need for future indoor & structural pest control
- Landscape/Outdoor Pesticide Use
- Pools, spas, ponds, decorative fountains, and other water features
- Food service
- Refuse areas
- Industrial processes
- Outdoor storage of equipment or materials
- Vehicle and Equipment Cleaning
- Vehicle/Equipment Repair and Maintenance
- Fuel Dispensing Areas
- Loading Docks
- Fire Sprinkler Test Water
- Miscellaneous Drain or Wash Water
- Plazas, sidewalks, and parking lots
- Large Trash Generating Facilities
- Animal Facilities
- Plant Nurseries and Garden Centers
- Automotive-related Uses

Description / Additional Information:

No pesticides are expected to be required as part of the landscape management. Refuse containers stored in the garage. Onsite storm drains will include area drains and catch basins.

Identification and Narrative of Receiving Water

Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable)

Runoff flows from the project site from sidewalk underdrains and then flows southerly approximately 620 feet to a curb inlet that discharges to the Pacific Ocean

Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations.

For Coastal Water uses include Industrial service supply, Navigation, Contact Water Recreation, Non-Contact Water Recreation, Commercial and Sport fishing, Biologic Habitats, Estuarine, Wildlife, Rare and Marine habitats, Migration, Aquaculture, Shellfish Harvesting, Spawning. Ground Water uses include Municipal, Domestic and Industrial supply.

Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations. La Jolla Shores (Area 29). This will require higher priority classification of the Construction Phase determination. See Storm Water Requirement Applicability Checklist. The project will use landscaping practices to address non-storm water dry weather discharges. By adjusting irrigation practices these type of discharges will be eliminated. Additionally, the "Final Compliance Plan – La Jolla Area of Special Biological Significance" report, dated September 20, 2014 submitted by the City of San Diego to the SDRWQCB state there is a low flow diversion structure located at the corner of Camino del Oro and El Paseo Grande that addresses low flow diversion. See Page 11 for additional comments.

Provide distance from project outfall location to impaired or sensitive receiving waters.

Approximately 500' westerly to the Pacific Ocean.

Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands

There are no MHPA or ESL areas near the project site. (Is located in a Water Quality Sensitive Area)

Form I-3B Page 8 of 11

Identification of Receiving Water Pollutants of Concern

List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

| 303(d) Impaired Water Body | Pollutant(s)/Stressor(s) | TMDLs/ WQIP Highest Priority Pollutant |
|----------------------------|--------------------------|--|
| Pacific Ocean | Bacteria | Indicator Bacteria |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Identification of Project Site Pollutants*

*Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated) **No onsite infiltration is allowed. See also Worksheet B.5-2 demonstrating Alternative Minimum Footprint would be too large.**

Identify pollutants anticipated from the project site based on all proposed use(s) of the site (see BMP Design Manual (Part 1 of Storm Water Standards) Appendix B.6):

| Pollutant | Not Applicable to the Project Site | Anticipated from the Project Site | Also a Receiving Water Pollutant of Concern |
|-----------------------------|------------------------------------|-----------------------------------|---|
| Sediment | | X | |
| Nutrients | | X | |
| Heavy Metals | X | | |
| Organic Compounds | X | | |
| Trash & Debris | | X | |
| Oxygen Demanding Substances | | X | |
| Oil & Grease | | X | |
| Bacteria & Viruses | | X | Not indicator bacteria |
| Pesticides | | X | |

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6 of the BMP Design Manual)?

- Yes, hydromodification management flow control structural BMPs required.
- No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.
- No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.
- No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.

Description / Additional Information (to be provided if a 'No' answer has been selected above):

Runoff from the site flows along Paseo Grande to its intersection with Camino del Oro where it will be collected in a curb inlet that then discharges, underground, to the Pacific Ocean. This is an exempt portion of the public storm drain system as shown on SanGIS layers for exempt systems. See Attachment 1 for print out of the exempt system that collects runoff from this site.

Critical Coarse Sediment Yield Areas*

*This Section only required if hydromodification management requirements apply

Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream area draining through the project footprint?

- Yes
- No

Discussion / Additional Information:

Potential CCSYAs do not occur onsite or areas upstream and tributary to the site.

Flow Control for Post-Project Runoff*

*This Section only required if hydromodification management requirements apply

List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.

Has a geomorphic assessment been performed for the receiving channel(s)?

- No, the low flow threshold is 0.1Q2 (default low flow threshold)
- Yes, the result is the low flow threshold is 0.1Q2
- Yes, the result is the low flow threshold is 0.3Q2
- Yes, the result is the low flow threshold is 0.5Q2

If a geomorphic assessment has been performed, provide title, date, and preparer:

Discussion / Additional Information: (optional)

Other Site Requirements and Constraints

When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.

None.

Optional Additional Information or Continuation of Previous Sections As Needed

This space provided for additional information or continuation of information from previous sections as needed.

Continuing ASBS comments: The project site addresses new NPDES MS4 requirements by providing landscaped area and further treating storm water runoff by use of a Filterra Biofiltration Unit to remove pollutants from runoff before it leaves the site. Non-storm water discharges, including from irrigation will be eliminated by proper use of irrigation use of controls and careful orientation of the irrigation system. Additionally, during construction the project site will be subject to additional inspections to assure compliance with construction storm water requirements.

Source Control BMP Checklist
for All Development Projects

Form I-4

Source Control BMPs

All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of the Storm Water Standards) for information to implement source control BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.

| Source Control Requirement | Applied? | | |
|---|---|-----------------------------|---|
| SC-1 Prevention of Illicit Discharges into the MS4 | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Discussion / justification if SC-1 not implemented: None anticipated. | | | |
| SC-2 Storm Drain Stenciling or Signage | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Discussion / justification if SC-2 not implemented: None occur onsite. | | | |
| SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Discussion / justification if SC-3 not implemented: Will not occur onsite. | | | |
| SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Discussion / justification if SC-4 not implemented: Will not occur onsite. | | | |
| SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| Discussion / justification if SC-5 not implemented: Refuse containers will be stored within the proposed garage. | | | |

Form I-4 Page 2 of 2

| Source Control Requirement | Applied? | | |
|--|---|-----------------------------|---|
| SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below) | | | |
| On-site storm drain inlets | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| Interior floor drains and elevator shaft sump pumps | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Interior parking garages | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Need for future indoor & structural pest control | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Landscape/Outdoor Pesticide Use | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| Pools, spas, ponds, decorative fountains, and other water features | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Food service | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Refuse areas | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| Industrial processes | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Outdoor storage of equipment or materials | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Vehicle/Equipment Repair and Maintenance | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Fuel Dispensing Areas | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Loading Docks | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Fire Sprinkler Test Water | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Miscellaneous Drain or Wash Water | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Plazas, sidewalks, and parking lots | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| SC-6A: Large Trash Generating Facilities | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| SC-6B: Animal Facilities | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| SC-6C: Plant Nurseries and Garden Centers | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| SC-6D: Automotive-related Uses | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| <p>Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for <u>all</u> "No" answers shown above.</p> <p>Landscaping will be employed but pesticide use is not anticipated. Refuse will be collected in container stored in the proposed garage. Onsite drains include area drains and catch basins.</p> | | | |

Site Design BMP Checklist
for All Development Projects

Form I-5

Site Design BMPs

All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of Storm Water Standards) for information to implement site design BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided.

A site map with implemented site design BMPs must be included at the end of this checklist.

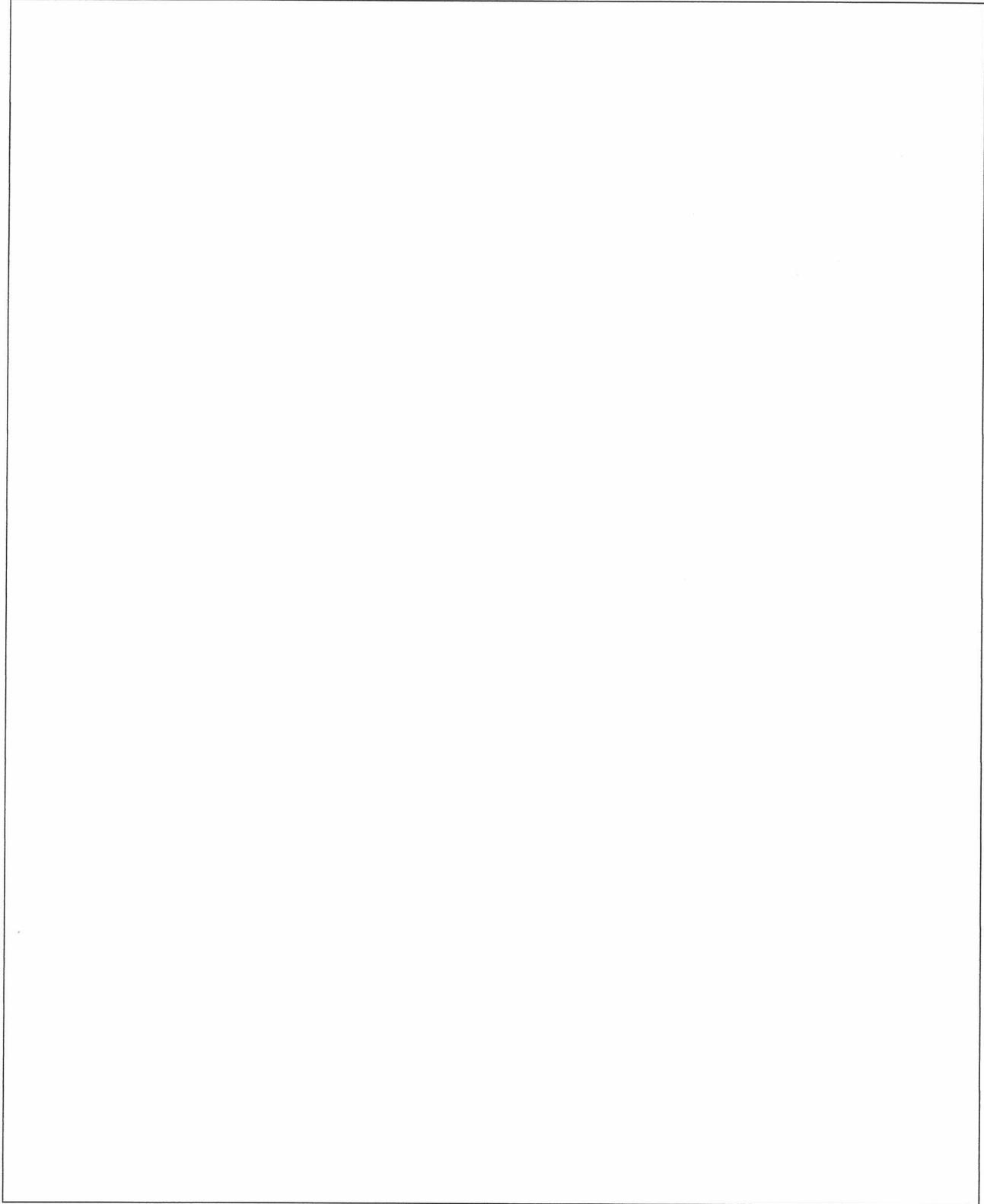
| Site Design Requirement | Applied? | | |
|---|------------------------------|--|---|
| SD-1 Maintain Natural Drainage Pathways and Hydrologic Features | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Discussion / justification if SD-1 not implemented: Does not exist onsite. | | | |
| 1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | |
| 1-2 Are trees implemented? If yes, are they shown on the site map? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | |
| 1-3 Implemented trees meet the design criteria in SD-1 Fact Sheet (e.g. soil volume, maximum credit, etc.)? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | |
| 1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | |
| SD-2 Have natural areas, soils and vegetation been conserved? | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| Discussion / justification if SD-2 not implemented: No natural area exists onsite. | | | |

| Site Design Requirement | Applied? | | |
|--|---|--|------------------------------|
| SD-3 Minimize Impervious Area | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| <p>Discussion / justification if SD-3 not implemented:</p> <p>Pervious area increases from the existing improvements.</p> | | | |
| SD-4 Minimize Soil Compaction | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| <p>Discussion / justification if SD-4 not implemented:</p> | | | |
| SD-5 Impervious Area Dispersion | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| <p>Discussion / justification if SD-5 not implemented:</p> | | | |
| 5-1 Is the pervious area receiving runoff from impervious area identified on the site map? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | |
| 5-2 Does the pervious area satisfy the design criteria in SD-5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.) | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | |
| 5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and SD-5 Fact Sheet in Appendix E? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | |

Form I-5 Page 3 of 4

| Site Design Requirement | Applied? | | |
|--|---|--|---|
| SD-6 Runoff Collection | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> N/A |
| <p>Discussion / justification if SD-6 not implemented:</p> <p>Runoff is collected from the impervious areas and directed to the Filterra biofiltration unit for treatment.</p> | | | |
| 6a-1 Are green roofs implemented in accordance with design criteria in SD-6A Fact Sheet? If yes, are they shown on the site map? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | |
| 6a-2 Is green roof credit volume calculated using Appendix B.2.1.2 and SD-6A Fact Sheet in Appendix E? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | |
| 6b-1 Are permeable pavements implemented in accordance with design criteria in SD-6B Fact Sheet? If yes, are they shown on the site map? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | |
| 6b-2 Is permeable pavement credit volume calculated using Appendix B.2.1.3 and SD-6B Fact Sheet in Appendix E? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | |
| SD-7 Landscaping with Native or Drought Tolerant Species | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> N/A |
| <p>Discussion / justification if SD-7 not implemented:</p> | | | |
| SD-8 Harvesting and Using Precipitation | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | <input type="checkbox"/> N/A |
| <p>Discussion / justification if SD-8 not implemented:</p> <p>The water demand in the 36 hour limit is exceeded by the DCV.</p> | | | |
| 8-1 Are rain barrels implemented in accordance with design criteria in SD-8 Fact Sheet? If yes, are they shown on the site map? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | |
| 8-2 Is rain barrel credit volume calculated using Appendix B.2.2.2 and SD-8 Fact Sheet in Appendix E? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | |

Insert Site Map with all site design BMPs identified:

A large, empty rectangular box with a thin black border, intended for the user to insert a site map. The map should show the site design and identify all Best Management Practices (BMPs) used. The box occupies most of the page below the header and instruction text.

PDP Structural BMPs

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).

PDP structural BMPs must be verified by the City at the completion of construction. This includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 7 of the BMP Design Manual).

Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

The site is not a candidate to infiltrate runoff (shallow ground water, soil type). The limited area available for a non-infiltration BMP makes it use problematic. The proprietary unit (Filterra) allows the site runoff to be treated to the maximum extent practicable before being discharged. This is a hydromodification exempt site.

(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)

(Continued from page 1)

Structural BMP Summary Information

Structural BMP ID No. IMPs 1, 2, 3 & 4

Construction Plan Sheet No.

Type of structural BMP:

- Retention by harvest and use (HU-1)
- Retention by infiltration basin (INF-1)
- Retention by bioretention (INF-2)
- Retention by permeable pavement (INF-3)
- Partial retention by biofiltration with partial retention (PR-1)
- Biofiltration (BF-1)
 - Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type/description in discussion section below)
 - Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or
 - biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
 - Flow-thru treatment control with alternative compliance (provide BMP type/description in
 - Detention pond or vault for hydromodification management
 - Other (describe in discussion section below)

Purpose:

- Pollutant control only
- Hydromodification control only
- Combined pollutant control and hydromodification control
- Pre-treatment/forebay for another structural BMP
- Other (describe in discussion section below)

Who will certify construction of this BMP?
Provide name and contact information for the party responsible to sign BMP verification form DS-563

Antony K. Christensen, RCE 54021

Who will be the final owner of this BMP?

The homeowners
Joseph and Machelles Cardenas

Who will maintain this BMP into perpetuity?

The homeowners

What is the funding mechanism for maintenance?

A storm water agreement with the City of San Diego

Structural BMP ID No.

Construction Plan Sheet No.

Discussion (as needed):



City of San Diego
 Development Services
 1222 First Ave., MD-302
 San Diego, CA 92101
 (619) 446-5000

**Permanent BMP
 Construction**
 Self Certification Form

FORM
 DS-563
 February 2016

| | |
|--------------------|--------------|
| Date Prepared: | Project No.: |
| Project Applicant: | Phone: |
| Project Address: | |
| Project Engineer: | Phone: |

The purpose of this form is to verify that the site improvements for the project, identified above, have been constructed in conformance with the approved Storm Water Quality Management Plan (SWQMP) documents and drawings.

This form must be completed by the engineer and submitted prior to final inspection of the construction permit. Completion and submittal of this form is required for all new development and redevelopment projects in order to comply with the City's Storm Water ordinances and NDPES Permit Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100. Final inspection for occupancy and/or release of grading or public improvement bonds may be delayed if this form is not submitted and approved by the City of San Diego.

CERTIFICATION:

As the professional in responsible charge for the design of the above project, I certify that I have inspected all constructed Low Impact Development (LID) site design, source control and structural BMP's required per the approved SWQMP and Construction Permit No. _____; and that said BMP's have been constructed in compliance with the approved plans and all applicable specifications, permits, ordinances and Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 of the San Diego Regional Water Quality Control Board.

I understand that this BMP certification statement does not constitute an operation and maintenance verification.

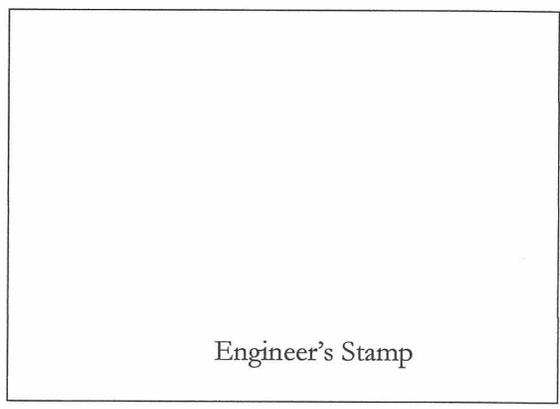
Signature: _____

Date of Signature: _____

Printed Name: _____

Title: _____

Phone No. _____



**ATTACHMENT 1
BACKUP FOR PDP POLLUTANT
CONTROL BMPS**

This is the cover sheet for Attachment 1.

DRAINAGE MANAGEMENT AREA EXHIBIT

EXHIBIT CHECKLIST:

HYDROLOGIC SOIL GROUP: 'D' (UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICES WEB SOIL SURVEY)

APPROXIMATE DEPTH TO GROUNDWATER: LESS THAN 10'

EXISTING NATURAL HYDROLOGIC RESOURCES: NO WATERCOURSES, SEEP, SPRINGS OR WETLANDS EXIST IN THE PROJECT AREA

CRITICAL COARSE SEDIMENT YIELD AREAS: POTENTIAL CCSYAs (PCCSYAs) DO NOT OCCUR ONSITE OR UPSTREAM

EXISTING TOPOGRAPHY AND IMPERVIOUS AREAS: TOPOGRAPHY IS SHOWN NEARLY ALL EXISTING IMPROVEMENTS ARE IMPERVIOUS

EXISTING AND PROPOSED SITE DRAINAGE NETWORK AND CONNECTIONS TO DRAINAGE OFFSITE: EX ONSITE DRAINAGE NETWORK PUMPED TO STREET PROPOSED NETWORK IS SHOWN.

PROPOSED GRADING: IS SHOWN ON DMA MAP AND IS MINIMAL TO "LEVEL" PORTION OF SITE AND TO ADD TO LOWER LEVEL

PROPOSED IMPERVIOUS FEATURES: BUILDING ROOF AND HARDSCAPE ARE SHOWN

PROPOSED DESIGN FEATURES AND SURFACE TREATMENTS USED TO MINIMIZE IMPERVIOUSNESS: ARE SHOWN AND LANDSCAPING IS USED TO MINIMIZE IMPERVIOUSNESS.

DMA MANAGEMENT AREA BOUNDARIES, NUMBERS, AREAS AND TYPES: SHOWN ABOVE

POTENTIAL POLLUTANT SOURCE AREAS AND SOURCE CONTROLS:

EXISTING ONSITE STORM DRAIN INLET: TO BE MARKED: DO NOT EXIST
INDOOR DRAINS, GARAGES AND PESTICIDE USE: NOT EMPLOYED
LANDSCAPE/OUTSIDE PESTICIDE USE: NOT ANTICIPATED TO BE USED
POOLS, SPAS, PONDS: POOL IS SHOWN AND WILL DRAIN TO SEWER
FOOD SERVICE: NOT EMPLOYED
REFUSE AREAS: COVERED AND STORED INSIDE GARAGE
INDUSTRIAL PROCESSES: DO NOT OCCUR
OUTDOOR STORAGE OF EQUIPMENT OR MATERIALS: DOES NOT EXIST
VEHICLE CLEANING: DOES NOT EXIST
VEHICLE AND EQUIPMENT REPAIR: DOES NOT EXIST
FUEL DISPENSING AREAS: DO NOT EXIST
LOADING DOCKS: DO NOT EXIST
FIRE SPRINKLER TEST WATER: WILL BE CONVEYED TO SEWER, IF OCCUR
MISCELLANEOUS DRAIN OR WASH WATER: DOES NOT EXIST
PLAZAS, SIDEWALKS AND PARKING LOTS: DO NOT OCCUR

STRUCTURAL BMP SHOWN AS TO LOCATION, TYPE, SIZE AND DETAIL ARE SHOWN (FILTERRA UNIT - BIOFILTRATION UNIT)

**DMA-D
SPA
(SELF RETAINING)
AREA = 0.008 AC**

**IMP-1
4 X 6 FILTERRA
BIOFILTRATION UNIT**

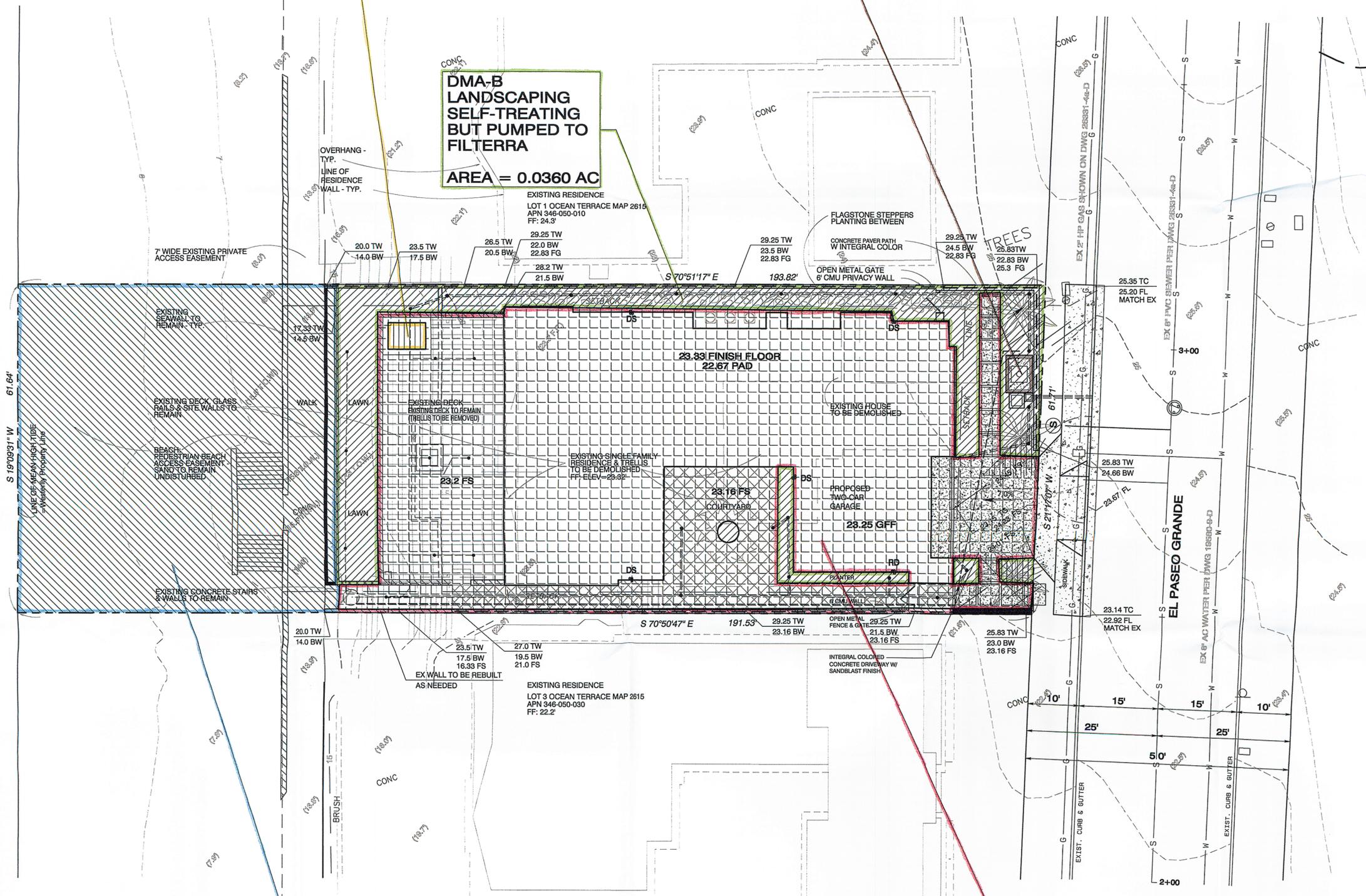
**DMA-B
LANDSCAPING
SELF-TREATING
BUT PUMPED TO
FILTERRA
AREA = 0.0360 AC**

**DMA-C
PUBLIC ACCESS
EASEMENT AND
BEACH AREA
NOT A PART OF DMA
AREA = 0.0876 AC**

**DMA-A
BUILDING AND HARDSCAPE
INCLUDING OFFSITE HARDSCAPE
AREA = 0.1483 AC
(IMPERVIOUS)
PUMPED TO IMP-1 (FILTERRA)**

DMA TABLE

| ID # | AREA | TYPE OF SURFACE | DMA TYPE |
|-------|-----------|-----------------|--------------------------------|
| DMA-A | 0.1483 AC | ROOF/PAVEMENT | FLOWS TO IMP-1 (SELF-TREATING) |
| DMA-B | 0.0360 AC | LANDSCAPED AREA | (NOT A PART) |
| DMA-C | 0.0876 AC | PUBLIC EASEMENT | (SELF-RETAINING) |
| DMA-D | 0.0008 AC | SPA | (SELF-RETAINING) |



Indicate which Items are Included:

| Attachment Sequence | Contents | Checklist |
|----------------------|--|---|
| Attachment 1a | DMA Exhibit (Required) See DMA Exhibit Checklist. | <input checked="" type="checkbox"/> Included |
| Attachment 1b | Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a | <input checked="" type="radio"/> Included on DMA Exhibit in Attachment 1a <input type="radio"/> Included as Attachment 1b, separate from DMA Exhibit |
| Attachment 1c | Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7. | <input checked="" type="radio"/> Included <input type="radio"/> Not included because the entire project will use infiltration BMPs |
| Attachment 1d | Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) See Attachment 6 Refer to Appendices C and D of the BMP Design Manual to complete Form I-8. | <input checked="" type="radio"/> Included <input type="radio"/> Not included because the entire project will use harvest and use BMPs |
| Attachment 1e | Pollutant Control BMP Design Worksheets / Calculations (Required) See Drainage Study for WQ Flow Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations | <input checked="" type="checkbox"/> Included |

Use this checklist to ensure the required information has been included on the DMA Exhibit:

The DMA Exhibit must identify:

- Underlying hydrologic soil group
- Approximate depth to groundwater
- Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- Critical coarse sediment yield areas to be protected
- Existing topography and impervious areas
- Existing and proposed site drainage network and connections to drainage offsite
- Proposed grading
- Proposed impervious features
- Proposed design features and surface treatments used to minimize imperviousness
- Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
- Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
- Structural BMPs (identify location, type of BMP, and size/detail)

Appendix B: Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods

Worksheet B.2-1 DCV

| Design Capture Volume | | Worksheet B.2-1 | | |
|-----------------------|---|-----------------|--------|------------|
| 1 | 85 th percentile 24-hr storm depth from Figure B.1-1 | d= | 0.52 | inches |
| 2 | Area tributary to BMP (s) | A= | 0.1843 | acres |
| 3 | Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1) | C= | 0.74 | unitless |
| 4 | Trees Credit Volume | TCV= | 0 | cubic-feet |
| 5 | Rain barrels Credit Volume | RCV= | 0 | cubic-feet |
| 6 | Calculate DCV = $(3630 \times C \times d \times A) - \text{TCV} - \text{RCV}$ | DCV= | 255 | cubic-feet |

Weighted Runoff Factor Calculations for 8466 El Paseo Grande:

Total Area 0.2727 Ac

Total Disturbed Area 0.1851 Ac

Total Undisturbed Area 0.0876 Ac

Proposed Impervious Area 0.1483 Ac

Landscape Area 0.0360 Ac

Spa Area Exposed to Precipitation 0.0008 Ac

Beach and Access area not being developed 0.0876 Ac

$$C = ((0.1483 * 0.90) + (0.0360 * 0.1) + (0.0008 * 0)) / 0.1851 = 0.74$$

Appendix B: Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods

CARDENAS RESIDENCE

Worksheet B.5-2: Calculation of Alternative Minimum Footprint Sizing Factor

| Alternative Minimum Footprint Sizing Factor | | Worksheet B.5-2 (Page 1 of 2) | | |
|---|--|-------------------------------|-----------------------|----------------|
| 1 | Area draining to the BMP | 0.183 | acre | |
| 2 | Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2) | 0.74 | | |
| 3 | Load to Clog (See Table B.5-3 for guidance; L_c) | 2.0 | lb/sq-ft | |
| 4 | Allowable Period to Accumulate Clogging Load (T_L) | 10 | years | |
| Volume Weighted EMC Calculation | | | | |
| | Land Use | Fraction of Total DCV | TSS EMC (mg/L) | Product |
| | Single Family Residential | 1 | 123 | 123 |
| | Commercial | | 128 | |
| | Industrial | | 125 | |
| | Education (Municipal) | | 132 | |
| | Transportation | | 78 | |
| | Multi-family Residential | | 40 | |
| | Roof Runoff | | 14 | |
| | Low Traffic Areas | | 50 | |
| | Open Space | | 216 | |
| | Other, specify: | | | |
| | Other, specify: | | | |
| | Other, specify: | | | |
| 5 | Volume Weighted EMC (sum of all products) | | 123 | mg/L |
| BMP Parameters | | | | |
| 6 | If pretreatment measures are included in the design, apply an adjustment of 25% ¹ [Line 5 x (1-0.25)] | | 123 | mg/L |
| 7 | Average Annual Precipitation | | 10 | inches |
| 8 | Calculate the Average Annual Runoff (Line 7 x 43,560/12) x Line 2 | | 6643 | cu-ft/yr |
| 9 | Calculate the Average Annual TSS Load (Line 8 x 62.4 x Line 6)/10 ⁶ | | 51 | lb/yr |
| 10 | Calculate the BMP Footprint Needed (Line 9 x Line 4)/Line 3 | | 255 | sq-ft |
| 11 | Calculate the Alternative Minimum Footprint Sizing Factor [Line 10/ (Line 1 x Line 2)] | | 1883 | |

1 A value of 25 percent is supported by Maniquiz-Redillas et al. (2014) study, which found a pretreatment sediment capture range of 15% - 35%. If using a value outside of this range, documentation of the selected value is required. A value of 50 percent can be claimed for a system with an active Washington State TAPE approval rating for “pre-treatment.”

**Appendix H: Guidance for Investigation Potential Critical Coarse Sediment Yield Areas
8466 El Paseo Grande – Cardenas Residence**

| Harvest and Use Feasibility Checklist | | Form I-7 |
|---|--|--|
| <p>1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?</p> <p><input type="checkbox"/> Toilet and urinal flushing</p> <p><input type="checkbox"/> Landscape irrigation</p> <p><input type="checkbox"/> Other: _____</p> | | |
| <p>2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2. [Provide a summary of calculations here]</p> <p>From Table B.3-3 for Low Plant Water use 390 gal/36hr/Ac Area of landscaping = 0.036 Ac Landscape water demand = 390 x 0.036 = 14 gallon = 1.9 cf</p> | | |
| <p>3. Calculate the DCV using worksheet B-2.1. DCV = <u>255</u> (cubic feet)</p> | | |
| <p>3a. Is the 36 hour demand greater than or equal to the DCV?</p> <p><input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No ⇒</p> <p align="center">↓</p> | <p>3b. Is the 36 hour demand greater than 0.25DCV but less than the full DCV?</p> <p><input type="checkbox"/> Yes / <input checked="" type="checkbox"/> No ⇒</p> <p align="center">↓</p> | <p>3c. Is the 36 hour demand less than 0.25DCV?</p> <p><input checked="" type="checkbox"/> Yes ↓</p> |
| <p>Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.</p> | <p>Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.</p> | <p>Harvest and use is considered to be infeasible.</p> |
| <p>Is harvest and use feasible based on further evaluation?</p> <p><input type="checkbox"/> Yes, refer to Appendix E to select and size harvest and use BMPs.</p> <p><input checked="" type="checkbox"/> No, select alternate BMPs.</p> | | |

Appendix I: Forms and Checklists

| | |
|---|------------------|
| Onsite Proprietary Biofiltration BMP Checklist | Form I-10 |
|---|------------------|

Provide basis for Criteria 1 and 3:

Feasibility Analysis:

Summarize findings and attach Worksheet C.4-1 (See form I-8, Attachment 6)

If Partial Infiltration Condition:

Provide documentation that 40% (average annual capture; or $0.375 \times \text{DCV}$ when using a 36-hour drawdown BMP) volume reduction is achieved within the BMP or downstream of the BMP. This could be achieved through downstream site design BMPs, downstream infiltration BMP, incidental retention by having an open bottom in the proprietary BMP or other similar measures.

If No Infiltration Condition:

Provide documentation that the alternative minimum sizing factor (attach Worksheet B.5-2) BMP is not feasible onsite or the volume reduction achieved by a non-proprietary BMP sized to the alternative minimum sizing factor can be achieved through downstream site design BMPs, downstream evapotranspiration BMPs, incidental evapotranspiration from the proprietary BMP or other similar measures.

See Worksheet B.5.2 that results in a Minimum Footprint Sizing Factor of 1883 resulting in a minimum footprint for this project of 255 sf which is larger than onsite area available for such a structure and so is not feasible.

| Criteria | Answer | Progression |
|--|---|---|
| <p>Criteria 2:</p> <p>Is the proprietary biofiltration BMP sized to meet the performance standard from the MS4 Permit?</p> <p>Refer to Appendix B.5 and Appendix F.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.</p> | <input checked="" type="checkbox"/> Meets Flow based Criteria | <p>Use guidance from Appendix F.2 to size the proprietary BMP to meet the flow based criteria. Include the calculations in the PDP SWQMP.</p> <p>Use parameters for sizing consistent with manufacturer guidelines and conditions of its third party certifications (i.e. a BMP certified at a loading rate of 1 gpm/sq. ft cannot be designed using a loading rate of 1.5 gpm/sq. ft)</p> <p>Proceed to Criteria 4.</p> |
| | <input type="checkbox"/> Meets Volume based Criteria | <p>Provide documentation that the proprietary biofiltration BMP has a total static (i.e. non-routed) storage volume, including pore-spaces and pre-filter detention volume (Refer to Appendix B.5 for a schematic) of at least 0.75 times the portion of the DCV not reliably retained onsite.</p> <p>Proceed to Criteria 4.</p> |
| | <input type="checkbox"/> Does not Meet either criteria | <p>Stop. Proprietary biofiltration BMP is not allowed.</p> |

| Onsite Proprietary Biofiltration BMP Checklist | | Form I-10 |
|---|--|--|
| <p>Provide basis for Criteria 2:</p> <p>Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., loading rate, etc., as applicable).</p> <p>See attached Drainage Study the substantiates, using the method from section B.6.3 to calculate the required flow rate (in agreement with the requirements found in section F.2.2) that the Filterra Unit will treat the required flow rate (Required flow rate to be treated 0.036 cfs vs treated flow rate of 0.055 cfs for the 4' x 4' Filterra Unit). See also the Washington State Department of Ecology "General Level Designation providing TAPE certification.</p> | | |
| Criteria | Answer | Progression |
| <p>Criteria 4:</p> <p>Does the proprietary biofiltration BMP meet the pollutant treatment performance standard for the projects most significant pollutants of concern?</p> <p>Refer to Appendix B.6 and Appendix F.1 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.</p> | <input checked="" type="checkbox"/> Yes, meets the TAPE certification. | <p>Provide documentation that the proprietary BMP has an appropriate TAPE certification for the projects most significant pollutants of concern.</p> <p>Proceed to Criteria 5.</p> |
| | <input type="checkbox"/> Yes, through other third-party documentation | <p>Acceptance of third-party documentation is at the discretion of the City Engineer. The City engineer will consider, (a) the data submitted; (b) representativeness of the data submitted; and (c) consistency of the BMP performance claims with pollutant control objectives in Table F.1-2 and Table F.1-1 while making this determination. If a proprietary biofiltration BMP is not accepted, a written explanation/ reason will be provided in Section 2.</p> <p>Proceed to Criteria 5.</p> |
| | <input type="checkbox"/> No | <p>Stop. Proprietary biofiltration BMP is not allowed.</p> |
| <p>Provide basis for Criteria 4:</p> <p>Provide documentation that identifies the projects most significant pollutants of concern and TAPE certification or other third party documentation that shows that the proprietary biofiltration BMP meets the pollutant treatment performance standard for the projects most significant pollutants of concern.</p> <p>See the Washington State Department of Ecology "General Level Designation for Basic, Phosphorous and Oil Treatment providing TAPE certification for the most significant pollutants of concern from the project site. See page 8 of Form I-3B.</p> | | |

Appendix I: Forms and Checklists

| Onsite Proprietary Biofiltration BMP Checklist | | Form I-10 |
|---|---|---|
| Criteria | Answer | Progression |
| <p>Criteria 5:</p> <p>Is the proprietary biofiltration BMP designed to promote appropriate biological activity to support and maintain treatment process?</p> <p>Refer to Appendix F of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.</p> | <input checked="" type="checkbox"/> Yes | <p>Provide documentation that the proprietary biofiltration BMP support appropriate biological activity. Refer to Appendix F for guidance.</p> <p>Proceed to Criteria 6.</p> |
| | <input type="checkbox"/> No | <p>Stop. Proprietary biofiltration BMP is not allowed.</p> |
| <p>Provide basis for Criteria 5:</p> <p>Provide documentation that appropriate biological activity is supported by the proprietary biofiltration BMP to maintain treatment process.</p> <p>See the description of Basic Operations found in Attachment 3 that the unit support bacterial breakdown and metabolizing material while the plants also uptake and metabolize the pollutants. Some materials are bound to organic particles in the mulch and then released to feeder roots in the plants and bacteria cells while some pollutants are bound to soil particles and again released to bacteria and plants to be metabolized.</p> | | |
| Criteria | Answer | Progression |
| <p>Criteria 6:</p> <p>Is the proprietary biofiltration BMP designed with a hydraulic loading rate to prevent erosion, scour and channeling within the BMP?</p> | <input checked="" type="checkbox"/> Yes | <p>Provide documentation that the proprietary biofiltration BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification.</p> <p>Proceed to Criteria 7.</p> |
| | <input type="checkbox"/> No | <p>Stop. Proprietary biofiltration BMP is not allowed.</p> |
| <p>Provide basis for Criteria 6:</p> <p>Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable).</p> <p>See attached Drainage Study the substantiates, using the method from section B.6.3 to calculate the required flow rate (in agreement with the requirements found in section F.2.2), that the Filterra Unit will treat the required flow rate (Required flow rate to be treated 0.036 cfs vs treated flow rate of 0.055 cfs for the 4' x 4' Filterra Unit). See also the Washington State Department of Ecology "General Level Designation providing TAPE certification.</p> | | |

| Onsite Proprietary Biofiltration BMP Checklist | | Form I-10 |
|--|---|---|
| Criteria | Answer | Progression |
| <p>Criteria 7:</p> <p>Is the proprietary biofiltration BMP maintenance plan consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies)?</p> | <input checked="" type="checkbox"/> Yes, and the proprietary BMP is privately owned, operated and not in the public right of way. | <p>Submit a maintenance agreement that will also include a statement that the BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification.</p> <p>Stop. The proprietary biofiltration BMP meets the required criteria.</p> |
| | <input type="checkbox"/> Yes, and the BMP is either owned or operated by the City or in the public right of way. | <p>Approval is at the discretion of the City Engineer. The city engineer will consider maintenance requirements, cost of maintenance activities, relevant previous local experience with operation and maintenance of the BMP type, ability to continue to operate the system in event that the vending company is no longer operating as a business or other relevant factors while making the determination.</p> <p>Stop. Consult the City Engineer for a determination.</p> |
| | <input type="checkbox"/> No | <p>Stop. Proprietary biofiltration BMP is not allowed.</p> |
| <p>Provide basis for Criteria 7:</p> <p>Include copy of manufacturer guidelines and conditions of third-party certification in the maintenance agreement. Attachment 3A of the PDP SWQMP must include a statement that the proprietary BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification.</p> <p>See Attachment 3. The Filterra Unit will be maintained in accordance with manufacturer guidelines and conditions of third-party certification. See also the Washington State Department of Ecology “General Level Designation providing TAPE certification in Attachment 1..</p> | | |



November 2015

**GENERAL USE LEVEL DESIGNATION FOR BASIC (TSS), ENHANCED,
PHOSPHORUS & OIL TREATMENT**

For

Americast Filterra®

Ecology's Decision:

Based on Americast's submissions, including the Final Technical Evaluation Reports, dated March 27, 2014 and December 2009, and additional information provided to Ecology dated October 9, 2009, Ecology hereby issues the following use level designations:

1. A General Use Level Designation for Basic, Enhanced, Phosphorus, and Oil Treatment at the following water quality design hydraulic loading rates:

| Treatment | Hydraulic Conductivity* (in/hr) for use in Western Washington Sizing | Infiltration Rate (in/hr) for use in eastern Washington Sizing |
|------------|--|--|
| Basic | 70.92 | 100 |
| Phosphorus | 70.92 | 100 |
| Oil | 35.46 | 50 |
| Enhanced | 24.82 | 35 |

*calculated based on listed infiltration rate and a hydraulic gradient of 1.41 inch/inch.

2. The Filterra® unit is not appropriate for oil spill-control purposes.
3. Ecology approves the Filterra® units for treatment at the hydraulic loading rates listed above, to achieve the maximum water quality design flow rate. Calculate the water quality design flow rates using the following procedures:

- Western Washington: for treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the sand filter module in the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model. The model must indicate the unit is capable of processing 91 percent of the influent runoff file.
- Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three flow rate based methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
- Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

4. This General Use Level Designation has no expiration date but Ecology may revoke or amend the designation, and is subject to the conditions specified below.

Ecology's Conditions of Use:

Filtterra[®] units shall comply with these conditions shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the Filtterra[®] units in accordance with applicable Americast Filtterra[®] manuals, document, and the Ecology Decision.
2. Each site plan must undergo Americast Filtterra[®] review before Ecology can approve the unit for site installation. This will ensure that site grading and slope are appropriate for use of a Filtterra[®] unit.
3. Filtterra[®] media shall conform to the specifications submitted to and approved by Ecology.
4. Maintenance includes removing trash, degraded mulch, and accumulated debris from the filter surface and replacing the mulch layer. Use inspections to determine the site-specific maintenance schedules and requirements. Follow maintenance procedures given in the most recent version of the Filtterra[®] Operation and Maintenance Manual.
5. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.
 - Filtterra[®] designs their systems for a target maintenance interval of 6 months. Maintenance includes removing accumulated sediment and trash from the surface area of the media, removing the mulch above the media, replacing the mulch, providing plant health evaluation, and pruning the plant if deemed necessary.
 - Conduct maintenance following manufacturer's guidelines.
6. Filtterra[®] units come in standard sizes.
7. The minimum size filter surface-area for use in western Washington is determined by using the sand filter module in the latest version of WWHM or other Ecology approved continuous runoff model for western Washington. Model inputs include
 - a) Filter media depth: 1.8 feet
 - b) Effective Ponding Depth: 0.75 feet (This is equivalent to the 6-inch clear zone between the top of the mulch and the bottom of the slab plus 3-inches of mulch.)
 - c) Side slopes: Vertical
 - d) Riser height: 0.70 feet
 - e) Filter Hydraulic Conductivity: Use the Hydraulic Conductivity as listed in the table above (use the lowest applicable hydraulic conductivity depending on the level of treatment required) under Ecology's Decision, above.

8. The minimum size filter surface-area for use in eastern Washington is determined by using the design water quality flow rate (as determined in item 3, above) and the Infiltration Rate from the table above (use the lowest applicable Infiltration Rate depending on the level of treatment required). Calculate the required area by dividing the water quality design flow rate (cu-ft/sec) by the Infiltration Rate (converted to ft/sec) to obtain required surface area (sq ft) of the Filterra unit.
9. Discharges from the Filterra® units shall not cause or contribute to water quality standards violations in receiving waters.

Approved Alternate Configurations

Filterra® Internal Bypass - Pipe (FTIB-P)

1. The Filterra® Internal Bypass – Pipe allows for piped-in flow from area drains, grated inlets, trench drains, and/or roof drains. Design capture flows and peak flows enter the structure through an internal slotted pipe. Filterra® inverted the slotted pipe to allow design flows to drop through to a series of splash plates that then disperse the design flows over the top surface of the Filterra® planter area. Higher flows continue to bypass the slotted pipe and convey out the structure.
2. To select a FTIB-P unit, the designer must determine the size of the standard unit using the sizing guidance described above.

Filterra® Internal Bypass – Curb (FTIB-C)

1. The Filterra® Internal Bypass –Curb model (FTIB-C) incorporates a curb inlet, biofiltration treatment chamber, and internal high flow bypass in one single structure. Filterra® designed the FTIB-C model for use in a “Sag” or “Sump” condition and will accept flows from both directions along a gutter line. An internal flume tray weir component directs treatment flows entering the unit through the curb inlet to the biofiltration treatment chamber. Flows in excess of the water quality treatment flow rise above the flume tray weir and discharge through a standpipe orifice; providing bypass of untreated peak flows. Americast manufactures the FTIB-C model in a variety of sizes and configurations and you may use the unit on a continuous grade when a single structure providing both treatment and high flow bypass is preferred. The FTIB-C model can also incorporate a separate junction box chamber to allow larger diameter discharge pipe connections to the structure.
2. To select a FTIB-C unit, the designer must determine the size of the standard unit using the sizing guidance described above.

Filterra® Shallow

1. The Filterra® Shallow provides additional flexibility for design engineers and designers in situations where there is limited depth and various elevation constraints to applying a standard Filterra® configuration. Engineers can design this system up to six inches shallower than any of the previous Filterra unit configurations noted above.

2. Ecology requires that the Filterra® Shallow provide a contact time equivalent to that of the standard unit. This means that with a smaller depth of media, the surface area must increase.
3. To select a Filterra® Shallow System unit, the designer must first identify the size of the standard unit using the modeling guidance described above.
4. Once you establish the size of the standard Filterra® unit using the sizing technique described above, use information from the following table to select the appropriate size Filterra® Shallow System unit.

Shallow Unit Basic, Enhanced, and Oil Treatment Sizing

| Standard Depth | Equivalent Shallow Depth |
|----------------|--------------------------|
| 4x4 | 4x6 or 6x4 |
| 4x6 or 6x4 | 6x6 |
| 4x8 or 8x4 | 6x8 or 8x6 |
| 6x6 | 6x10 or 10x6 |
| 6x8 or 8x6 | 6x12 or 12x6 |
| 6x10 or 10x6 | 13x7 |

Notes:

1. Shallow Depth Boxes are less than the standard depth of 3.5 feet but no less than 3.0 feet deep (TC to INV).

Applicant: Filterra® Bioretention Systems, division of Contech Engineered Solutions, LLC.

Applicant's Address: 11815 NE Glenn Widing Drive
Portland, OR 97220

Application Documents:

- State of Washington Department of Ecology Application for Conditional Use Designation, Americast (September 2006)
- Quality Assurance Project Plan Filterra® Bioretention Filtration System Performance Monitoring, Americast (April 2008)
- Quality Assurance Project Plan Addendum Filterra® Bioretention Filtration System Performance Monitoring, Americast (June 2008)
- Draft Technical Evaluation Report Filterra® Bioretention Filtration System Performance Monitoring, Americast (August 2009)
- Final Technical Evaluation Report Filterra® Bioretention Filtration System Performance Monitoring, Americast (December 2009)
- Technical Evaluation Report Appendices Filterra® Bioretention Filtration System Performance Monitoring, Americast, August 2009
- Memorandum to Department of Ecology Dated October 9, 2009 from Americast, Inc. and Herrera Environmental Consultants

- Quality Assurance Project Plan Filterra® Bioretention System Phosphorus treatment and Supplemental Basic and Enhanced Treatment Performance Monitoring, Americast (November 2011)
- Filterra® letter August 24, 2012 regarding sizing for the Filterra® Shallow System.
- University of Virginia Engineering Department Memo by Joanna Crowe Curran, Ph. D dated March 16, 2013 concerning capacity analysis of Filterra® internal weir inlet tray.
- Terraphase Engineering letter to Jodi Mills, P.E. dated April 2, 2013 regarding Terraflume Hydraulic Test, Filterra® Bioretention System and attachments.
- Technical Evaluation Report, Filterra® System Phosphorus Treatment and Supplemental Basic Treatment Performance Monitoring. March 27th, 2014.

Applicant’s Use Level Request:

General Level Use Designation for Basic, Enhanced, Phosphorus, and Oil Treatment.

Applicant’s Performance Claims:

Field-testing and laboratory testing show that the Filterra® unit is promising as a stormwater treatment best management practice and can meet Ecology’s performance goals for basic, enhanced, phosphorus, and oil treatment.

Findings of Fact:

Field Testing 2013

1. Filterra® completed field-testing of a 6.5 ft x 4 ft. unit at one site in Bellingham, Washington. Continuous flow and rainfall data collected from January 1, 2013 through July 23, 2013 indicated that 59 storm events occurred. The monitoring obtained water quality data from 22 storm events. Not all the sampled storms produced information that met TAPE criteria for storm and/or water quality data.
2. The system treated 98.9 percent of the total 8-month runoff volume during the testing period. Consequently, the system achieved the goal of treating 91 percent of the volume from the site. Stormwater runoff bypassed during four of the 59 storm events.
3. Of the 22 sampled events, 18 qualified for TSS analysis (influent TSS concentrations ranged from 25 to 138 mg/L). The data were segregated into sample pairs with influent concentration greater than and less than 100 mg/L. The UCL95 mean effluent concentration for the data with influent less than 100 mg/L was 5.2 mg/L, below the 20-mg/L threshold. Although the TAPE guidelines do not require an evaluation of TSS removal efficiency for influent concentrations below 100 mg/L, the mean TSS removal for these samples was 90.1 percent. Average removal of influent TSS concentrations greater than 100 mg/L (three events) was 85 percent. In addition, the system consistently exhibited TSS removal greater than 80 percent at flow rates at a 100 inches per hour [in/hr] infiltration rate and was observed at 150 in/hr.

4. Ten of the 22 sampled events qualified for TP analysis. Americast augmented the dataset using two sample pairs from previous monitoring at the site. Influent TP concentrations ranged from 0.11 to 0.52 mg/L. The mean TP removal for these twelve events was 72.6 percent. The LCL95 mean percent removal was 66.0, well above the TAPE requirement of 50 percent. Treatment above 50 percent was evident at 100 in/hr infiltration rate and as high as 150 in/hr. Consequently, the Filterra® test system met the TAPE Phosphorus Treatment goal at 100 in/hr. Influent ortho-P concentrations ranged from 0.005 to 0.012 mg/L; effluent ortho-P concentrations ranged from 0.005 to 0.013 mg/L. The reporting limit/resolution for the ortho-P test method is 0.01 mg/L, therefore the influent and effluent ortho-P concentrations were both at and near non-detect concentrations.

Field Testing 2008-2009

1. Filterra® completed field-testing at two sites at the Port of Tacoma. Continuous flow and rainfall data collected during the 2008-2009 monitoring period indicated that 89 storm events occurred. The monitoring obtained water quality data from 27 storm events. Not all the sampled storms produced information that met TAPE criteria for storm and/or water quality data.
2. During the testing at the Port of Tacoma, 98.96 to 99.89 percent of the annual influent runoff volume passed through the POT1 and POT2 test systems respectively. Stormwater runoff bypassed the POT1 test system during nine storm events and bypassed the POT2 test system during one storm event. Bypass volumes ranged from 0.13% to 15.3% of the influent storm volume. Both test systems achieved the 91 percent water quality treatment-goal over the 1-year monitoring period.
3. Consultants observed infiltration rates as high as 133 in/hr during the various storms. Filterra® did not provide any paired data that identified percent removal of TSS, metals, oil, or phosphorus at an instantaneous observed flow rate.
4. The maximum storm average hydraulic loading rate associated with water quality data is <40 in/hr, with the majority of flow rates < 25 in/hr. The average instantaneous hydraulic loading rate ranged from 8.6 to 53 inches per hour.
5. The field data showed a removal rate greater than 80% for TSS with an influent concentration greater than 20 mg/l at an average instantaneous hydraulic loading rate up to 53 in/hr (average influent concentration of 28.8 mg/l, average effluent concentration of 4.3 mg/l).
6. The field data showed a removal rate generally greater than 54% for dissolved zinc at an average instantaneous hydraulic loading rate up to 60 in/hr and an average influent concentration of 0.266 mg/l (average effluent concentration of 0.115 mg/l).
7. The field data showed a removal rate generally greater than 40% for dissolved copper at an average instantaneous hydraulic loading rate up to 35 in/hr and an average influent concentration of 0.0070 mg/l (average effluent concentration of 0.0036 mg/l).
8. The field data showed an average removal rate of 93% for total petroleum hydrocarbon (TPH) at an average instantaneous hydraulic loading rate up to 53 in/hr and an average influent concentration of 52 mg/l (average effluent concentration of 2.3 mg/l). The data

also shows achievement of less than 15 mg/l TPH for grab samples. Filterra® provided limited visible sheen data due to access limitations at the outlet monitoring location.

9. The field data showed low percentage removals of total phosphorus at all storm flows at an average influent concentration of 0.189 mg/l (average effluent concentration of 0.171 mg/l). We may relate the relatively poor treatment performance of the Filterra® system at this location to influent characteristics for total phosphorus that are unique to the Port of Tacoma site. It appears that the Filterra® system will not meet the 50 percent removal performance goal when you expect the majority of phosphorus in the runoff to be in the dissolved form.

Laboratory Testing

1. Filterra® performed laboratory testing on a scaled down version of the Filterra® unit. The lab data showed an average removal from 83-91% for TSS with influents ranging from 21 to 320 mg/L, 82-84% for total copper with influents ranging from 0.94 to 2.3 mg/L, and 50-61% for orthophosphate with influents ranging from 2.46 to 14.37 mg/L.
2. Filterra® conducted permeability tests on the soil media.
3. Lab scale testing using Sil-Co-Sil 106 showed percent removals ranging from 70.1% to 95.5% with a median percent removal of 90.7%, for influent concentrations ranging from 8.3 to 260 mg/L. Filterra® ran these laboratory tests at an infiltration rate of 50 in/hr.
4. Supplemental lab testing conducted in September 2009 using Sil-Co-Sil 106 showed an average percent removal of 90.6%. These laboratory tests were run at infiltration rates ranging from 25 to 150 in/hr for influent concentrations ranging from 41.6 to 252.5 mg/l. Regression analysis results indicate that the Filterra® system's TSS removal performance is independent of influent concentration in the concentration range evaluated at hydraulic loading rates of up to 150 in/hr.

Contact Information:

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Applicant's Website: <http://www.conteches.com>

Ecology web link: <http://www.ecy.wa.gov/programs/wq/stormwater/newtech/index.html>

Ecology: Douglas C. Howie, P.E.
Department of Ecology
Water Quality Program
(360) 407-6444
douglas.howie@ecy.wa.gov

| Date | Revision |
|----------------|---|
| December 2009 | GULD for Basic, Enhanced, and Oil granted, CULD for Phosphorus |
| September 2011 | Extended CULD for Phosphorus Treatment |
| September 2012 | Revised design storm discussion, added Shallow System. |
| January 2013 | Revised format to match Ecology standards, changed Filterra contact information |
| February 2013 | Added FTIB-P system |
| March 2013 | Added FTIB-C system |
| April 2013 | Modified requirements for identifying appropriate size of unit |
| June 2013 | Modified description of FTIB-C alternate configuration |
| March 2014 | GULD awarded for Phosphorus Treatment. GULD updated for a higher flow-rate for Basic Treatment. |
| June 2014 | Revised sizing calculation methods |
| March 2015 | Revised Contact Information |
| June 2015 | CULD for Basic and Enhanced at 100 in/hr infiltration rate |
| November 2015 | Removed information on CULD (created separate CULD document for 100 in/hr infiltration rate) |

E.15. BF-3 Proprietary Biofiltration Systems

The purpose of this fact sheet is to help explain the potential role of proprietary BMPs in meeting biofiltration requirements, when full retention of the DCV is not feasible. The fact sheet does not describe design criteria like the other fact sheets in this appendix because this information varies by BMP product model.

Criteria for Use of a Proprietary BMP as a Biofiltration BMP

A proprietary BMP may be acceptable as a “biofiltration BMP” under the following conditions:

1. The BMP meets the minimum design criteria listed in Appendix F, including the selection criteria (i.e. only allowed in No Infiltration Condition and where site-specific documentation demonstrates that the use of larger footprint biofiltration BMPs (i.e. minimum sizing factor calculated using Worksheet B.5.2) would be infeasible) and pollutant treatment performance standard in Appendix F.1;
2. The BMP is designed and maintained in a manner consistent with its performance certifications (See explanation in Appendix F.2); and
3. The BMP is acceptable at the discretion of the City Engineer. In determining the acceptability of a BMP, the City Engineer should consider, as applicable, (a) the data submitted; (b) representativeness of the data submitted; (c) consistency of the BMP performance claims with pollutant control objectives; certainty of the BMP performance claims; (d) for projects within the public right of way and/or public projects: maintenance requirements, cost of maintenance activities, relevant previous local experience with operation and maintenance of the BMP type, ability to continue to operate the system in event that the vending company is no longer operating as a business; and (e) other relevant factors. If a proposed BMP is not accepted by the City Engineer, a written explanation/reason will be provided to the applicant.

Guidance for Sizing a Proprietary BMP as a Biofiltration BMP

Proprietary biofiltration BMPs must meet the same sizing guidance as non-proprietary BMPs. Sizing is typically based on capturing and treating 1.50 times the DCV not reliably retained. Guidance for sizing biofiltration BMPs to comply with requirements of this manual is provided in Appendix F.2.

E.20. FT-5 Proprietary Flow-Thru Treatment Control BMPs

The purpose of this fact sheet is to help explain the potential role of proprietary BMPs in meeting flow thru treatment control BMP requirements. The fact sheet does not describe design criteria like the other fact sheets in this appendix because this information varies by BMP product model.

Criteria for Use of a Proprietary BMP as a Flow-Thru Treatment Control BMP

A proprietary BMP may be acceptable as a “flow-thru treatment control BMP” under the following conditions:

1. The BMP is selected and sized consistent with the method and criteria described in Appendix B.6;
2. The BMP is designed and maintained in a manner consistent with its performance certifications (See explanation in Appendix B.6); and
3. The BMP is acceptable at the discretion of the City Engineer. In determining the acceptability of a BMP, the City Engineer should consider, as applicable, (a) the data submitted; (b) representativeness of the data submitted; (c) consistency of the BMP performance claims with pollutant control objectives; certainty of the BMP performance claims; (d) for projects within the public right of way and/or public projects: maintenance requirements, cost of maintenance activities, relevant previous local experience with operation and maintenance of the BMP type, ability to continue to operate the system in event that the vending company is no longer operating as a business; and (e) other relevant factors. If a proposed BMP is not accepted by the City Engineer, a written explanation/reason will be provided to the applicant.

Guidance for Sizing Proprietary BMPs

Proprietary flow-thru BMPs must meet the same sizing guidance as other flow-thru treatment control BMPs. Guidance for sizing flow-thru BMPs to comply with requirements of this manual is provided in Appendix B.6.

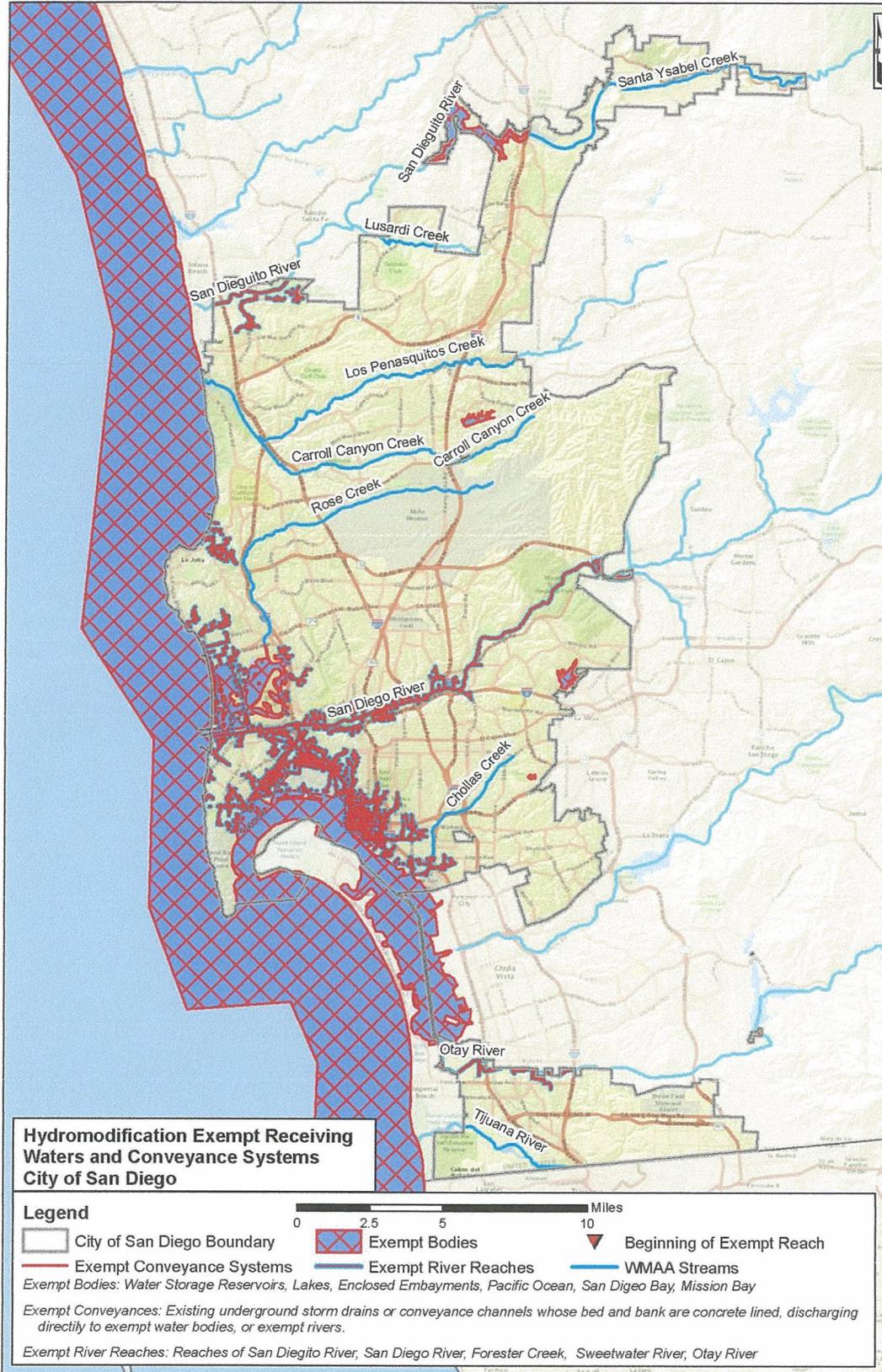
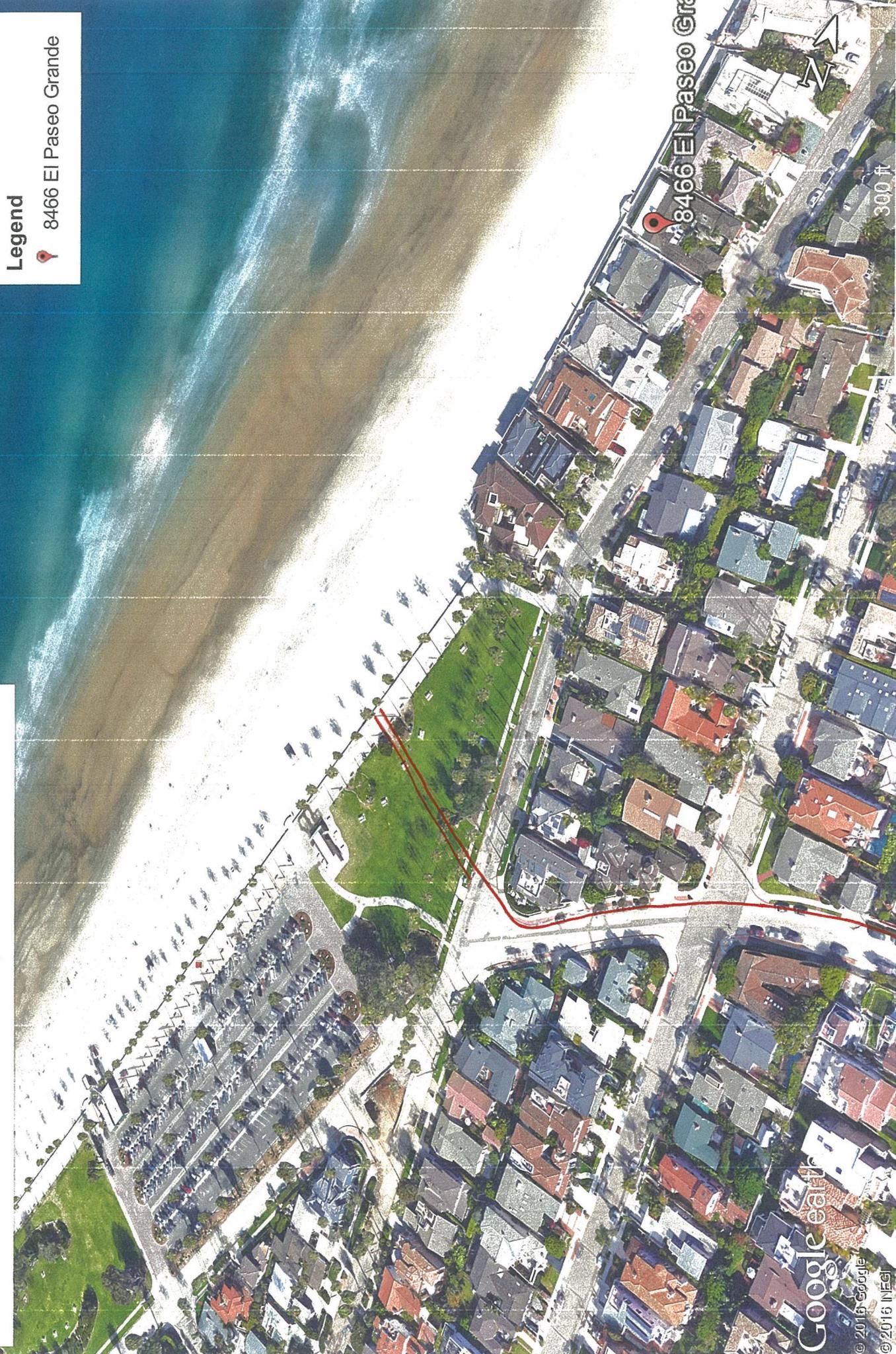


Figure H-G.2-2 Hydromodification Exempt Areas

HYDROMODIFICATION EXEMPT SYSTEM

EXHIBIT SHOWING FLOW ALONG EL PASEO GRANDE TO THE EXEMPT SYSTEM AT CAMINO DEL ORO AND EL PASEO GRANDE (EXEMPT SYSTEM SHOWN AS RED LINE)



Legend

 8466 El Paseo Grande

FILTERRA BIORETENTION SYSTEMS

ADVANCING CONVENTIONAL STORMWATER TREATMENT WITH HIGH FLOW RATE BIORETENTION DESIGN

Presented by:

Glen Payton

General Manager

gpayton@filtrerra.com

Whitepaper authored by:



Summary

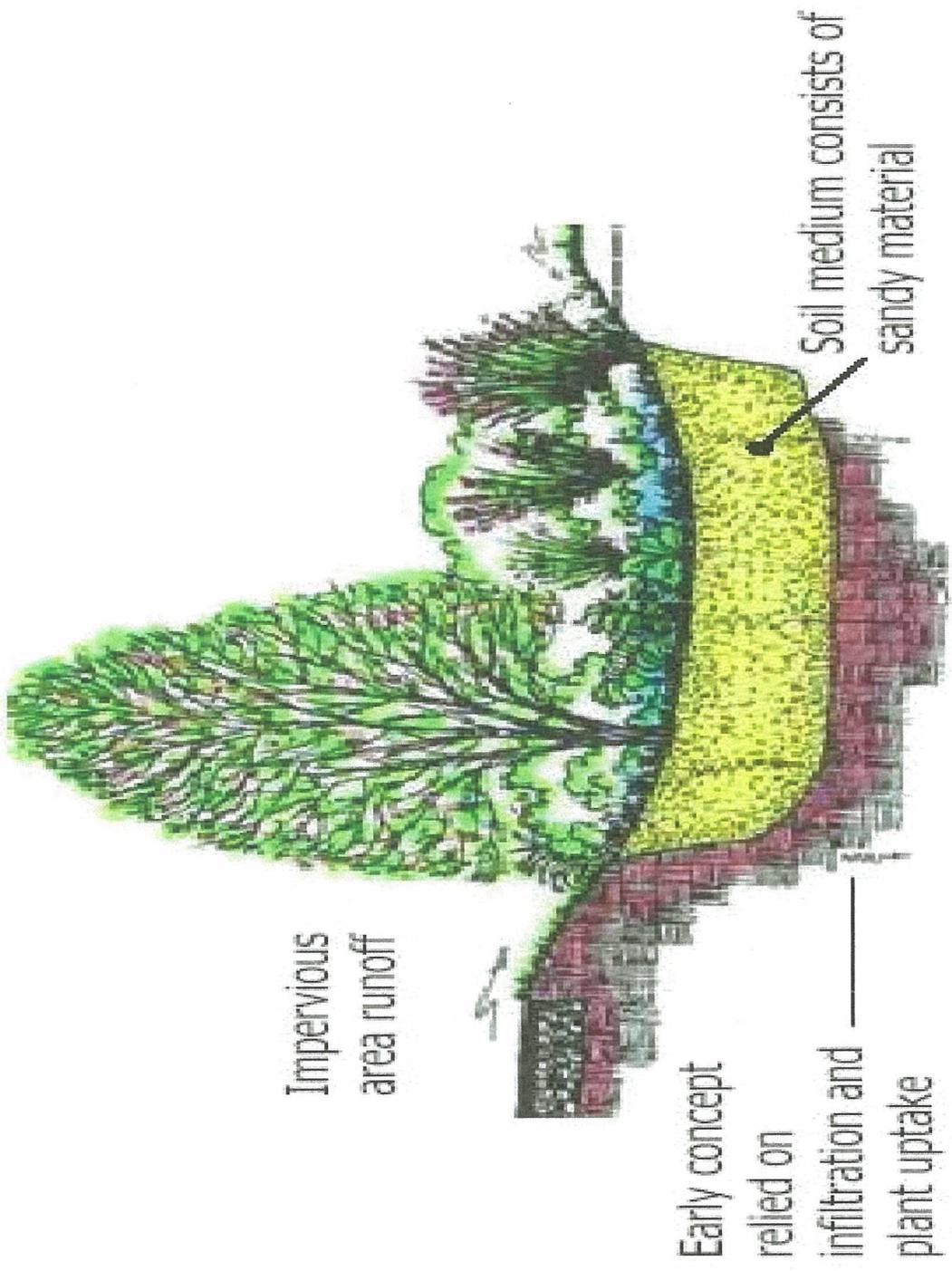
- **Filterra is equal to or better than standard bioretention**
 - Effluent quality
 - Treatment volume
- **Justification**
 - Identical removal mechanisms
 - Comparison by independent consultants
 - (5) third-party monitoring studies on Filterra vs. extensive field data as presented in the International BMP Database

Filterra vs. Standard Bioretention

| | <u>Standard Bio.</u> | <u>Filterra</u> |
|---------------------------|----------------------|-----------------|
| Components | | |
| 3" mulch | ✓ | ✓ |
| 2' media depth | ✓ | ✓ |
| Under drain | ✓ | ✓ |
| Plants | 1000 plants/acre* | 4 plants/acre |
| Media Tests | | |
| pH | ✓* | ✓ |
| Organic Matter | ✓* | ✓ |
| Fertility | ✓* | ✓ |
| Soluble Salts | ✓* | ✓ |
| CEC | X | ✓ |
| Moisture | X | ✓ |
| PSD | X | ✓ |
| Hydraulic Performance | X | ✓ |
| Water Quality Performance | X | ✓ |
| Removal Mechanisms | ✓ | ✓ |
| Infiltration Rate | 0.3 – 8.3 in/hr* | 140 in/hr |

*VA DCR 1999 Manual

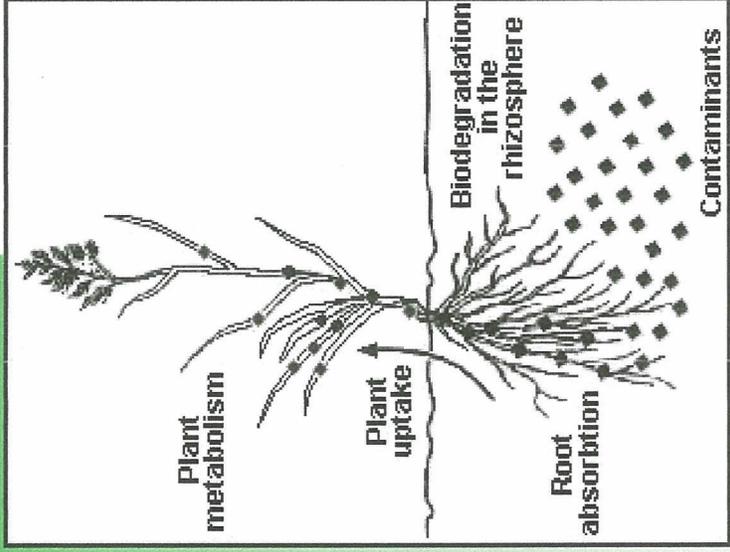
SIMILAR: Filterra Components vs. Standard Bioretention



SIMILAR: Filterra Components vs. Standard Bioretention

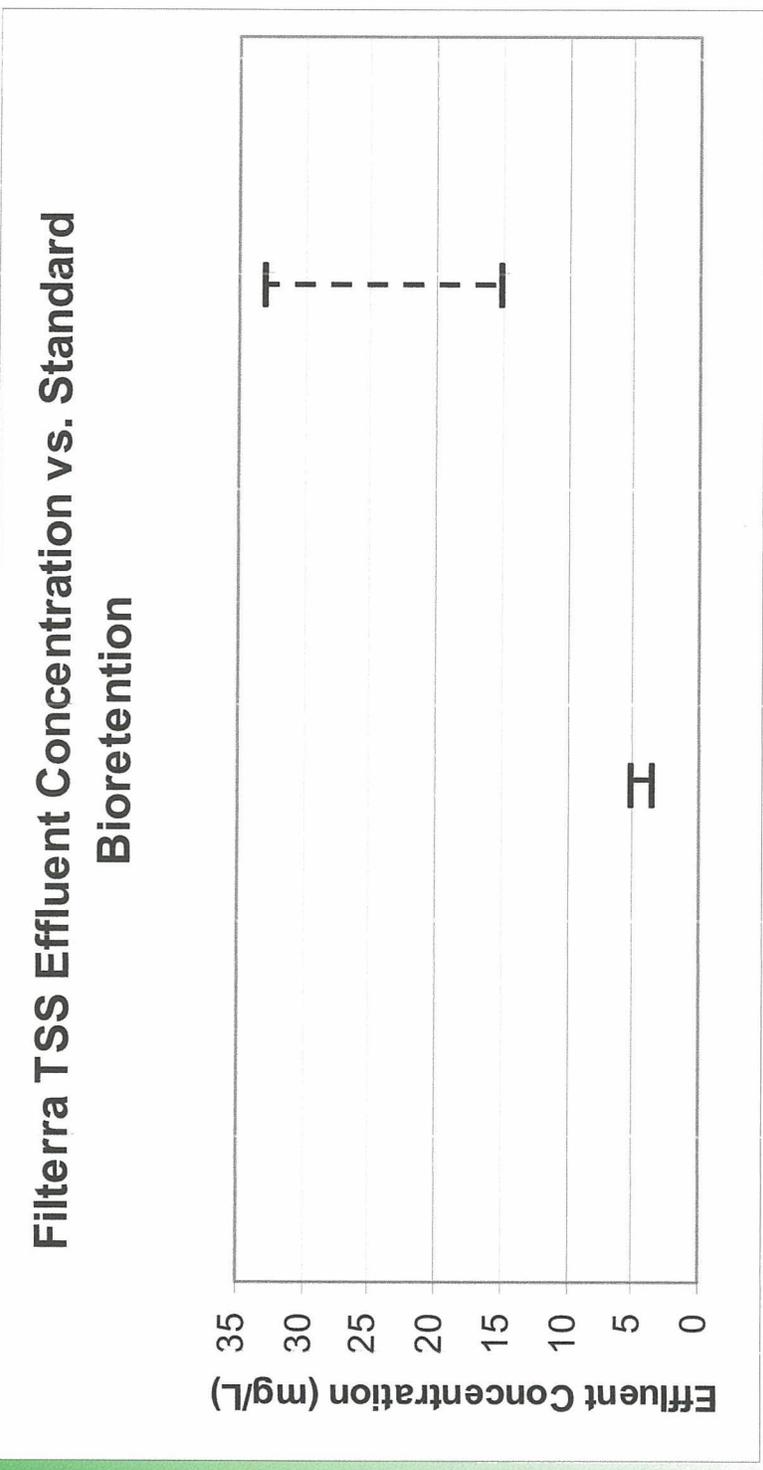


SIMILAR: Filterra vs. Standard Bioretention Removal Mechanisms



- Within-storm Treatment Processes
 - Inert Filtration
 - Reactive Filtration
- Inter-storm Treatment Processes
 - Microbial-mediated Transformations
 - Biological Uptake and Sequestration
 - Volatilization
 - Bacterial Inactivation Processes
 - Soil Processes
 - Routine Maintenance

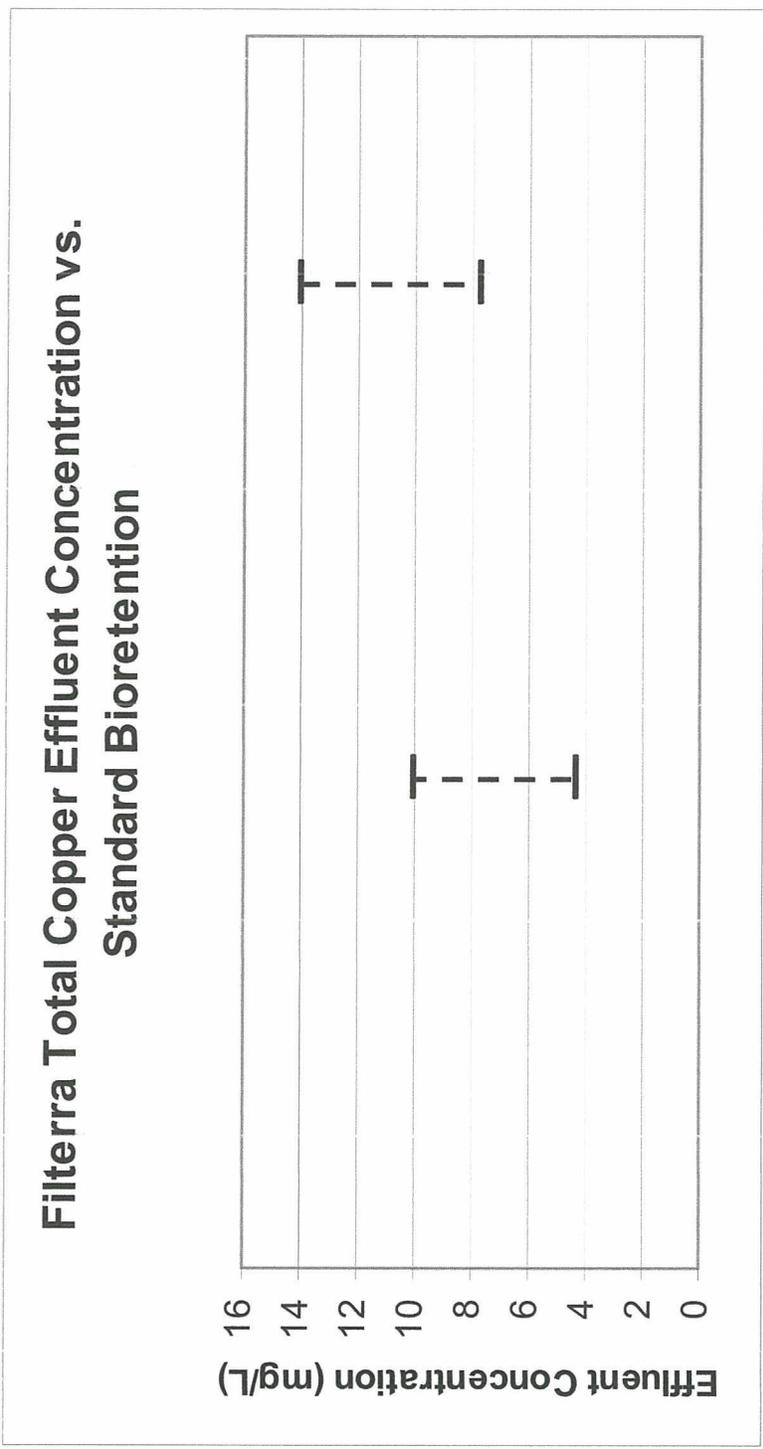
SIMILAR: Filterra effluent quality superior to standard bioretention



*International BMP Database 2010

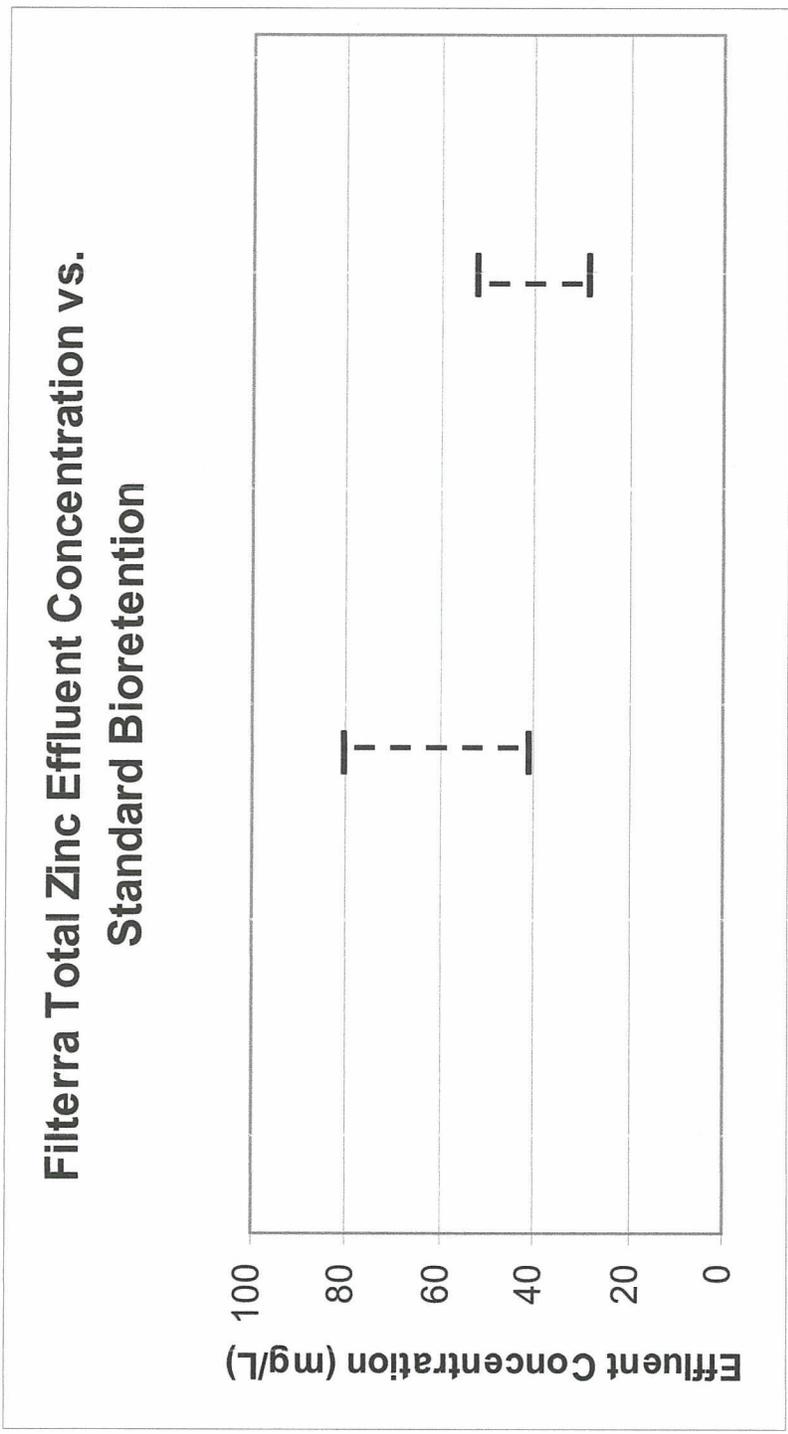
** TARP (VA), TAPE (WA) & Four Indep Field Test Sites (MD, VA, WA)

SIMILAR: Filterra effluent quality superior to standard bioretention

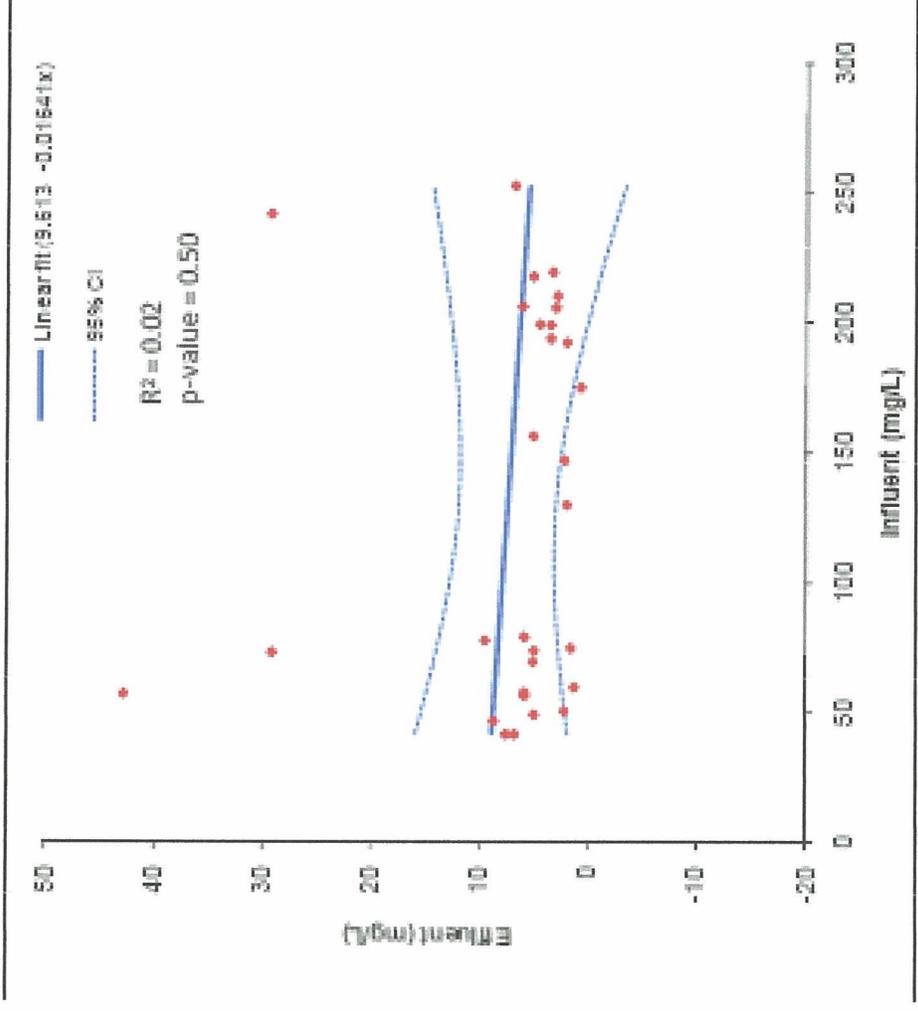


*International BMP Database 2010

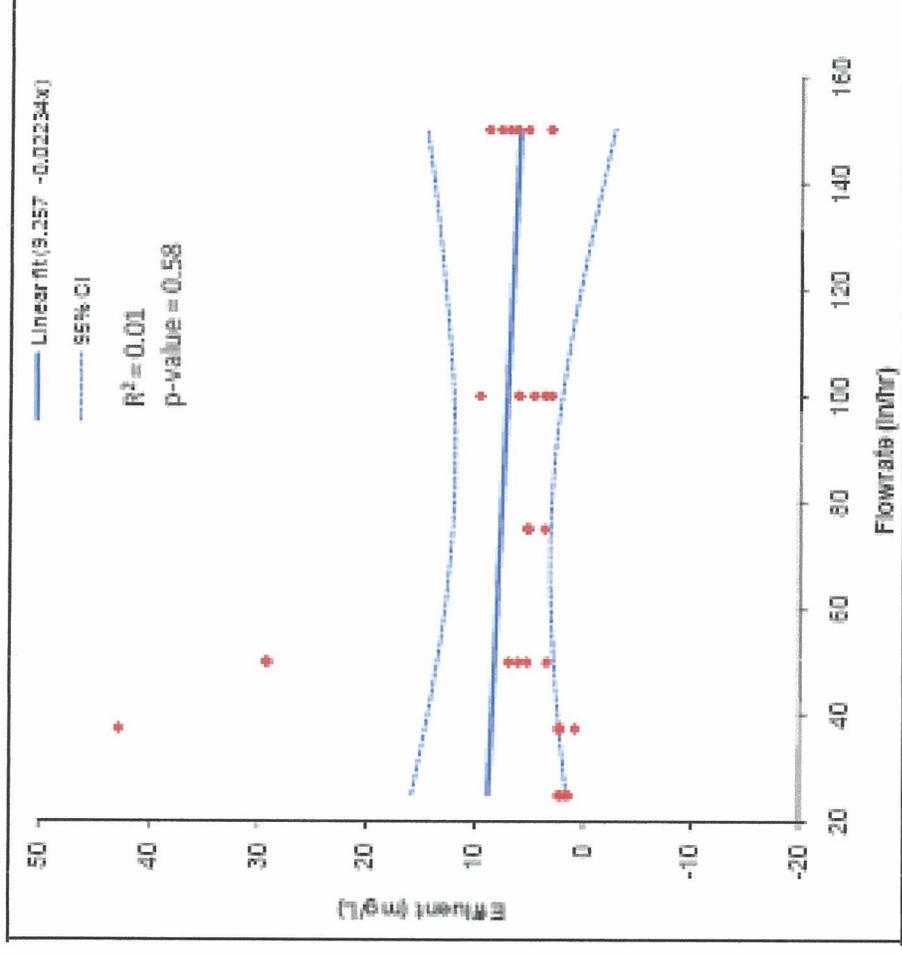
SIMILAR: Filterra effluent quality superior to standard bioretention



SIMILAR: Filterra TSS effluent quality is independent of influent conc.

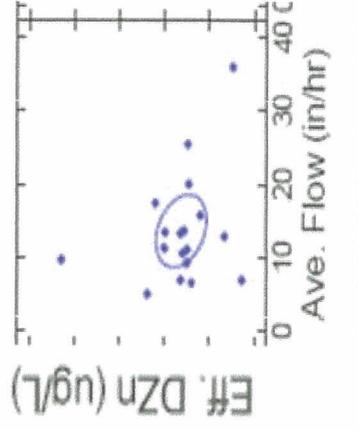
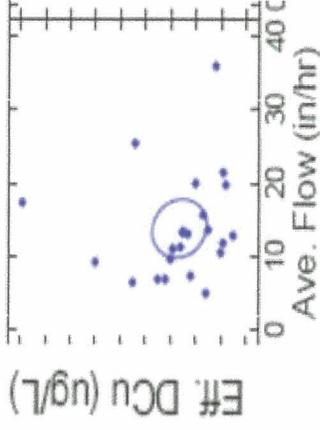
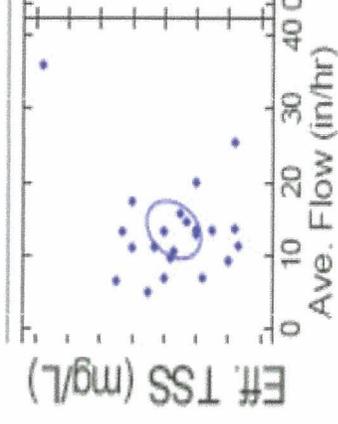


SIMILAR: Filterra effluent quality is independent of flow rate



* Filterra lab-based for TAPE approval

SIMILAR: Filterra effluent quality is independent of flow rate

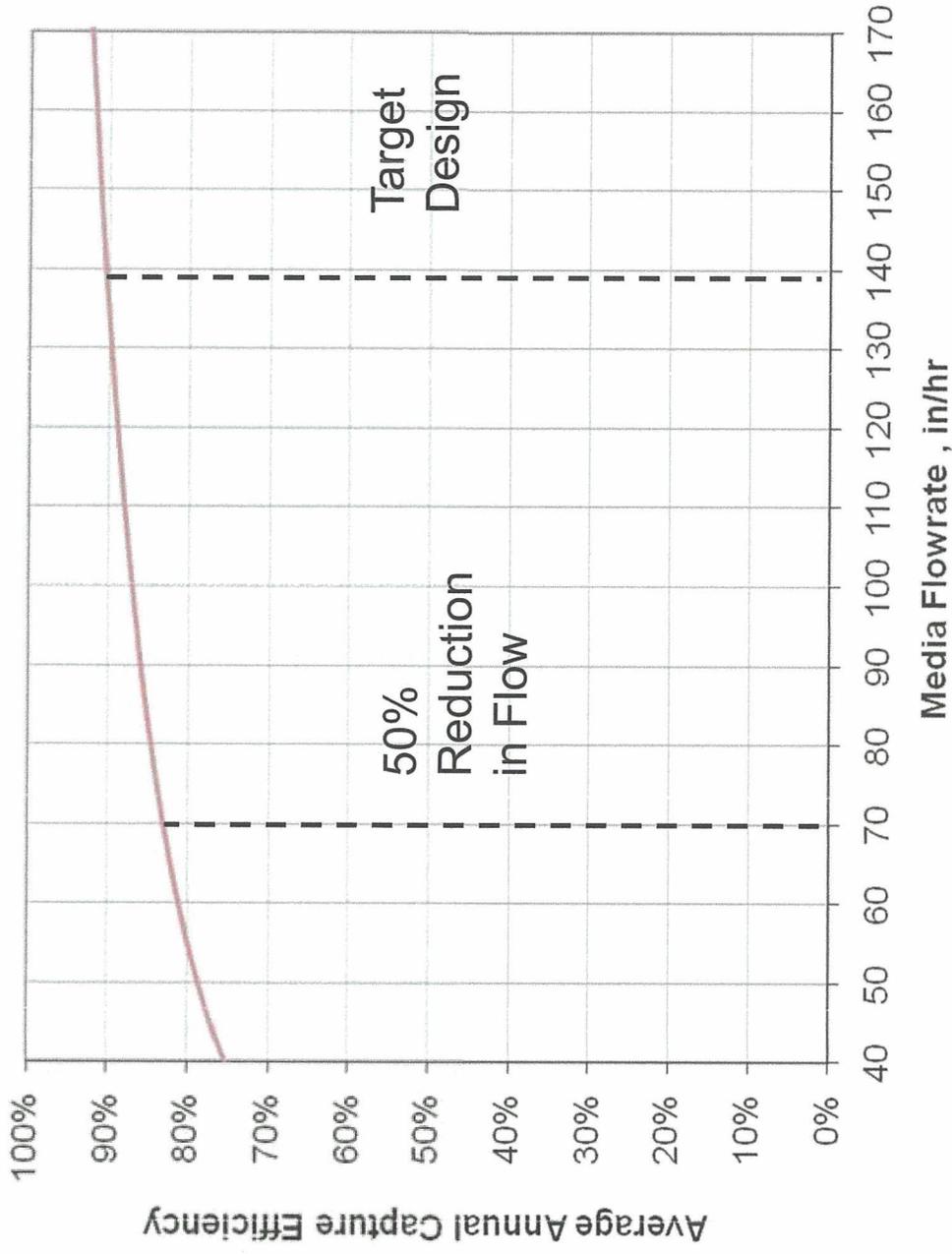


* Filterra field tests for TAPE approval

SIMILAR: Filterra Treatment Volume vs. Standard Bioretention

| Site Description | Third Party | % Annual Volume Treated |
|--|--|-------------------------|
| Flow-weighted Composite | | |
| TARP & TARP Addendum Community Center in Northern VA (1 unit) | University of Virginia, ATR Associates | 93% |
| TAPE Industrial Port Development in WA (2 units) | Herrera Env. Consultants | 99% |
| Residential street City of Bellingham, WA | City of Bellingham | >91% |
| Discrete Grab | | |
| Performance Over Time Restaurant, oil service station and gas station parking lot in VA & MD (3 units) | Commercial Laboratory | N/A |

DIFFERENT: Filterra High Flow Rate vs. Standard Bioretention



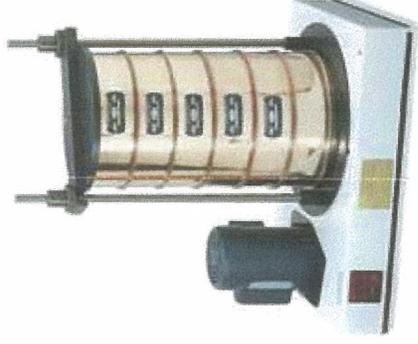
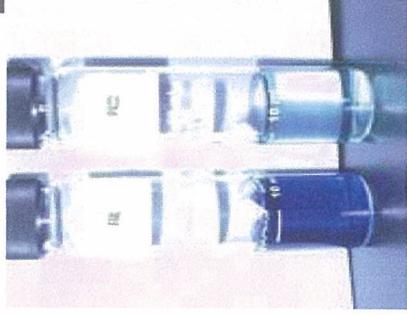
DIFFERENT: Filterra Design/QC Standards vs. Standard Bioretention

- Use of Old Design Standards (PG 1993 Manual not up to date)
 - clay / organic / K factor
- Poor Drainage
 - Under drain design / Geo-fabrics
- Media Variability
 - Reliable Sources
- Contractor Substitutes
- Testing often left to site contractor and/or not done
- Contamination
 - P, N and Heavy Metals
- CEC
- Sizing / Space

Filterra QC



- Filterra's stringent QA/QC program allows for less problems caused by older design standards
- Quarterly sampling of media, UD and mulch
 - fertility, CEC, moisture, pH, PSD, organics, ash, lab and field performance (flow rate and quality)



DIFFERENT: Filtterra Maintenance vs. Standard Bioretention

- > 10 times less surface area to be maintained vs. standard bioretention
 - reduced cost
- Pollutant load – sediment and trash – concentrated on smaller footprint for easy removal

Conclusions

- Filterra is based on bioretention technology and involves the same removal mechanisms
- High flow rate media (140 in/hr) allows for small footprint and provides a standardized, easily installed and maintained design
- High flow rate bioretention media performs as well or better than standard bioretention
- Correlation analysis indicated there is no direct relationship b/n system performance and hydraulic loading rate
- Significant flow reductions with high flow rate media do not greatly affect average annual volume treated

QUESTIONS??

Glen Payton
General Manager
Filterra Bioretention Systems
(804) 752-1418
gpayton@filterra.com

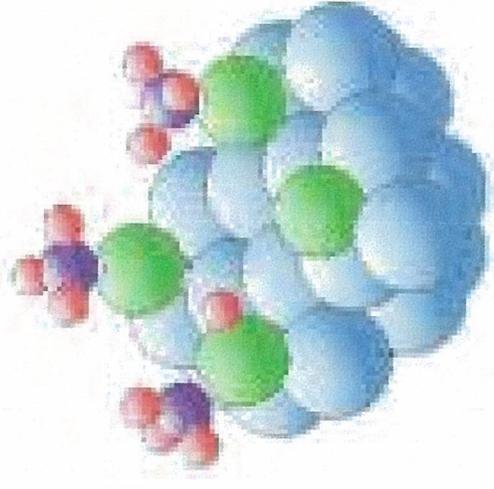
High Flow Rate Treatment Whitepaper:
www.filterra.com



A division of **AMERICAST**

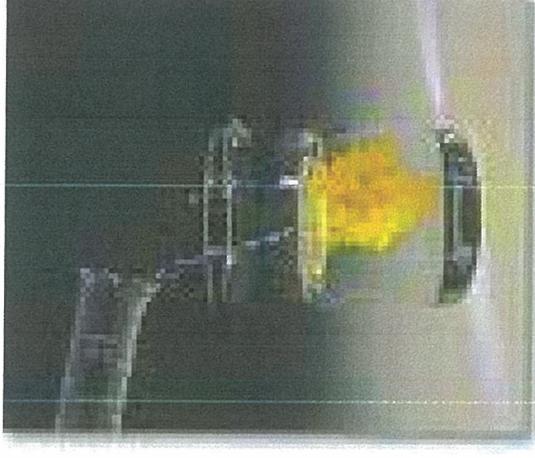
Reactive Filtration

- **Chemical Adsorption**
 - Bonding, chemical interaction
- **Physical Adsorption**
 - Electrostatic, electrokinetic and van der Waals forces
- **Biological Growth**
 - biofilm



Reactive Filtration

- Precipitation
- Ion Exchange
- Adsorption



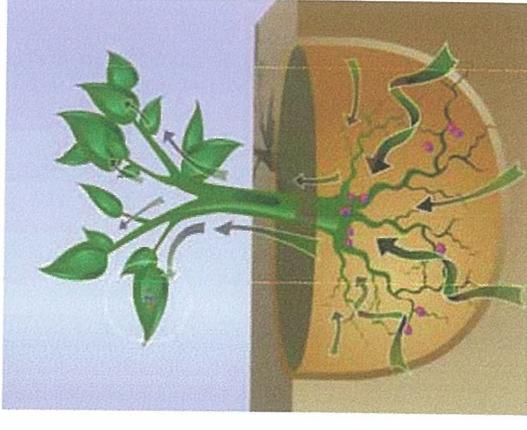
***CEC – quantity of positively-charged ions that can be exchanged or adsorbed**

Microbially-Mediated Transformations

- **Metabolic activity of bacteria, algae and fungus**
- **Root zone**
 - **Biomass - aerobic and anaerobic conditions to promote diverse microbial activity**
 - **Microbes alter pH and redox potential – causes organic chemical degradation, metal precipitation, conversion of pollutants into plant/microbe available forms**

Biological Uptake and Sequestration

- **Removal by plants and microorganisms through nutrient uptake and bioaccumulation**
- **Biomass production – macro and micronutrients**

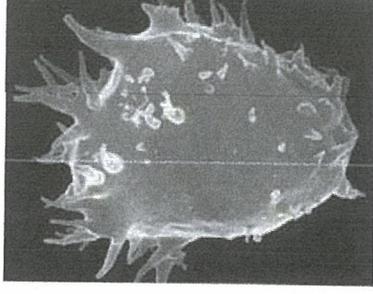
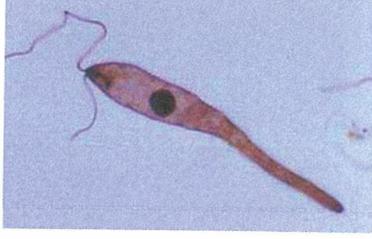
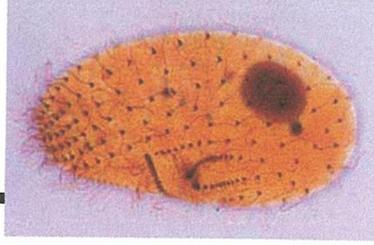


Volatilization

- Vaporization of liquids and solids into atmosphere
- VOCs and SVOCs – petroleum hydrocarbons, gasoline oxygenates, herbicides and pesticides
- Microbial and phytochemical redox transformations

Bacterial Inactivation Processes

- Predation
- Solar irradiation
- Inhospitable growth conditions
- Studies show bioretention provides >90% removal



Soil Processes

- **Evapotranspiration**
- **Weathering**
- **Plant activity**
- **Animal activity**
- **Fungus**



Unit Treatment Summary

| Unit Removal Processes Potentially Provided by Bioretention Systems | Pollutant Removal | | | | | | | Other Performance Factors | | |
|---|------------------------|------------------|--------------------|----------------------|----------|----------------|----------------|------------------------------|------------------|--|
| | Particulates and bound | Dissolved Metals | Dissolved Nitrogen | Dissolved Phosphorus | Bacteria | Oil and Grease | VOCs and SVOCs | Hydraulic Capture Efficiency | Volume Reduction | |
| Inert Filtration | ◆ | ○ | ○ | ○ | ◆ | ◆ | ○ | NA | NA | |
| Reactive Filtration | ○ | ◆ | ◆ | ◆ | ◆ | ○ | ◆ | NA | NA | |
| Microbially-mediated Transformations | § | § | § | § | ○ | § | ○ | NA | NA | |
| Biological Uptake and Storage | ○ | § | § | § | § | § | ○ | NA | NA | |
| Volatilization | ○ | ○ | § | ○ | ○ | ○ | ◆ | NA | NA | |
| Bacterial Inactivation Processes | ○ | ○ | ○ | ○ | § | ○ | § | NA | NA | |
| Soil Processes | § | § | § | § | § | § | § | § | § | |
| Routine Maintenance | ◆ | § | § | § | § | § | § | § | NA | |

◆ Primary removal mechanism in bioretention systems

◆ Generally limited removal mechanism in bioretention systems unless specific design attributes are included

§ Supporting process in well-drained bioretention systems

○ Process with no contribution or unknown contribution to pollutant removal

Components and Unit Treatment Processes

- **Mulch**
 - Inert and reactive filtration
- **Media**
 - Inert and reactive filtration, microbially-mediated transformations, biological uptake and storage and volatilization
- **Vegetation**
 - Microbially-mediated transformations, biological uptake and storage and soil processes

Filterra

Laboratory Testing

- **Flow Rate**
 - 50 and 300 in/hr under heavy and light compaction, respectively
- **TSS**
 - Geosyntec 2006, 90.7%, 50 in/hr
 - Americast 2009, 96.7%, 25-150 in/hr

Filterra

Field Hydraulic Performance

- **Field verification tests – 10 units in 2008 of varying ages (0 to 3 yrs) and maintenance periods (0 to 2 yrs)**
 - 140 in/hr
- **Core samples of 11 different aged systems (6 to 18 mo)**
 - No significant change in PSD or silt/clay, no sig. media degradation, emphasizes roll of mulch

Filterra

Field Water Quality Performance

- Pollutant removal performance quantified based on efficiency ratio
- $EF = 1 - (C_{effluent} / C_{influent})$
- EF = efficiency ratio
- $C_{effluent}$ = mean or median effluent conc.
- $C_{influent}$ = mean or median influent conc.

| Pollutant | n | Median | | Mean | | Effluent < Influent? | Efficiency Ratio | Reference |
|-------------------------|----|------------------------------|------------------------------|------------------------------|------------------------------|----------------------|--------------------|------------------------------|
| | | Influent (mg/L) ^a | Effluent (mg/L) ^a | Influent (mg/L) ^a | Effluent (mg/L) ^a | | | |
| Total Suspended Solids | 11 | 20 | 2.5 U | 28.8 | 5.2 | Yes ^b | 87.5% ^d | TARP |
| | 7 | 63.4 | 11.6 | 66.3 | 11.1 | Yes ^c | 83.3% ^e | TARP Addendum |
| | 34 | 38.0 | 4.1 | 71.0 ^f | 8.3 ^f | Yes ^c | 88.3% ^f | Perf. Over Time |
| | 18 | 36.3 | 4.8 | 68.9 | 7.4 | Yes ^b | 86.9% ^d | Bellingham ^g |
| | 10 | 27.5 | 4.2 | 28.8 | 4.3 | Yes ^c | 85.2% ^e | TAPE ^g |
| Total Phosphorus | 14 | 0.14 | 0.076 | 0.23 | 0.090 | Yes ^c | 59.7% ^f | TARP |
| | 6 | 0.52 | 0.16 | 0.59 | 0.18 | Yes ^c | 69.5% ^f | TARP Addendum |
| | 41 | 0.29 | 0.16 | 1.15 | 0.49 | Yes ^b | 44.8% ^d | Perf. Over Time |
| | 15 | 0.12 | 0.054 | 0.16 | 0.065 | Yes ^b | 56.5% ^d | Bellingham ^h |
| | 12 | 0.15 | 0.14 | 0.19 ^f | 0.17 ^f | No ^c | 8.5% ^f | TAPE ^{hi} |
| Total Kjeldahl Nitrogen | 6 | 1.90 | 1.15 | 2.22 | 1.27 | Yes ^b | 39.5% ^d | TARP |
| Total Copper | 8 | 0.012 | 0.01 U | 0.015 | 0.01 U | No ^c | 33.2% ^f | TARP |
| | 30 | 0.061 | 0.014 | 0.083 | 0.029 | Yes ^b | 76.9% ^d | Perf. Over Time |
| | 29 | 0.0081 | 0.0034 | 0.0082 | 0.0037 | Yes ^b | 58.0% ^d | TAPE |
| Dissolved Copper | 23 | 0.0056 | 0.0033 | 0.0070 ^f | 0.0036 ^f | Yes ^c | 48.0% ^f | TAPE ^j |
| Total Zinc | 16 | 0.039 | 0.02 U | 0.070 | 0.023 | Yes ^b | 48.1% ^d | TARP |
| | 30 | 0.355 | 0.08 | 88.7 | 18.1 | Yes ^b | 78.7% ^d | Perf. Over Time |
| | 29 | 0.384 | 0.102 | 0.516 | 0.230 | Yes ^b | 73.4% ^d | TAPE |
| Dissolved Zinc | 23 | 0.194 | 0.082 | 0.267 ^f | 0.120 ^f | Yes ^c | 54.9% ^f | TAPE ^k |
| Oil & Grease | 20 | 7.0 | 2.9 | 26.8 | 4.2 | Yes ^b | 58.6% ^d | Perf. Over Time ^l |
| TPH | 12 | 43.4 | 1.2 | 55.7 ^f | 2.2 ^f | Yes ^c | 96.1% ^f | TAPE ^m |

International SW BMP Database

- Effluent concentrations for Filterra equivalent or slightly lower than those from biofilters and media filters
- Filterra shows statistically significant removals for a broader range of pollutants than for the biofilter and media filter

| Pollutant | Units | Biofilter | | | Media Filter | | | Filterra® System | | |
|------------------------|-------|----------------|----------------|-----------------------------------|----------------|----------------|-----------------------------------|------------------|----------------|-----------------------------------|
| | | Influent Range | Effluent Range | Effluent < Influent? ^a | Influent Range | Effluent Range | Effluent < Influent? ^a | Influent Range | Effluent Range | Effluent < Influent? ^b |
| Total Suspended Solids | mg/L | 41-63 | 15-33 | Yes | 27-60 | 9.7-22 | Yes | 31-41 | 3.5-5.0 | Yes |
| Total Phosphorus | mg/L | 0.22-0.28 | 0.26-0.41 | No | 0.15-0.26 | 0.11-0.16 | Yes | 0.16-0.25 | 0.08-0.14 | Yes |
| Total Copper | µg/L | 25-39 | 7.7-14 | Yes | 11-18 | 8.2-12 | Yes | 9.3-26 | 4.3-10 | Yes |
| Dissolved Copper | µg/L | 10-18 | 5.7-12 | Yes | 4.6-11 | 7.3-11 | No | 4.5-7.0 | 2.6-3.9 | Yes |
| Total Zinc | µg/L | 128-225 | 28-52 | Yes | 52-132 | 17-59 | Yes | 158-290 | 41-80 | Yes |
| Dissolved Zinc | µg/L | 33-79 | 19-32 | Yes | 38-101 | 29-74 | Yes | 177-322 | 75-110 | Yes |



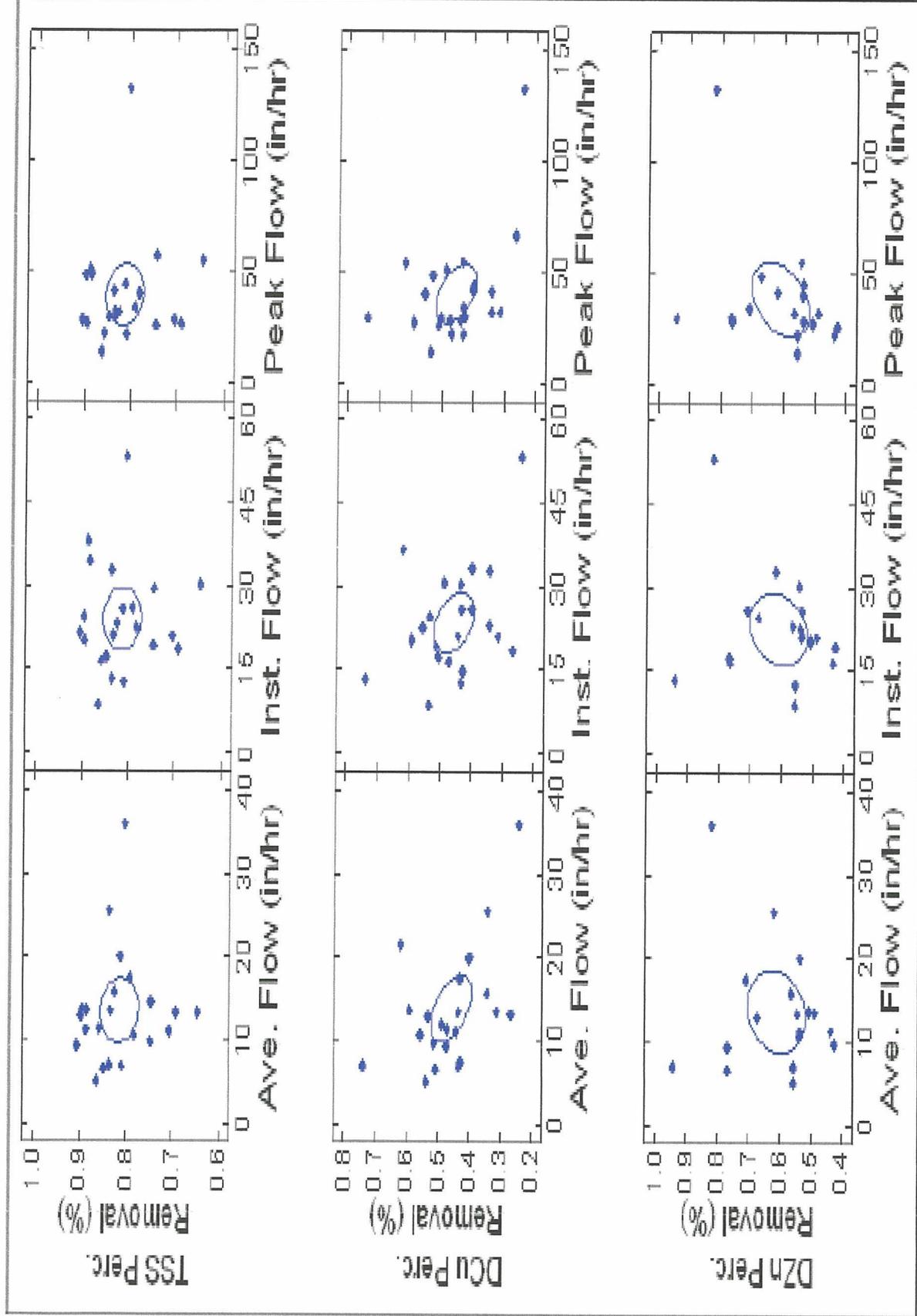
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<http://www.bmpdatabase.org>

Filterra

Evaluation of Hydraulic Loading Rate

- **TAPE Study**
 - **Average hydraulic loading rate**
 - TSS (5 – 36 in/hr), Metals (5 – 55 in/hr)
 - **Peak hydraulic loading rate**
 - TSS and Metals (14 – 133 in/hr)
 - **Avg. instantaneous hydraulic loading rate**
 - TSS (8.6 – 53 in/hr), Metals (8.6 – 81 in/hr)



•No correlation between various hydraulic loading measurements and percent removal

Filterra

Maintenance

- **Filterra will theoretically last indefinitely if routine maintenance is performed**
- **As long as the plant is thriving, the Filterra system should function as designed**
- **Annual maintenance (west coast) and semi-annual (east coast); industrial areas may require more frequent maintenance**
- **Maximum flow rate capacity of 100 to 140 in/hr**

**ATTACHMENT 2
BACKUP FOR PDP
HYDROMODIFICATION CONTROL
MEASURES**

This is the cover sheet for Attachment 2.

Mark this box if this attachment is empty because the project is exempt from PDP hydromodification management requirements.

Indicate which Items are Included:

| Attachment Sequence | Contents | Checklist |
|----------------------|--|--|
| Attachment 2a | Hydromodification Management Exhibit (Required) | <input type="checkbox"/> Included See Hydromodification Management Exhibit Checklist. |
| Attachment 2b | Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual. | <input type="checkbox"/> Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination <input type="checkbox"/> 6.2.1 Verification of Geomorphic Landscape Units Onsite <input type="checkbox"/> 6.2.2 Downstream Systems Sensitivity to Coarse Sediment <input type="checkbox"/> 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite <input type="radio"/> Not Performed |
| Attachment 2c | Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual. | <input type="radio"/> Included <input checked="" type="radio"/> Submitted as separate stand-alone document |
| Attachment 2d | Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP See Chapter 6 and Appendix G of the BMP Design Manual | <input type="radio"/> Included <input checked="" type="radio"/> Submitted as separate stand-alone document <input type="radio"/> Included |
| Attachment 2e | Vector Control Plan (Required when structural BMPs will not drain in 96 hours) | <input checked="" type="radio"/> Not required because BMPs will drain in less than 96 hours |

Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

- Underlying hydrologic soil group
- Approximate depth to groundwater
- Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- Critical coarse sediment yield areas to be protected
- Existing topography
- Existing and proposed site drainage network and connections to drainage offsite
- Proposed grading
- Proposed impervious features
- Proposed design features and surface treatments used to minimize imperviousness
- Point(s) of Compliance (POC) for Hydromodification Management
- Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
- Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)

**ATTACHMENT 3
STRUCTURAL BMP MAINTENANCE
INFORMATION**

This is the cover sheet for Attachment 3.

Indicate which Items are Included:

| Attachment Sequence | Contents | Checklist |
|----------------------|--|---|
| Attachment 3a | Structural BMP Maintenance Thresholds and Actions (Required) | <input checked="" type="checkbox"/> Included See Structural BMP Maintenance Information Checklist. |
| Attachment 3b | Maintenance Agreement (Form DS-3247) (when applicable) | <input type="checkbox"/> Included <input checked="" type="checkbox"/> Not Applicable |

**Use this checklist to ensure the required information has been included in the Structural BMP
Maintenance Information Attachment:**

Preliminary Design / Planning / CEQA level submittal:

- Attachment 3a must identify:
 - Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual
 - Attachment 3b is not required for preliminary design / planning / CEQA level submittal.
-

Operation & Maintenance (OM) Manual v01-FTRD Filterra Roofdrain



filterra[®]

Bioretention Systems
A Growing Idea in Stormwater Filtration.



A Division of:

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Filterra[®] Stormwater Bioretention Filtration System

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Overview

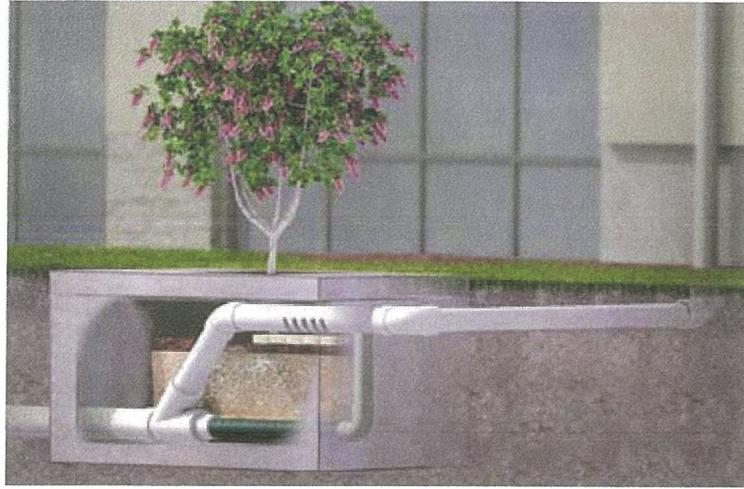
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Filterra® Roofdrain Stormwater Treatment System

A Greenroof at Ground Level™

Filterra® Roofdrain System

The Filterra Roofdrain System treats piped in stormwater runoff from rooftops. Using bioretention filtration the system captures and immobilizes pollutants of concern such as: TSS, nutrients and metals.

Stormwater continues to flow through the media and into the underdrain system, where treated water is discharged. Higher flows bypass the bioretention treatment via an overflow/bypass pipe design.

Features and Benefits

Best Value for Rooftop Treatment.

- compact size
- needs no external bypass
- easy installation
- simple maintenance

Versatile.

Filterra Roofdrain can be used for:

- new construction
- retrofits
- commercial or residential applications.

Filterra Roofdrain can be placed:

- At grade
- Above grade with effluent below grade to meet elevation challenges of high water tables
- Install next to or away from your building

Maintenance. Maintenance is simple and safe (at ground level), and the first year is provided FREE with the purchase of every unit. The procedure is so easy you can perform it yourself.

Protection. The Filterra Roofdrain's hydraulic configuration was tested by the Colorado State University Hydraulics Laboratory.

Below grade treatment using Filterra Roofdrain avoids the slipping hazard liabilities of daylighted roofdrains during freezing weather.

Protect from erosion with Filterra's monolithic water tight design.

Expected Pollutant Removal

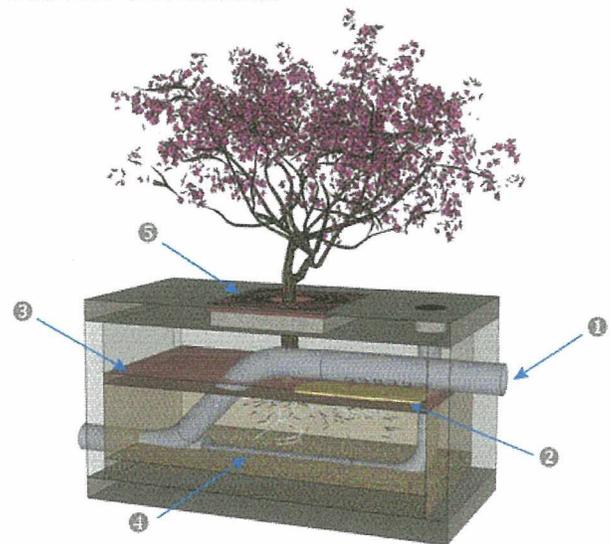
(Ranges Varying with Particle Size, Pollutant Loading and Site Conditions)

| | |
|--------------------|-----------|
| TSS Removal | 85% |
| Phosphorus Removal | 60% - 70% |
| Zinc Removal | > 66% |
| Copper Removal | >58% |
| Nitrogen Removal | 42% - 45% |
| TPH* Removal | > 93% |

*Total Petroleum Hydrocarbons

Information on the pollutant removal efficiency of the filter soil/plant media is based on third party lab and field studies.

Filterra media has been TAPE and TARP tested and approved.



1. Influent Pipe from Roof Leader
2. Erosion Control
3. Protective Mulch Layer
4. Perforated Underdrain for Treatment Flows
5. Cast Iron Tree Grate for Maintenance Access



Filterra® Roofdrain Stormwater Treatment System

A Greenroof at Ground Level™

Design Guidelines

- 1) Use the Filterra Roofdrain Design Guidance as a reference available from design@falterra.com.
- 2) Select Filterra Roofdrain model according to your Regional Sizing Table, and according to the building's roof drainage area and associated roof drain pipe sizes.
- 3) Determine Filterra Roofdrain placement next to a building, or away from your building.
- 4) Ensure piping to and from Filterra Roofdrain system is free-draining at minimum 1% slope, or per local codes.

Placement Review

Because we want your project with Filterra to be a great success, we respectfully require that each Filterra Roofdrain project be reviewed by our placement/design staff. This review is mandatory, as proper placement ensures you of the most efficient and cost effective solution, as well as optimum performance and minimal maintenance

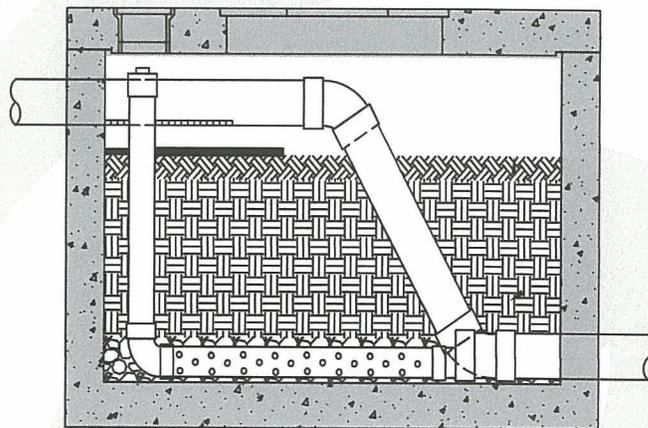
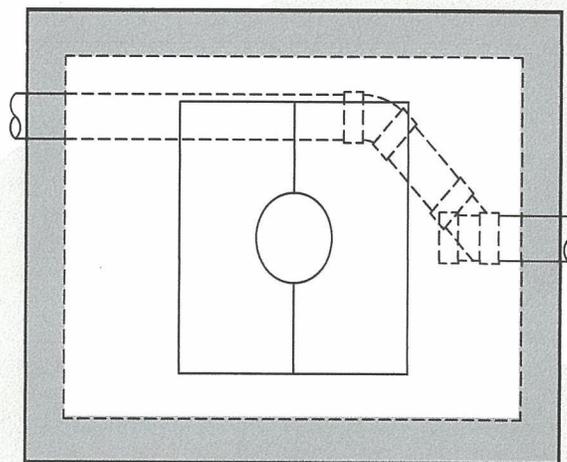
Proper Placement

- 1) Pipe flow of the Filterra Roofdrain System eliminates the cross-linear flow requirements necessary with standard Filterra.
- 2) Filterra Roofdrain Systems should only receive piped in runoff.
- 3) Rooftop drainage should still be designed with emergency bypass relief prior to the Filterra Roofdrain System (e.g.: rooftop scuppers, etc.)

Always follow local plumbing codes for roof drainage requirements.

The Filterra System is not a substitute for rooftop overflow/bypass.

- 4) Send completed project information form along with plans to Filterra for placement and application review.



Filterra Roofdrain System
One pipe in, one pipe out, with internal high-flow bypass.

Western Region Support
34428 Yucaipa Blvd., Suite E-312
Yucaipa, CA 92399

Corporate Headquarters & Eastern Region Support
11352 Virginia Precast Road
Ashland, VA 23005

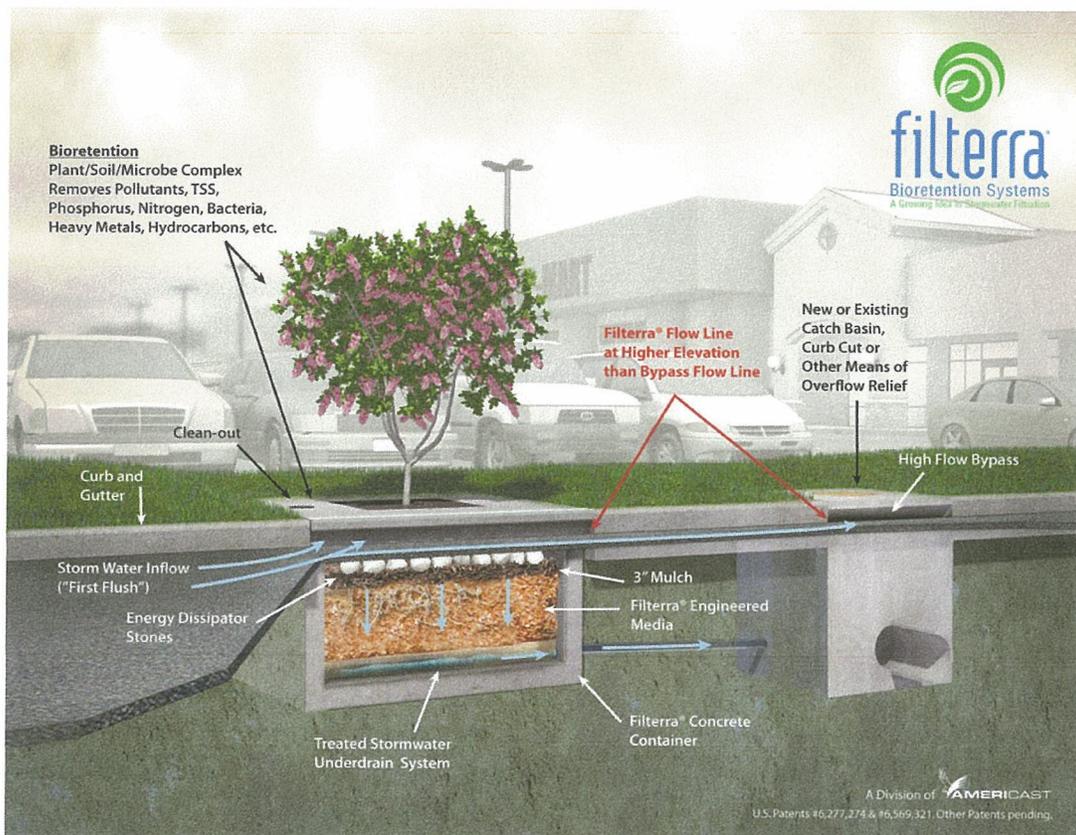
Toll Free: (866) 349-3458 • F: (804) 798-8400

E-mail: design@falterra.com • Web: www.falterra.com

Filterra® is protected by U.S. Patents #6,277,274, #6,569,321 & #7,625,485 B2. Other patents pending.

General Description

The following general specifications describe the general operations and maintenance requirements for the Americast stormwater bioretention filtration system, the Filterra®. The system utilizes physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system is a fully equipped, pre-constructed drop-in place unit designed for applications in the urban landscape to treat contaminated runoff.



Stormwater flows through a specially designed filter media mixture contained in a landscaped concrete container. The mixture immobilizes pollutants which are then decomposed, volatilized and incorporated into the biomass of the Filterra® system's micro/macro fauna and flora. Stormwater runoff flows through the media and into an underdrain system at the bottom of the container, where the treated water is discharged. Higher flows bypass the Filterra® to a downstream inlet or outfall.

Maintenance is a simple, inexpensive and safe operation that does not require confined space access, pumping or vacuum equipment or specialized tools. Properly trained landscape personnel can effectively maintain Filterra® Stormwater systems by following instructions in this manual.



Basic Operations

Filterra[®] is a bioretention system in a concrete box. Contaminated stormwater runoff enters the filter box through the curb inlet spreading over the 3-inch layer of mulch on the surface of the filter media. As the water passes through the mulch layer, most of the larger sediment particles and heavy metals are removed through sedimentation and chemical reactions with the organic material in the mulch. Water passes through the soil media where the finer particles are removed and other chemical reactions take place to immobilize and capture pollutants in the soil media. The cleansed water passes into an underdrain and flows to a pipe system or other appropriate discharge point. Once the pollutants are in the soil, the bacteria begin to break down and metabolize the materials and the plants begin to uptake and metabolize the pollutants. Some pollutants such as heavy metals, which are chemically bound to organic particles in the mulch, are released over time as the organic matter decomposes to release the metals to the feeder roots of the plants and the cells of the bacteria in the soil where they remain and are recycled. Other pollutants such as phosphorus are chemically bound to the soil particles and released slowly back to the plants and bacteria and used in their metabolic processes. Nitrogen goes through a very complex variety of biochemical processes where it can ultimately end up in the plant/bacteria biomass, turned to nitrogen gas or dissolves back into the water column as nitrates depending on soil temperature, pH and the availability of oxygen. The pollutants ultimately are retained in the mulch, soil and biomass with some passing out of the system into the air or back into the water.

Design and Installation

Each project presents different scopes for the use of Filterra[®] systems. To ensure the safe and specified function of the stormwater BMP, Americast reviews each application before supply. Information and help may be provided to the design engineer during the planning process. Correct Filterra[®] box sizing (by rainfall region) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra units as shown in approved plans. A comprehensive installation manual is available at fillterra.com.

Maintenance

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement.

- Avoid legal challenges from your jurisdiction's maintenance enforcement program.
- Prolong the expected lifespan of your Filterra media.
- Avoid more costly media replacement.
- Help reduce pollutant loads leaving your property.

Simple maintenance of the Filterra[®] is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the throat. This may include trash, silt and leaves etc. which will be contained within the void below the top grate and above the mulch layer. Too much silt may inhibit the Filterra's[®] flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.



When to Maintain?

Americast includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of two (2) scheduled visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated for full operation. Full operation is defined as the unit installed, curb and gutter and transitions in place and activation (by Supplier) when mulch and plant are added and temporary throat protection removed.

Activation cannot be carried out until the site is **fully** stabilized (full landscaping, grass cover, final paving and street sweeping completed). Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands. The fall visit helps the system by removing excessive leaf litter.

A first inspection to determine if maintenance is necessary should be performed at least twice annually after every major storm event of greater than (1) one inch total depth (subject to regional climate). Please refer to the maintenance checklist for specific conditions that indicate if maintenance is necessary.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required. Regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the (maintenance) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing).

Exclusion of Services

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra® system.

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur, the Owner must block off the outlet pipe of the Filterra® (where the cleaned runoff drains to, such as drop-inlet) and block off the throat of the Filterra®. The Supplier should be informed immediately.



Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra® and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, trash and mulch
4. Mulch replacement
5. Plant health evaluation and pruning or replacement as necessary
6. Clean area around Filterra®
7. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.).

Most visits require only replacement mulch. Three bags of double shredded mulch are used per unit (on a standard 6x6' size). Some visits may require additional Filterra® engineered soil media available from the Supplier.

Variables for Roofdrain Filterra from Standard Filterra

The Roofdrain Filterra model has a few variations from standard units to accommodate during maintenance.

The Roofdrain model comprises the same underdrain, Filterra media and mulch as a standard system (see drawing detail at end of this document). Consequently, only the mulch needs replacing as per standard requirements listed and photographed following this page.

The differences are that the mulch is held down by a plastic mesh to reduce floating (see photo) and this will need removing before mulch can be removed and replaced. Also the erosion control stones in the throat of a standard unit are replaced in the Roofdrain model by four to eight small paving slabs under the inlet flow pipe (see photo). These splash blocks are simple to remove and replace after the mulch replacement. All other procedures follow the same manner as standard units.

Internal Photo of Filterra Roofdrain showing Paving Slabs and Plastic Mesh



Maintenance Visit Procedure



1. Inspection of Filterra® and surrounding area

- Record individual unit **before** maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

| | |
|-------------------------|----------|
| Standing Water | yes no |
| Damage to Box Structure | yes no |
| Damage to Grate | yes no |
| Is Bypass Clear | yes no |

If yes answered to any of these observations, record with close-up photograph (numbered).



2. Removal of tree grate and erosion control stones

- Remove metal grates for access into Filterra® box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

Record on Maintenance Report the following:

| | |
|----------------------|----------|
| Silt/Clay | yes no |
| Cups/ Bags | yes no |
| Leaves | yes no |
| # of Buckets Removed | |



3. Removal of debris, trash and mulch

- After removal of mulch and debris, measure distance from the top of the Filterra® engineered media soil to the bottom of the top slab. If this distance is greater than 12", add Filterra® media (not top soil or other) to recharge to a 9" distance.

Record on Maintenance Report the following:

| | |
|---|--|
| Distance to Bottom of Top Slab (inches) | |
| # of Buckets of Media Added | |

Filterra® Stormwater Bioretention Filtration System

toll free: (866) 349 3458 | fax: (804) 798 8400 | maintenance@filterra.com | filterra.com



4. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 3”.
- Ensure correct repositioning of erosion control stones by the Filterra® inlet to allow for entry of trash during a storm event.
- Replace Filterra® grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.



5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant’s health and replace if dead.
- Prune as necessary to encourage growth in the correct directions

Record on Maintenance Report the following:

| | |
|-----------------------|--------------|
| Height above Grate | (feet) |
| Width at Widest Point | (feet) |
| Health | alive dead |
| Damage to Plant | yes no |
| Plant Replaced | yes no |



6. Clean area around Filterra®

- Clean area around unit and remove all refuse to be disposed of appropriately.



7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Americast during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

| Drainage System Failure | Problem | Conditions to Check For | Conditions That Should Exist | Actions |
|-------------------------|--|---|---|---|
| Inlet | Excessive sediment or trash accumulation | Accumulated sediments or trash impair free flow of water into Filterra | Inlet should be free of obstructions allowing free distributed flow of water into Filterra. | Sediments and/or trash should be removed. |
| Mulch Cover | Trash and floatable debris accumulation | Excessive trash and/or debris accumulation. | Minimal trash or other debris on mulch cover. | Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used. |
| Mulch Cover | "Ponding" of water on mulch cover. | "Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils. | Stormwater should drain freely and evenly through mulch cover. | Recommend contact manufacturer and replace mulch as a minimum. |
| Vegetation | Plants not growing or in poor condition. | Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants. | Plants should be healthy and pest free. | Contact manufacturer for advice. |
| Vegetation | Plant growth excessive | Plants should be appropriate to the species and location of Filterra. | | Trim/prune plants in accordance with typical landscaping and safety needs. |
| Structure | Structure has visible cracks | Cracks wider than ½ inch or evidence of soil particles entering the structure through the cracks. | | Vault should be repaired. |

Maintenance is ideally to be performed twice annually.
 Inspection to be performed after every major storm event >1 inch total depth, subject to climate.

Filterra® Stormwater Bioretention Filtration System

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Filterra® Project Maintenance Order

Project

Address

Directions

Project

Company

Owner

Contact Name

Telephone #

Owner Notified

of Mtce on (date)

Filterra Units on this Order
Total Units on this Project

==
==

Date of Maintenance

Arrival Time

Departure Time

of Workers

Notes on Project

Maintenance Supervisor

Filterra® Structure Maintenance Report

| | | | |
|------------|----------------------|------------------|----------------------|
| Project | <input type="text"/> | Structure Number | <input type="text"/> |
| Plant Type | <input type="text"/> | Structure Size | <input type="text"/> |
| Date | <input type="text"/> | GPS | <input type="text"/> |
| | | Pre Mtce Photo # | <input type="text"/> |

Initial Observations

| | | | |
|---|---|-----------------|---|
| Standing Water | <input type="text"/> Y <input type="text"/> N | Damage to Grate | <input type="text"/> Y <input type="text"/> N |
| IF Yes, STOP NOW & call 804-798-6068 | | Is Bypass Clear | <input type="text"/> Y <input type="text"/> N |
| Damage to Box Structure | <input type="text"/> Y <input type="text"/> N | Notes | |
| If YES to any observation take close up photo | | | |

Waste

| | | | |
|-------------|---|------------------------|----------------------|
| Silt / Clay | <input type="text"/> Y <input type="text"/> N | Buckets Removed (# of) | <input type="text"/> |
| Cups/Bags | <input type="text"/> Y <input type="text"/> N | Notes | |
| Leaves | <input type="text"/> Y <input type="text"/> N | | |
| Other | <input type="text"/> | | |

Media

| | | | |
|--------------------------------------|----------------------|-------|--|
| Distance to Bottom of Top Slab (in.) | <input type="text"/> | Notes | |
| Buckets of Media Added (# of) | <input type="text"/> | | |

Mulch

| | | | |
|------------------|---|----------------------------|----------------------|
| Netting Replaced | <input type="text"/> Y <input type="text"/> N | Bags of Mulch Added (# of) | <input type="text"/> |
| Stones Replaced | <input type="text"/> Y <input type="text"/> N | Notes | |

Plant

| | #1 | (#2) | | #1 | (#2) |
|--|---|---|----------------|---|---|
| Height above Grate (feet) | <input type="text"/> | <input type="text"/> | Plant Replaced | <input type="text"/> Y / <input type="text"/> N | <input type="text"/> Y / <input type="text"/> N |
| Width at Widest Point (feet) | <input type="text"/> | <input type="text"/> | Notes | | |
| Health | Alive/Dead | Alive/Dead | | | |
| Damage to Plant | <input type="text"/> Y / <input type="text"/> N | <input type="text"/> Y / <input type="text"/> N | | | |
| If YES to plant damage take close up photo | | | | | |

Other Notes

(use back if necessary)



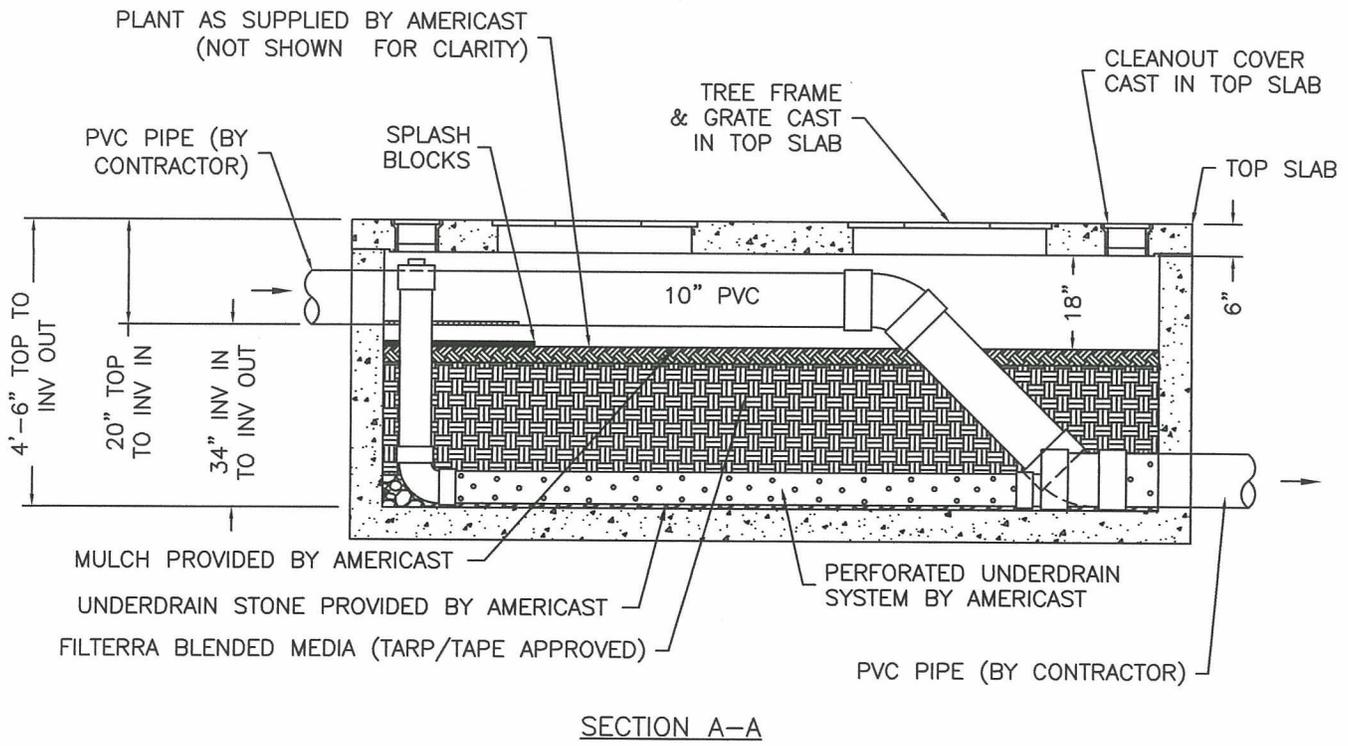
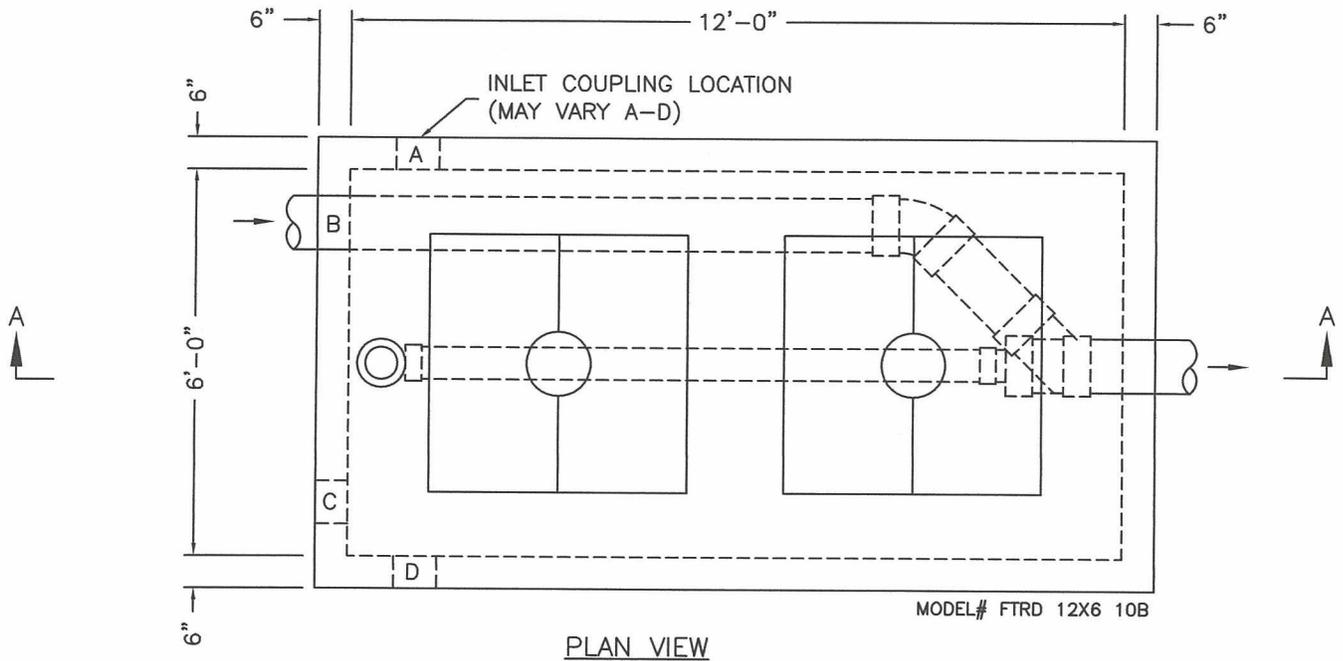
Filterra[®] Warranty

Seller warrants goods sold hereunder against defects in materials and workmanship only, for a period of (1) year from date the Seller activates the system into service. Seller makes no other warranties, express or implied.

Seller's liability hereunder shall be conditioned upon the Buyer's installation, maintenance, and service of the goods in strict compliance with the written instructions and specifications provided by the Seller. Any deviation from Seller's instructions and specifications or any abuse or neglect shall void warranties.

In the event of any claim upon Seller's warranty, the burden shall be upon the Buyer to prove strict compliance with all instructions and specifications provided by the Seller.

Seller's liability hereunder shall be limited only to the cost or replacement of the goods. Buyer agrees that Seller shall not be liable for any consequential losses arising from the purchase, installation, and/or use of the goods.



MODIFICATIONS OF DRAWINGS ARE ONLY PERMITTED BY WRITTEN AUTHORIZATION FROM FILTERRA

DRAWING AVAILABLE IN TIF FILE FORMAT.



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DATE: 02-01-10

DWG: FTRD 12x6 10

**12x6' PRECAST FILTERRA® UNIT
ROOF DRAIN CONFIGURATION
WITH 10" PVC PIPED IN**



| Common Name | Latin Name | Plant Type | Sun | Hardy Range | Height | Spread | Sizing | Region Availability |
|-------------------------------------|--|------------|---------------------------|-------------|-----------|-----------|--------|------------------------------------|
| Beautyberry | <i>Calliandra americana</i> | Deciduous | Partial Shade to Full Sun | 7A - 10B | 4' - 8' | 6' - 7' | L | MA, NW, SE, SC, NoCA, SoCA |
| Blue Palo Verde | <i>Parkinsonia floridum</i> | Deciduous | Full Sun | 8A - 11 | 10' - 20' | 15' | XL | NW, SC, NoCA, SoCA |
| Ceanothus, Big-pod | <i>Ceanothus megacarpus</i> | Deciduous | Partial Shade to Full Sun | 7A - 10B | 4' - 8' | 6' - 7' | L | SoCA |
| Chokeberry, Black | <i>Aronia melanocarpa</i> | Deciduous | Full Shade to Full Sun | 3B - 8B | 3' - 6' | 4' - 6' | M | GL, MA, NE, NW, SE, NoCA, SoCA |
| Chokeberry, Red | <i>Aronia arbutifolia</i> | Deciduous | Partial Shade to Full Sun | 4B - 9A | 6' - 10' | 4' - 6' | M | GL, MA, NE, NW, SE, NoCA, SoCA |
| Coyote Brush | <i>Baccharis pilularis ssp. Consanguinea</i> | Deciduous | Partial Shade to Full Sun | 5A - 10A | 4' - 6' | 6' - 8' | L | NoCA, SoCA |
| Crabapple, American | <i>Malus coronaria</i> | Deciduous | Full Sun | 3B - 8A | 15' - 25' | 10' - 25' | Tree | GL, MA, NE, NW, SE, NoCA, SoCA |
| Crape Myrtle | <i>Lagerstroemia indica</i> | Deciduous | Full Sun | 7A - 9A | 15' - 25' | 15' - 25' | Tree | MA, NW, SC, SE, NoCA, SoCA |
| Elderberry, American | <i>Sambucus canadensis</i> | Deciduous | Partial Shade to Full Sun | 4A - 9B | 10' - 15' | 6' - 10' | L | GL, GP, MA, NW, SC, SE, NoCA, SoCA |
| Elderberry, Mexican | <i>Sambucus mexicana 'Blue Elderberry'</i> | Deciduous | Partial Shade to Full Sun | 7B - 10A | 8' - 15' | 15' | XL | NoCA, SoCA |
| Four-wing Salibush | <i>Atriplex canescens</i> | Deciduous | Partial Shade to Full Sun | 8A - 11 | 4' - 6' | 10' | L | SC, SoCA |
| Fringe Tree, Chinese | <i>Chionanthus retusus</i> | Deciduous | Full Shade to Full Sun | 5B - 9A | 15' - 25' | 10' - 15' | Tree | GL, MA, NW, NE, SC, SE, NoCA, SoCA |
| Holly, Winterberry | <i>Ilex verticillata</i> | Deciduous | Partial Shade to Full Sun | 3B - 9A | 6' - 10' | 8' - 15' | L | GL, GP, MA, NW, SC, SE, NoCA, SoCA |
| Lilac, Dwarf | <i>Syringa meyeri</i> | Deciduous | Full Sun | 3B - 8A | 5' - 8' | 8' - 10' | L | GL, MA, NE, NW, SC, SE, NoCA, SoCA |
| Magnolia, Galaxy | <i>Magnolia x 'Galaxy'</i> | Deciduous | Partial Shade to Full Sun | 5A - 8B | 15' - 20' | 15' - 25' | Tree | GL, MA, NE, NW, SC, SE, NoCA, SoCA |
| Magnolia, Saucer | <i>Magnolia x soulangiana</i> | Deciduous | Partial Shade to Full Sun | 5A - 9A | 15' - 25' | 15' - 25' | Tree | MA, NE, NW, SC, SE, NoCA, SoCA |
| Plum, Purpleleaf 'Krauter Vesuvius' | <i>Prunus cerasifera 'Krauter Vesuvius'</i> | Deciduous | Full Sun | 5B - 8A | 15' - 25' | 15' - 25' | Tree | NW, SoCA |
| Redbud, Eastern | <i>Cercis canadensis</i> | Deciduous | Partial Shade to Full Sun | 4B - 9A | 15' - 25' | 15' - 25' | Tree | GL, GP, MA, NE, NW, SE, NoCA, SoCA |
| Redbud, Mexican | <i>Cercis canadensis</i> | Deciduous | Partial Shade to Full Sun | 6B - 8A | 15' - 20' | 10' - 15' | XL | SC, SoCA |
| Redbud, Western | <i>Cercis occidentalis</i> | Deciduous | Partial Shade to Full Sun | 5A - 9A | 8' - 20' | 10' | L | NW, NoCA, SC, NoCA, SoCA |
| Smoke tree | <i>Cotinus coggygria</i> | Deciduous | Full Sun | 5A - 8A | 10' - 15' | 15' - 25' | Tree | GL, MA, NW, SE, SoCA |
| Sugar Bush, Sugar Sumac | <i>Rhus ovata</i> | Deciduous | Partial Shade to Full Sun | 8A - 11 | 8' - 15' | 10' | L | NW, NoCA, SoCA |
| Sweetshrub | <i>Calycanthus floridus</i> | Deciduous | Full Shade to Full Sun | 5B - 10A | 6' - 10' | 6' - 12' | L | GL, MA, NW, SC, SE, NoCA, SoCA |
| Willow, Desert | <i>Chilopsis linearis</i> | Deciduous | Full Sun | 7A - 11 | 15' - 25' | 15' - 25' | Tree | NoCA, SoCA |
| Acacia, Bailey's Purple | <i>Acacia baileyana 'Purpurea'</i> | Evergreen | Full Sun | 10B - 11 | 15' - 20' | 20' - 30' | Tree | NoCA, SoCA |

| Common Name | Latin Name | Plant Type | Sun | Hardy Range | Height | Spread | Sizing | Region Availability |
|---------------------------|--|------------|---------------------------|-------------|-----------|-----------|--------|--------------------------------|
| After Dark Peppermint | <i>Agonis flexuosa</i> "Jervis Bay Afterdark" | Evergreen | Full Sun | 10 - 11 | 15' - 18' | 10' - 15' | XL | SoCA |
| Bottlebrush, Lemon | <i>Callistemon citrinus</i> | Evergreen | Full Sun | 9A - 11 | 10' - 15' | 10' - 15' | XL | SE, SoCA |
| Bottlebrush, Weeping | <i>Callistemon viminalis</i> | Evergreen | Full Sun | 9B - 11 | 15' - 25' | 15' - 25' | Tree | SoCA |
| Camellia, Japanese | <i>Camellia japonica</i> | Evergreen | Partial Shade to Full Sun | 7A - 9A | 10' - 15' | 6' - 10' | L | MA, NW, SC, SE, NoCA, SoCA |
| Gold Medallion Shrub Form | <i>Cassia leptophylla</i> | Evergreen | Partial Shade | 7A - 9A | 10' - 15' | 6' - 10' | L | SoCA |
| Hawthorn, Indian | <i>Raphiolepis indica</i> | Evergreen | Partial Shade to Full Sun | 8A - 11 | 4' - 10' | 3' - 10' | L | NW, SC, SE, NoCA, SoCA |
| Hawthorn, Yedda | <i>Raphiolepis umbellata</i> 'Majestic Beauty' | Evergreen | Partial Shade to Full Sun | 8A - 10A | 8' - 10' | 8' - 10' | L | SC, SE, NoCA, SoCA |
| Holly, Chinese | <i>Ilex cornuta</i> | Evergreen | Partial Shade to Full Sun | 7A - 9A | 15' - 25' | 15' - 25' | Tree | MA, NE, NW, SE, NoCA, SoCA |
| Holly, Foster's | <i>Ilex x attenuata</i> 'Fosteri' | Evergreen | Partial Shade to Full Sun | 6A - 9A | 20' - 25' | 6' - 10' | L | MA, NE, NW, SC, SE, NoCA, SoCA |
| Holly, Nellie Stevens | <i>Ilex x</i> | Evergreen | Partial Shade to Full Sun | 6A - 9A | 15' - 25' | 6' - 10' | L | MA, NE, NW, SC, SE, NoCA, SoCA |
| Holly, San Jose | <i>Ilex x aquipernyi</i> | Evergreen | Full Shade to Full Sun | 5B - 9A | 15' - 20' | 10' - 15' | XL | NW, SC, NoCA, SoCA |
| Holly, Yaupon | <i>Ilex vomitoria</i> | Evergreen | Full Shade to Full Sun | 7A - 10A | 15' - 18' | 10' - 15' | XL | MA, NW, SC, SE, NoCA, SoCA |
| Japanese Privet | <i>Ligustrum japonicum</i> | Evergreen | Partial Shade to Full Sun | 7B - 10B | 12' - 18' | 15' - 25' | Tree | NW, SC, NoCA, SoCA |
| Juniper, Blue Point | <i>Juniperus chinensis</i> | Evergreen | Partial Shade to Full Sun | 4A - 10A | 8' - 12' | 4' - 6' | M | GP, SoCA |
| Juniper, California | <i>Juniperus californica</i> | Evergreen | Partial Shade to Full Sun | 8A - 10A | 8' - 12' | 6' | L | SC, NoCA, SoCA |
| Lemon Scented Tea | <i>Leptospermum petersonii</i> | Evergreen | Full Sun | 9B - 10 | 12 - 20' | 8' - 12' | XL | SoCA |
| Manzanita, Bigberry | <i>Arctostaphylos glauca</i> | Evergreen | Partial Shade to Full Sun | 7A - 11 | 6' - 15' | 8' - 10' | L | NoCA, SoCA |
| Manzanita, Del Mar | <i>Grandulosa</i> ssp. <i>Crassifolia</i> | Evergreen | Partial Shade to Full Sun | 8A - 11 | 6' - 15' | 8' - 10' | L | SC, NoCA, SoCA |
| Manzanita, Howard McMinn | <i>Arctostaphylos densiflora</i> | Evergreen | Partial Shade to Full Sun | 8A - 11 | 4' - 6' | 6' | M | SC, NoCA, SoCA |
| Mock Orange | <i>Pittosporum tobira</i> | Evergreen | Partial Shade to Full Sun | 8A - 11 | 6' - 10' | 10' - 15' | XL | NW, SC, NoCA, SoCA |
| Narrowleaf Pittosporum | <i>Pittosporum Phillyreoides</i> | Evergreen | Partial Shade to Full Sun | 9A - 11 | 20' - 30' | 15' - 20' | Tree | NoCA, SoCA |
| Oleander, Rose Bay | <i>Nerium oleander</i> | Evergreen | Full Sun | 9A - 11 | 10' - 15' | 10' - 15' | XL | SoCA |
| Olive, Fruitless | <i>Olea europaea</i> 'Fruitless' | Evergreen | Full Sun | 8A - 11 | 15' - 25' | 15' - 20' | Tree | SoCA |
| Osmanthus, Sweet | <i>Osmanthus, fragrans</i> | Evergreen | Partial Shade to Full Sun | 7B - 9A | 15' - 25' | 15' - 25' | Tree | SoCA |
| Pittosporum Kohuhu | <i>Pittosporum tenuifolium</i> | Evergreen | Partial Shade to Full Sun | 9A-10B | 12' - 20' | 6' - 15' | XL | NoCA, SoCA |

| Common Name | Latin Name | Plant Type | Sun | Hardy Range | Height | Spread | Sizing | Region Availability |
|--------------------------|----------------------------------|------------|---------------------------|-------------|-----------|-----------|--------|----------------------------|
| Powderpuff | <i>Calliandra haematocephala</i> | Evergreen | Partial Shade to Full Sun | 9B-11 | 10' - 15' | 10' - 15' | XL | SoCA |
| Powderpuff, Pink | <i>Calliandra surinamensis</i> | Evergreen | Partial Shade to Full Sun | 10A-11 | 12' - 15' | 12' - 15' | XL | SoCA |
| Strawberry Tree | <i>Abutilon</i> | Evergreen | Partial Shade to Full Sun | 7B - 11 | 15' - 25' | 15' - 25' | Tree | SC, SE, NoCA, SoCA |
| Sumac, African | <i>Rhus lancea</i> | Evergreen | Partial Shade to Full Sun | 8B-11 | 15' - 20' | 15' - 20' | Tree | SoCA |
| Sumac, Lemonade Berry | <i>Rhus integrifolia</i> | Evergreen | Partial Shade to Full Sun | 9B-11 | 6' - 10' | 10' - 15' | XL | SoCA |
| Toyon | <i>Heteromeles arbutifolia</i> | Evergreen | Partial Shade to Full Sun | 8B-10B | 8' - 15' | 15' | XL | SC, NoCA, SoCA |
| Trumpet Tree | <i>Tabebuia impetiginosa</i> | Evergreen | Full Sun | 9B-11 | 15' - 20' | 15' - 20' | Tree | SoCA |
| Wax Myrtle, Pacific | <i>Myrica californica</i> | Evergreen | Partial Shade to Full Sun | 7B - 11 | 15' - 25' | 15' - 25' | Tree | NW, SC, NoCA, SoCA |
| Wax Myrtle, Southern | <i>Myrica cerifera</i> | Evergreen | Partial Shade to Full Sun | 7B - 11 | 15' - 25' | 15' - 25' | Tree | MA, NW, SC, SE, NoCA, SoCA |
| Yellow-wood, Long Leafed | <i>Podocarpus henkelii</i> | Evergreen | Partial Shade to Full Sun | 9A-11 | 15' - 25' | 8' - 15' | XL | SoCA |

Notes:

1. The species listed are drought tolerant and have applicability to bioretention due to shallow root zones.
2. The plants highlighted in green are typically more readily available in the noted regions as the listed species or another similar cultivar.
3. This list is subject to availability and Contech reserves the right to make appropriate substitutions when necessary.
4. For species not listed, please contact Contech for suitability.

Final Design level submittal:

Attachment 3a must identify:

- Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
- How to access the structural BMP(s) to inspect and perform maintenance
- Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
- Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
- Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
- When applicable, frequency of bioretention soil media replacement.
- Recommended equipment to perform maintenance
- When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For private entity operation and maintenance, Attachment 3b must include a Storm Water Management and Discharge Control Maintenance Agreement (Form DS-3247). The following information must be included in the exhibits attached to the maintenance agreement:

- Vicinity map
- Site design BMPs for which DCV reduction is claimed for meeting the pollutant control obligations.
- BMP and HMP location and dimensions
- BMP and HMP specifications/cross section/model
- Maintenance recommendations and frequency
- LID features such as (permeable paver and LS location, dim, SF).



THE CITY OF SAN DIEGO
 RECORDING REQUESTED BY:
THE CITY OF SAN DIEGO
 AND WHEN RECORDED MAIL TO:

(THIS SPACE IS FOR THE RECORDER'S USE ONLY)

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT

APPROVAL NUMBER:

ASSESSOR'S PARCEL NUMBER:

PROJECT NUMBER:

This agreement is made by and between the City of San Diego, a municipal corporation [City] and

the owner or duly authorized representative of the owner [Property Owner] of property located at:

(PROPERTY ADDRESS)

and more particularly described as:

(LEGAL DESCRIPTION OF PROPERTY)

in the City of San Diego, County of San Diego, State of California.

Property Owner is required pursuant to the City of San Diego Municipal Code, Chapter 4, Article 3, Division 3, Chapter 14, Article 2, Division 2, and the Land Development Manual, Storm Water Standards to enter into a Storm Water Management and Discharge Control Maintenance Agreement [Maintenance Agreement] for the installation and maintenance of Permanent Storm Water Best Management Practices [Permanent Storm Water BMP's] prior to the issuance of construction permits. The Maintenance Agreement is intended to ensure the establishment and maintenance of Permanent Storm Water BMP's onsite, as described in the attached exhibit(s), the project's Storm Water Quality Management Plan [SWQMP] and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s):

Property Owner wishes to obtain a building or engineering permit according to the Grading and/or Improvement Plan Drawing No(s) or Building Plan Project No(s):

Continued on Page 2

NOW, THEREFORE, the parties agree as follows:

1. Property Owner shall have prepared, or if qualified, shall prepare an Operation and Maintenance Procedure [OMP] for Permanent Storm Water BMP's, satisfactory to the City, according to the attached exhibit(s), consistent with the Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s):_____
2. Property Owner shall install, maintain and repair or replace all Permanent Storm Water BMP's within their property, according to the OMP guidelines as described in the attached exhibit(s), the project's WQTR and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s)_____.
3. Property Owner shall maintain operation and maintenance records for at least five (5) years. These records shall be made available to the City for inspection upon request at any time.

This Maintenance Agreement shall commence upon execution of this document by all parties named hereon, and shall run with the land.

Executed by the City of San Diego and by Property Owner in San Diego, California.

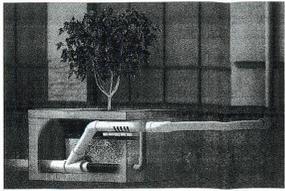
See Attached Exhibits(s):

| | |
|-----------------------------|-----------------------------------|
| _____ | THE CITY OF SAN DIEGO |
| (Owner Signature) | APPROVED: |
| _____ | _____ |
| (Print Name and Title) | (City Control engineer Signature) |
| _____ | _____ |
| (Company/Organization Name) | (Print Name) |
| _____ | _____ |
| (Date) | (Date) |

NOTE: ALL SIGNATURES MUST INCLUDE NOTARY ACKNOWLEDGMENTS PER CIVIL CODE SEC. 1180 ET.SEQ

ATTACHMENT 4
COPY OF PLAN SHEETS SHOWING
PERMANENT STORM WATER BMPS

This is the cover sheet for Attachment 4.



Filterra® Roofdrain Stormwater Treatment System
A Greenroof at Ground Level™



Filterra® Roofdrain System

The Filterra Roofdrain System treats piped in stormwater runoff from rooftops. Using bioretention filtration, the system captures and immobilizes pollutants of concern such as TSS, nutrients and metals. Stormwater continues to flow through the media and into the under drain system, where treated water is discharged. Higher flows bypass the bioretention treatment via an overflow bypass pipe design.

Features and Benefits

- Best Value for Rooftop Treatment.**
- compact size
 - needs no external bypass
 - easy installation
 - simple maintenance

Versatile.

- Filterra Roofdrain can be used for:
- new construction
 - retrofits
 - commercial or residential applications.

Filterra Roofdrain can be placed:

- At grade
- Above grade with effluent below grade to meet elevation challenges of high water tables
- Install next to or away from your building

Maintenance. Maintenance is simple and safe (at ground level), and the first year is provided FREE with the purchase of every unit. The procedure is so easy you can perform it yourself.

Protection. The Filterra Roofdrain's hydraulic configuration was tested by the Colorado State University Hydraulics Laboratory.

Below grade treatment using Filterra Roofdrain avoids the slipping hazard liabilities of daylighted roof drains during freezing weather.

Protect from erosion with Filterra's monolithic tight water design.

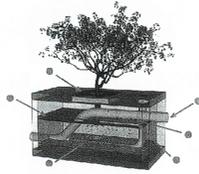
Expected Pollutant Removal
(Ranges Varying with Particle Size, Pollutant Loading and Site Conditions)

| | |
|--------------------|-----------|
| TSS Removal | 85% |
| Phosphorus Removal | 60% - 70% |
| Zinc Removal | > 66% |
| Copper Removal | > 58% |
| Nitrogen Removal | 43% |
| Oil & Grease | > 93% |

Total Retention Hydroflow™

Information on the pollutant removal efficiency of the filter soil/plant media is based on third party lab and field studies.

Filterra media has been TAPE and TARP tested and approved.



- Influent Pipe from Roof Leader
- Pipe slots allow treatment flow to media surface
- Erosion Control
- Perforated Underdrain for Treatment Flows
- Protective Mulch Layer
- Cast Iron Tree Grate for Maintenance Access



Filterra® Roofdrain Stormwater Treatment System
A Greenroof at Ground Level™

Design Guidelines

- Use the Filterra Roofdrain Design Guidance as a reference available from design@filterra.com.
- Select Filterra Roofdrain model according to your Regional Sizing Table, and according to the building's roof drainage area and associated roof drain pipe sizes.
- Determine Filterra Roofdrain placement next to a building, or away from your building.
- Ensure piping to and from Filterra Roofdrain system is free-draining at minimum 1% slope, or per local codes.

Placement Review

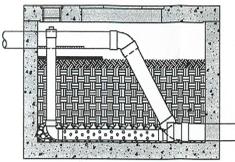
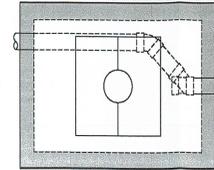
Because we want your project with Filterra to be a great success, we respectfully require that each Filterra Roofdrain project be reviewed by our placement/design staff. This review is mandatory, as proper placement ensures you of the most efficient and cost effective solution, as well as optimum performance and minimal maintenance.

Proper Placement

- Pipe flow of the Filterra Roofdrain System eliminates the cross-linear flow requirements necessary with standard Filterra.
- Filterra Roofdrain Systems should only receive piped in runoff.
- Rooftop drainage should still be designed with emergency bypass relief prior to the Filterra Roofdrain System (e.g.: rooftop scuppers, etc.)

Always follow local plumbing codes for roof drainage requirements. The Filterra System is not a substitute for rooftop overflow/bypass.

- Send completed project information form along with plans to Filterra for placement and application review.



Filterra Roofdrain System
One pipe in, one pipe out, with internal high-flow bypass.

Western Region Support: 14635 Tucson Blvd., Suite 1121, Tucson, CA 95739
Tel: (860) 343-3454 • Fax: (860) 790-8400
E-mail: design@filterra.com • Web: www.filterra.com
Corporate Headquarters & Eastern Region Support: 11320 Springwood Road, Atlanta, GA 30305
Filterra® is protected by U.S. Patents #6,277,274, #6,568,331, #7,427,625, #65. Other patents pending.
©2011 by Filterra® Bioretention Systems. Filterra® is a division of

FILTERRA BIOFILTRATION DETAILS

hayer architecture
 445 Marine View Avenue
 Suite 280
 Del Mar, CA 92014
 t 658 792 2800
 f 658 792 2802
 arch@hayerarchitecture.com

ANTHONY K. CHRISTENSEN
 ROE 04081
 EXP. 12-31-17
 Date: JULY 27, 2016



| | |
|---|--|
| PREPARED BY HAYER ARCHITECTURE Contact: William S. Hayer 445 Marine View Avenue Suite 280 Del Mar, CA 92014 (658) 792-2800 whayer@hayerarchitecture.com PROJECT CONSULTANTS Civil Engineer: CHRISTENSEN ENGINEERING 7888 Silverton Ave., Suite J San Diego, CA 92126 (658) 271-6901 Geotechnical Engineer: CONSTRUCTION TESTING & ENG. 1441 Montiel Road, Suite 115 Escondido, CA 92026 (760) 746-6556 Surveyor: K & S ENGINEERING, INC. 7801 Mission Center Court, Suite 100 San Diego, CA 92108 (619) 299-5565 | KEY PLAN NTS MAP NORTH NTS |
| PROJECT ADDRESS 8488 El Paseo Grande La Jolla, CA 92037 PROJECT OWNER Joseph & Michelle Cardenas ASSESSOR'S PARCEL NO.: 346-050-02-00 LEGAL DESCRIPTION: LOT 2 OF OCEAN TERRACE MAP 2815, CITY SAN DIEGO, COUNTY SAN DIEGO BENCHMARK: City of San Diego Benchmark SSP at El Paseo Grande & Paseo del Ocaso Record from City of San Diego. Elevation = 31.722 MSL Datum: NGVD 1928 PROJECT NO.: No. - PTS 446629 PROJECT NAME: CARDENAS RESIDENCE SHEET TITLE: GRADING & DRAINAGE DETAILS SHEET NUMBER: | PROJECT DATA Construction: VB Sprinklered Occupancy: R-3 S.F.R. Code: 2013 Edition-C.R.C. Zoning: La Jolla Shores SF No. of Stories: 2 Stories Gross Site Area: 11,878.7 sf. LDP Gross Area: 6,698 sf. F.A.R.: 0.265 Geo Hazard Area: 48 & 7E Landscape Area: 4,282 sf. |
| OVERLAY ZONES City Coastal Overlay Zone Coastal Height Limit Overlay Zone La Jolla Shores Planned District La Jolla Community Plan Beach Parking Impact Zone | EXISTING BUILDING Status: To Be Demolished Occupancy: R-3 S.F.R. Constructed: 1980 Non-Historic Soil Condition: Prev. Developed |
| APPROVALS: PERMITS REQUIRED: Coastal Development Permit Site Development Permit | REVISIONS: 10-16-2016 08-10-2016 02-28-2016 |

Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

- Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
- The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
- Details and specifications for construction of structural BMP(s)
- Signage indicating the location and boundary of structural BMP(s) as required by the City Engineer
- How to access the structural BMP(s) to inspect and perform maintenance
- Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
- Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
- Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
- Recommended equipment to perform maintenance
- When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
- Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
- All BMPs must be fully dimensioned on the plans
- When proprietary BMPs are used, site specific cross section with outflow, inflow and model number shall be provided. Broucher photocopies are not allowed.

ATTACHMENT 5 DRAINAGE REPORT

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.

Drainage Study CARDENAS RESIDENCE

**LOT 2, MAP NO. 2615
APN 346-050-02-00**

Prepared for:
Joseph & Machelle Cardenas
8466 El Paseo Grande
La Jolla, CA 92037

Prepared by:
Christensen Engineering & Surveying
7888 Silverton Avenue, Suite "J"
San Diego, CA 92126
(858) 271-9901

PTS No. 445629

July 26, 2015
Revised June 10, 2016

Introduction

This project involves the demolition of the existing residence on Lot 2 of Map 2615 at 8466 El Paseo Grande (except for the existing deck and drainage improvements, including sump pump) and construction of a new residence and improvements.

The attached drainage area maps are from a topographic survey by K & S Engineering, Inc, prepared in December 2003. A small offsite area conveys runoff onsite while a small onsite area conveys runoff offsite. The majority of the site conveys runoff to the deck and landscaped area where it is collected and conveyed to an existing sump pump. From there it is pumped in a PCV pipe along the southerly boundary to an area near the easterly boundary where it terminates, above ground, and permits runoff to flow over the surface of the ground to El Paseo Grande. The remainder of the site conveys its runoff westerly. Following construction the same general pattern will persist with the offsite runoff now be maintained on the adjacent property northerly, The small area of onsite runoff that was previously conveyed to the southerly property will now be collected and conveyed to the existing sump pump. From there it will now be conveyed to a Filterra Biofiltration unit and then to catch basin with pump and to a gravity catch basin onsite and from there it will flow by gravity through a sidewalk underdrain to El Paseo Grande. The remainder of the site will continue to flow westerly.

The area of imperviousness remains nearly the same (6,019 sf pre-construction, 6,458 post-construction) before and after construction. The imperviousness changes from 50.7 % to 54.4%. A runoff coefficient of 0.63 was selected from the County of San Diego Hydrology Manual, Page 3-6 for 50% imperviousness and Soil Type "D".

Since the project is a priority project due to being located in a Water Quality Sensitive Area.

The Rational Method was used to calculate the anticipated flow for the 100-year storm return frequency event using the method outlined in the City of San Diego Drainage Design Manual.



Antony K. Christensen
RCE 54021 Exp. 12-31-17

06-10-16
Date

JN A2015-38



Calculations

1. *Intensity Calculation*

(From the City of San Diego Drainage Design Manual, Page 86)

Tc = Time of concentration

$$T_c = (1.8 (1.1-C)D^{1/2})/S^{1/3}$$

Since the difference in elevation is 12' (26'-14') and the distance traveled is 158', S=7.6%. C = 0.63

Tc = 5.4 minutes.

From table on Page 83

$$I_{100} = 4.3 \text{ inches}$$

2. *Coefficient Determination*

Pre-Construction and Post-Construction:

From Page 3-6 from the County Hydrology Manual with 50% imperviousness and Soil Type "D"

$$C = 0.63$$

Percent imperviousness

Pre Construction = 50.7%

Post-Construction = 54.4%

3. *Volume calculations*

$$Q = CIA$$

Areas of Drainage

The area of this study is set to the same location occupied by the proposed improvements because the rest of the area will remain unchanged and will not affect runoff. Runoff from the area

northerly of the site, conveyed to it by the 18" and 36" drain will not change.

Pre-Construction

| | |
|--|--------------|
| Area offsite draining onsite | A = 0.004 Ac |
| Area onsite draining offsite southerly | B = 0.005 Ac |
| Area onsite draining to sump | C = 0.183 Ac |
| Area onsite draining westerly | D = 0.085 Ac |

Post-Construction

| | |
|-------------------------------|--------------|
| Area onsite draining to sump | E = 0.188 Ac |
| Area onsite draining westerly | D = 0.085 Ac |

Pre-Construction

$$Q_{100A} = (0.63) (4.3) (0.004)$$
$$Q_{100B} = (0.63) (4.3) (0.005)$$
$$Q_{100C} = (0.63) (4.3) (0.183)$$
$$Q_{100D} = (0.63) (4.3) (0.085)$$

$$Q_{100A} = 0.01 \text{ cfs}$$
$$Q_{100B} = 0.01 \text{ cfs}$$
$$Q_{100C} = 0.50 \text{ cfs}$$
$$Q_{100D} = 0.23 \text{ cfs}$$

Post-Construction

$$Q_{100E} = (0.63) (4.3) (0.188)$$
$$Q_{100D} = (0.63) (4.3) (0.085)$$

$$Q_{100E} = 0.51 \text{ cfs}$$
$$Q_{100D} = 0.23 \text{ cfs}$$

Water Quality Flow Rate

For Proprietary BMPs for treating impervious surface runoff flow rate use $I = 0.2$ in/hr and multiply Q by 1.5 to arrive at the flow rate to be treated.

$$Q = C \cdot I \cdot A \cdot (1.5)$$

$$Q_{WQX} = (0.63) (0.2) (0.188) (1.5)$$

$$Q_{WQX} = .036 \text{ cfs}$$

The 6 x4 Filterra unit is capable of conveying 0.055 cfs and so is adequate. The 4 x 4 unit is capable of conveying 0.037 cfs but the 6 x 4 unit is selected for this project to provide a factor of safety to treatment.

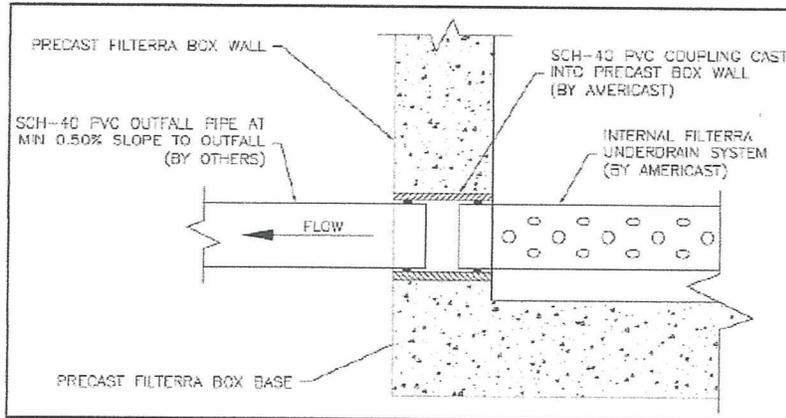
4. Discussion

Some offsite runoff that flows onto the site before construction will be retained on the neighboring property, from which it originates, following construction. A portion of the site that flows offsite, before construction will be retained onsite, following construction. The total runoff that flows from the site to El Paseo Grande before and after construction will remain unchanged. The flow to the west will remain unchanged. Following construction, runoff that currently is pumped from the existing sump is discharged onto the surface of property at the southeast corner. Following construction that discharge will be directed to a Filterra Biofiltration unit and then to a catch basin with pump that will convey the treated runoff to a gravity catch basin, that will allow it to flow to a sidewalk underdrain and then onto El Paseo Grande.

APPENDIX

Filterra® Piping Technical Details

Filterra® is supplied with an internal underdrain system that exits a wall in a perpendicular direction. Most efficient drainage is accomplished when the drain exits on the lower side of the Filterra®, i.e. nearest the overflow bypass. This is more important when using the larger sized Filterra® Systems.



*Drawing DP1:
Section View through Filterra Precast
Box Wall at Outfall Pipe Connection*

All units are supplied with the drainage pipe coupling precast into the wall, at a depth of 3.50 feet (INV to TC). Drawing DP1 is a detail of the coupling. The coupling used is SCH-40 PVC.

Typically, a minimum slope of 0.5% is adequate to accommodate the flow of treated water from the Filterra®, but each site may present unique conditions based on routing of the outfall pipe (elbows). The pipe must not be a restricting point for the successful operation of Filterra®. All connecting pipes must accommodate freefall flow. Table 3 lists approved treatment sizing flow rates of the various size Filterra® units. A safety factor of at least two should be used to size piping from the Filterra based on these conservative approved treatment flow rates.

Table 3: Filterra Flow Rates & Pipe Details

Important Note: Actual flow rate may be more than double rates below.

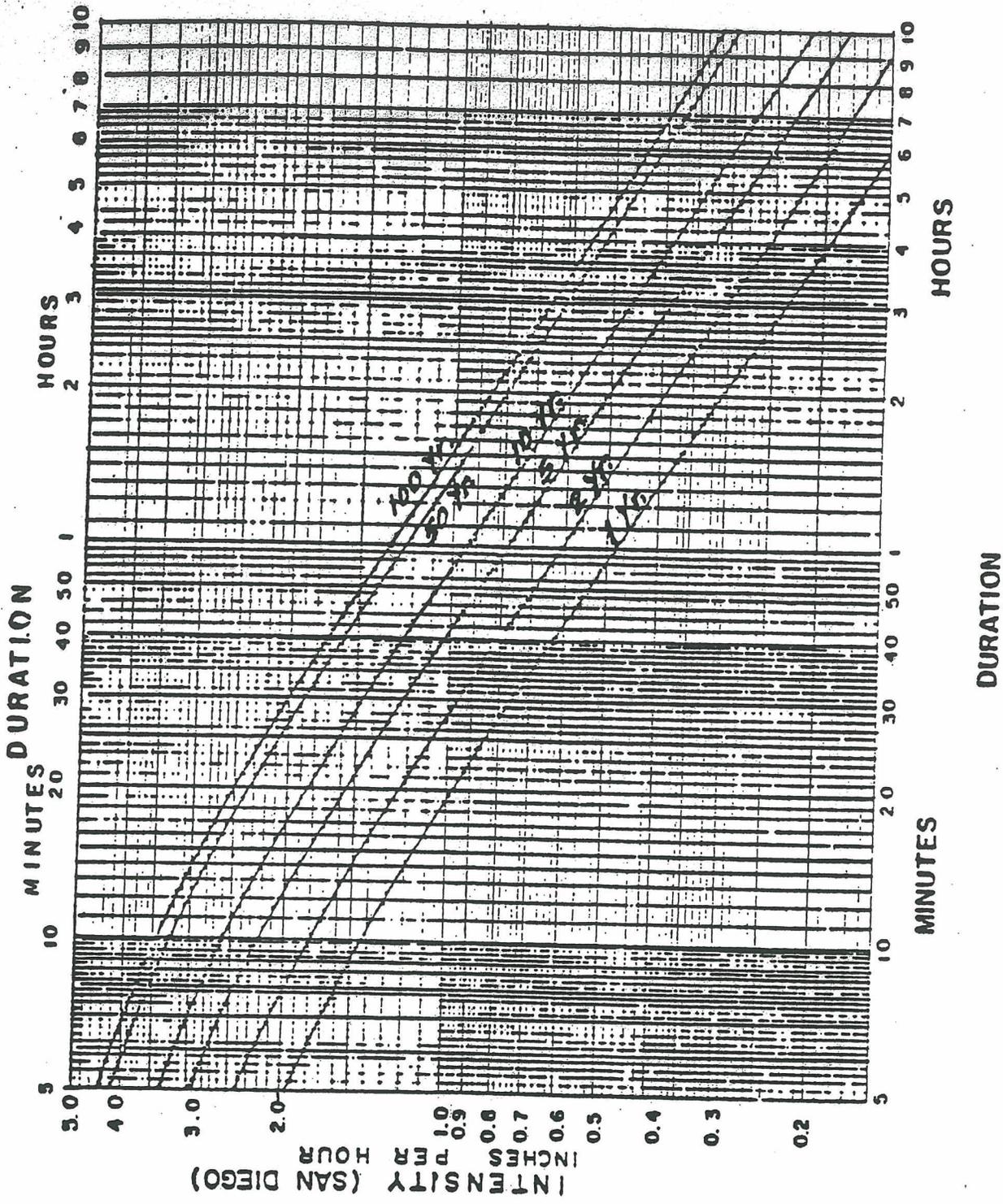
| Filterra® Size (feet) | Expected Flow Rate (cubic feet/second) | Connecting Drainage Pipe |
|-----------------------|--|--------------------------|
| 4x4 | 0.037 | 4" SCH-40 PVC |
| 4 x 6 or 6 x 4 | 0.055 | 4" SCH-40 PVC |
| 4x6.5 or 6.5x4 | 0.061 | 4" SCH-40 PVC |
| 4 x 8 or 8 x 4 | 0.075 | 4" SCH-40 PVC |
| 4x16 or 16x4 | 0.150 | 6" SCH-40 PVC |
| 6 x 6 | 0.084 | 4" SCH-40 PVC |
| 6 x 8 or 8 x 6 | 0.112 | 4" SCH-40 PVC |
| 6 x 10 or 10 x 6 | 0.140 | 6" SCH-40 PVC |
| 6 x 12 or 12 x 6 | 0.168 | 6" SCH-40 PVC |
| 8x12 or 12x8 | 0.224 | 6" SCH-40 PVC |
| 8x16 or 16x8 | 0.297 | 6" SCH-40 PVC |
| 8x18 or 18x8 | 0.337 | 6" SCH-40 PVC |
| 8x20 or 20x8 | 0.374 | 6" SCH-40 PVC |

**Table 3-1
 RUNOFF COEFFICIENTS FOR URBAN AREAS**

| Land Use | Runoff Coefficient "C" | Soil Type | | | | |
|---------------------------------------|--------------------------------|-----------|------|------|------|------|
| | | A | B | C | D | |
| NRCS Elements | | % IMPER. | | | | |
| County Elements | | | | | | |
| Undisturbed Natural Terrain (Natural) | Permanent Open Space | 0* | 0.20 | 0.25 | 0.30 | 0.35 |
| Low Density Residential (LDR) | Residential, 1.0 DU/A or less | 10 | 0.27 | 0.32 | 0.36 | 0.41 |
| Low Density Residential (LDR) | Residential, 2.0 DU/A or less | 20 | 0.34 | 0.38 | 0.42 | 0.46 |
| Low Density Residential (LDR) | Residential, 2.9 DU/A or less | 25 | 0.38 | 0.41 | 0.45 | 0.49 |
| Medium Density Residential (MDR) | Residential, 4.3 DU/A or less | 30 | 0.41 | 0.45 | 0.48 | 0.52 |
| Medium Density Residential (MDR) | Residential, 7.3 DU/A or less | 40 | 0.48 | 0.51 | 0.54 | 0.57 |
| Medium Density Residential (MDR) | Residential, 10.9 DU/A or less | 45 | 0.52 | 0.54 | 0.57 | 0.60 |
| Medium Density Residential (MDR) | Residential, 14.5 DU/A or less | 50 | 0.55 | 0.58 | 0.60 | 0.63 |
| High Density Residential (HDR) | Residential, 24.0 DU/A or less | 65 | 0.66 | 0.67 | 0.69 | 0.71 |
| High Density Residential (HDR) | Residential, 43.0 DU/A or less | 80 | 0.76 | 0.77 | 0.78 | 0.79 |
| Commercial/Industrial (N. Com) | Neighborhood Commercial | 80 | 0.76 | 0.77 | 0.78 | 0.79 |
| Commercial/Industrial (G. Com) | General Commercial | 85 | 0.80 | 0.80 | 0.81 | 0.82 |
| Commercial/Industrial (O.P. Com) | Office Professional/Commercial | 90 | 0.83 | 0.84 | 0.84 | 0.85 |
| Commercial/Industrial (Limited I.) | Limited Industrial | 90 | 0.83 | 0.84 | 0.84 | 0.85 |
| Commercial/Industrial (General I.) | General Industrial | 95 | 0.87 | 0.87 | 0.87 | 0.87 |

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
 DU/A = dwelling units per acre

NRCS = National Resources Conservation Service

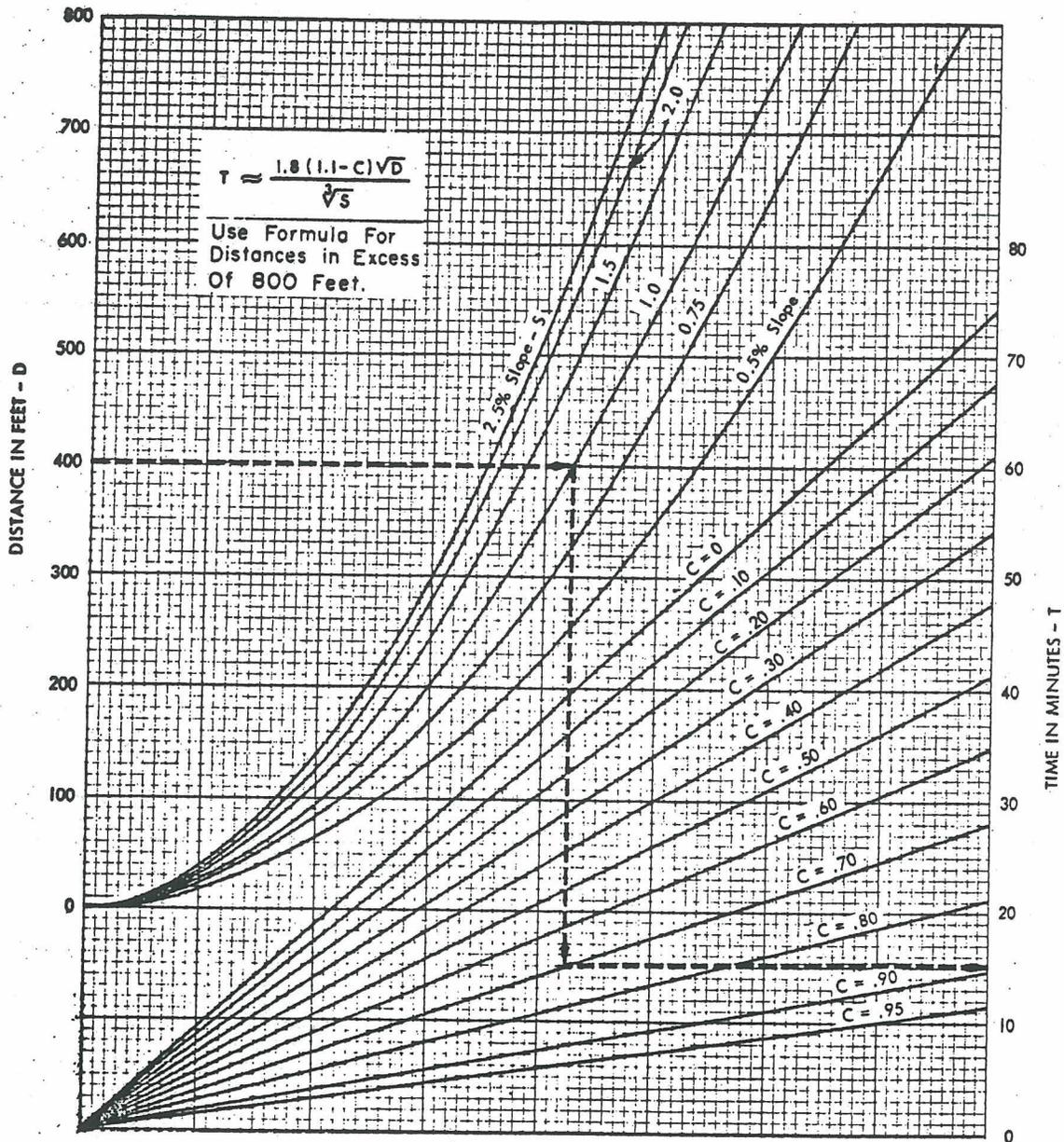


| ELEV. | FACTOR |
|-----------|--------|
| 0-1500 | 1.00 |
| 1500-3000 | 1.25 |
| 3000-4000 | 1.42 |
| 4000-5000 | 1.60 |
| 5000-6000 | 1.70 |
| DESERT | 1.25 |

To obtain correct intensity, multiply intensity on chart by factor for design elevation.

**RAINFALL
INTENSITY - DURATION - FREQUENCY
CURVES
for
COUNTY OF SAN DIEGO**

URBAN AREAS OVERLAND TIME OF FLOW CURVES



Surface Flow Time Curves

EXAMPLE:

GIVEN: LENGTH OF FLOW = 400 FT.

SLOPE = 1.0%

COEFFICIENT OF RUNOFF C = .70

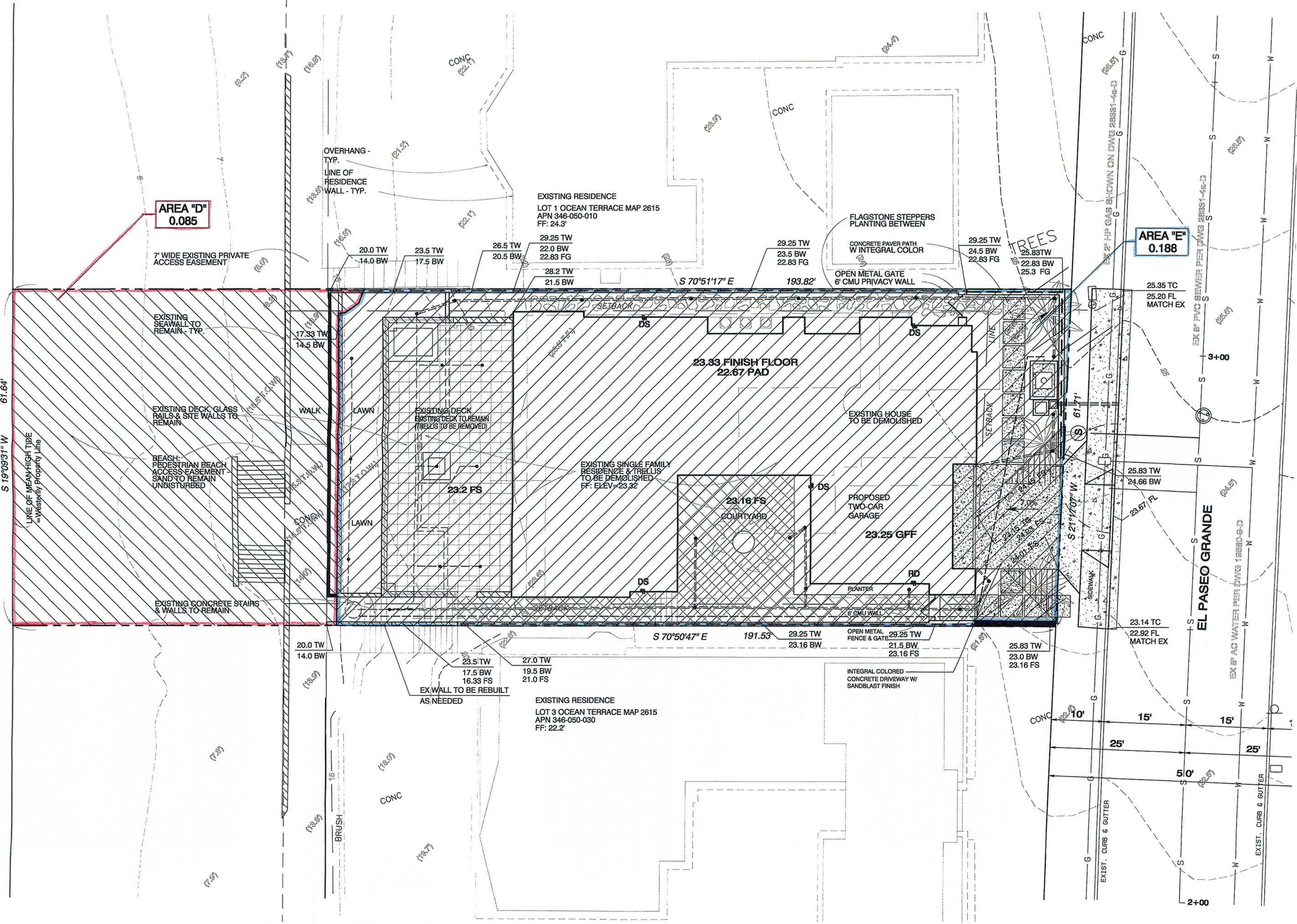
READ: OVERLAND FLOWTIME = 15 MINUTES

DRAINAGE AREA MAPS

PRE-DEVELOPMENT DRAINAGE AREA MAP

POST-DEVELOPMENT DRAINAGE AREA MAP

POST-CONSTRUCTION DRAINAGE AREA MAP



ATTACHMENT 6

GEO TECHNICAL AND GROUNDWATER INVESTIGATION REPORT

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements

Worksheet I-8 : Categorization of Infiltration Feasibility Condition

| Categorization of Infiltration Feasibility Condition | | Worksheet I-8 | |
|--|---|---------------|----|
| Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated? | | | |
| Criteria | Screening Question | Yes | No |
| 1 | Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D. | | X |
| <p>Provide basis: According to the NCRS superficial soil types in the project vicinity consists of Cr (Coastal Beaches), Corralitos loamy sand with 0 to 5 percent slopes (CsB), and Corralitos loamy sand with 5 to 9 percent slopes (CsC). These are all Type A soils with hydraulic conductivities ranging from 5.95 to 19.98 inches per hour.</p> <p>However, these soil types were not confirmed to be present in the near surface of the site based on our Geotechnical borings and laboratory analysis. Based on the boring logs, the soils consisted of previously placed fill material, Quaternary Slope Wash (Qsw) that consisted of loose to wet, silty to sandy Clay and sandy clayey Silt; Quaternary Old Paralic Deposits (previously mapped as Bay Point Formation), that consisted of a stiff to very stiff pedogenic argillic soil horizon (Qbp-Clay layer), a transitional unit between between Qsw and Qbp. There was an old beach sand layer at depth that is more characteristic to the NCRS soil types listed above.</p> <p>According to Appendix F, soils with >20% clay or >40% silt as documented at the site are typically not suitable for infiltration.</p> <p>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</p> | | | |
| 2 | Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2. | | X |
| <p>Provide basis: As shown on geologic cross-sections presented in the Faulting and Bluff Evaluation, dated February 12, 2015, and updated in Addendum 03, dated June 10, 2016; both prepared by Construction Testing & Engineering Inc., the fill and Quaternary Slope Wash material are underlain by an impermeable to low permeability argillic soil horizon. Perched groundwater was recognized above this layer within 7 to 10 feet of the surface. The argillic soil layer slopes to the west towards the beach and a series of retaining walls. Any infiltration of water is anticipated to mound and flow down gradient towards the retaining walls. This would result in saturated conditions beneath the structure and behind the retaining walls creating geotechnical hazards.</p> <p>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</p> | | | |

Worksheet I-8 Page 2 of 4

| Criteria | Screening Question | Yes | No |
|--|---|-----|--------|
| 3 | Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | | X |
| Provide basis: Infiltration rates are anticipated to be below 0.5 inches per hour, however any infiltration could increase the risk of storm water pollutants discharging to the public beach. | | | |
| Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |
| 4 | Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | | X |
| Provide basis: Infiltration rates are anticipated to be below 0.5 inches per hour, however any infiltration could increase the risk of storm water pollutants discharging to the public beach. | | | |
| Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |
| Part 1 Result* | If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration | | Part 2 |
| | If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2 | | |

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

| Criteria | Screening Question | Yes | No |
|--|--|-----|----|
| 5 | Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D. | | X |
| <p>Provide basis: Infiltration at any rate will result in mounding above the argillic (clay) layer, and perched groundwater has already been identified within 10 feet of the existing surface. This is considered an unsuitable condition in Appendix F of the City of San Diego Guidelines for Geotechnical Reports. Also, the fine content of the underlying soils are also considered unsuitable according to Appendix F, as is the slopes along the beach front that are greater than 25% and are retained by retaining walls.</p> <p>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</p> | | | |
| 6 | Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2. | | X |
| <p>Provide basis: Groundwater mounding would be increased above the clay layer and perched groundwater has already been documented to be within 10 feet of the existing surface. These conditions would create geotechnical hazards for the building and retaining wall foundations.</p> <p>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</p> | | | |

Worksheet I-8 Page 4 of 4

| Criteria | Screening Question | Yes | No |
|--|---|-----|------|
| 7 | Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | | |
| <p>Provide basis: As described above, infiltration of any amount would contribute to rising groundwater levels of the shallow perched groundwater conditions.</p> <p>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</p> | | | |
| 8 | Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | | |
| <p>Provide basis: N/A</p> <p>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</p> | | | |
| Part 2 Result* | <p>If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.</p> <p>If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</p> | | None |

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings



Construction Testing & Engineering, Inc.

Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying

June 10, 2016

CTE Project No. 10-12702G

C/O: Hayer Architecture
Attention: Mr. Greg Friesen
445 Marine View Ave, Suite 280
Del Mar, California 92014
Telephone: 858.792.2800

Via Email: gfriesen@hayerarchitecture.com

Subject: Addendum 03- Response to City of San Diego Cycle Review Comments
Cycle Type 4 –Submitted (Multi-Discipline): LDR-Geology, for Proposed
Cardenas Residence 8466 El Paseo Grande, La Jolla, California

References: At End of Document-Appendix A

Mr. Friesen:

Presented in this letter is our response to the City of San Diego, Cycle Type 4 (Multi-Discipline), LDR-Geology review for the proposed Cardenas Residence, located at 8466 El Paseo Grande, La Jolla, California. The numbers for the responses below correspond to the comments in the City letter, dated November 25, 2015. Comments 1 and 2 refer to project references and, therefore, no responses are required for these line items. Comments 3 through 11 are addressed herein. A copy of the City Cycle Issue comments is included as Appendix B.

In addition, as the Cycle Issues are multi-discipline, we have provided additional information characterizing the potential infiltration at the site. This information is intended to provide information for project team members to address Community Planning Group Cycle Issue Comment No. 9, and LDR-Engineering; Cycle Issue Comment No. 7.

1.0 CYCLE ISSUE COMMENT RESPONSES

Comment Issue No. 3: Submit the following document: Update Preliminary Geotechnical Recommendations, Cardenas Residence (formerly Lusardi Residence), 8466 El Paseo Grande, La Jolla California 92037, prepared by Construction Testing & Engineering, Inc., dated November 2, 2009 (their project no. 10-10144G).

Response: A copy of the above requested report is included as Appendix C.

Comment Issue No. 4: Submit the following document: Preliminary Geotechnical Recommendations, Proposed Lusardi Residence, 8466 El Paseo Grande, La Jolla California, 92037, prepared by Construction Testing & Engineering, Inc., dated March 24, 2006 (their project no. 10-8264G).

Response: A copy of the above requested report is included as an attachment to the “Update Preliminary Geotechnical Recommendations, Cardenas Residence (formerly Lusardi Residence), 8466 El Paseo Grande, La Jolla California 92037, prepared by Construction Testing & Engineering, Inc., dated November 2, 2009; Project no. 10-10144G”, that is included in Appendix C herein.

Comment Issue No. 5: Submit an addendum geotechnical report or update letter that addresses the proposed development for the purpose of environmental review and the following:

Response: This response to comment letter serves as Addendum 03 to the Update Geotechnical Report, Proposed Cardenas Residence, 8466 El Paseo Grande, La Jolla California, 92037, prepared by Construction Testing & Engineering, Inc., dated September 11, 2015, (project no. 10-12702G).

Comment Issue No. 6: Provide a geologic /geotechnical map that shows the distribution of fill and surficial deposits and the proposed development.

Response: The attached Figure 2 is an updated geologic/geotechnical map that has incorporated the new proposed improvements, distribution of fill and surficial deposits, and the proposed development.

Comment Issue No. 7: Provide geologic/geotechnical cross sections updated to show the proposed development.

Response: The attached Figure 3a, b, c, and d, are updated geologic/geotechnical cross sections that have incorporated the new proposed improvements for the development.

Comment Issue No. 8: The project’s geotechnical consultant should consider updating their description of site geology with respect to the current regional geologic mapping by Kennedy and Tan (2008).

Response: We have added a note on the figures to reflect the nomenclature change of the referenced geologic map units to be consistent with the current regional geologic mapping by Kennedy and Tan (2008). However, the map symbols on the map and sections have not been changed from Bay Point Formation to Quaternary Old Paralac Deposits in order to keep the figures consistent with previous reports and boring logs that were completed prior to the nomenclature change.

Comment Issue No. 9: The project's geotechnical consultant should reference the Tsunami Inundation Map for Emergency Planning, La Jolla Quadrangle, prepared by the California Emergency Management Agency, dated June 1, 2009 and indicate if there is a potential tsunami hazard for the site.

Response: The Tsunami Inundation Map for Emergency Planning, La Jolla Quadrangle, prepared by the California Emergency Management Agency, dated June 1, 2009, is attached as Figure 4. As shown on Figure 4, the tsunami hazard zone boundaries appear to be controlled, in part, by the existing sea wall along the beach front. However, given a tsunami event coupled with high tide storm conditions, it is possible that waves could flood the public access way and in severe cases, flood the lawn area of the residence. However, the main structure foundations are approximately 18 feet above sea level and are located approximately 45 feet outside of the designated hazard zone on the Tsunami Inundation Map. Based on these observations, we conclude that there is a low probability for a significant tsunami hazard at the site.

Comment Issue No. 10: Provide an updated conclusion regarding geologic hazards of the site and summarize any geologic hazards potentially impacting the proposed development.

Response: From review of the previous investigations and/or reports, it appears that geologic hazards at the site are primarily limited to those caused by violent shaking from earthquake generated ground motion waves, and potential differential settlement of the Quaternary undocumented fill and unsuitable Quaternary Slopewash soils at the site.

However, it is our professional opinion that these potential geologic hazards will be mitigated, provided the recommendations in the above referenced reports are incorporated into the design and construction of the project, and that grading and construction of site improvements are conducted in accordance with the 2013 California Building Code (CBC).

As discussed in response to Comment #9, there is generally a low probability for a significant tsunami hazard at the site, although wave run up could affect the public seawall and access way.

Comment Issue No. 11: Provide an updated conclusion regarding the suitability of the site for the proposed development.

Response: CTE concludes that the proposed development of the site is feasible from a geotechnical standpoint, provided the recommendations in the referenced project reports and addenda are incorporated into the design and construction of the project.

In addition, CTE has found the recommendations in the referenced reports to be in compliance with common geotechnical engineering practices and should be considered valid.

However, CTE reserves the right to further modify recommendations and/or provide additional recommendations based on the actual conditions encountered at the site during earthwork and/or construction.

2.0 INFILTRATION CHARACTERIZATION

It is our understanding, based on the City of San Diego's review comments from Community Planning Group Cycle Issue Comment No. 9 and LDR-Engineering; Cycle Issue Comment No. 7, that the proposed project is within a Water Quality Sensitive Area and is a Priority Development Project (PDP). Therefore, the project requires information per the Storm Water Standards, Part 1, BMP Design Manual, Appendix C, Section C.2 and Worksheet C.4-1. This addendum report provides information characterizing the infiltration potential at the site that can be used as an attachment to the Water Quality Technical Report as requested by Planning Group Cycle Issue Comment No. 9. A copy of Worksheet C.4-1 is included within Appendix D, and is summarized below.

Based on questions per Worksheet C.4-1 and CTE's previous geotechnical and Bluff Evaluation Reports, the site soils and site conditions have a number of unsuitable features pertaining to potential infiltration. These include soils greater than 20 percent clay and greater than 40 percent silt, shallow perched groundwater within 10 feet of the existing surface, slopes greater than 25%, and groundwater mounding creating geotechnical hazards to building foundations and retaining walls along the beach public access. As shown on the Worksheet C.4.1 it does not appear that the noted geologic conditions allow for infiltration in any appreciable rate or volume and, therefore, on-site infiltration is generally considered to be infeasible. The Work Sheet feasibility screening category is "No Infiltration".

This document is subject to the same limitations as the previous geotechnical documents prepared for the subject project. The opportunity to be of service is appreciated. If you have any questions, please do not hesitate to contact this office.

Respectfully submitted,

CONSTRUCTION TESTING & ENGINEERING, INC.



Dan T. Math, GE #2665
Principal Engineer



Martin E. Siem, CEG #2311
Certified Engineering Geologist



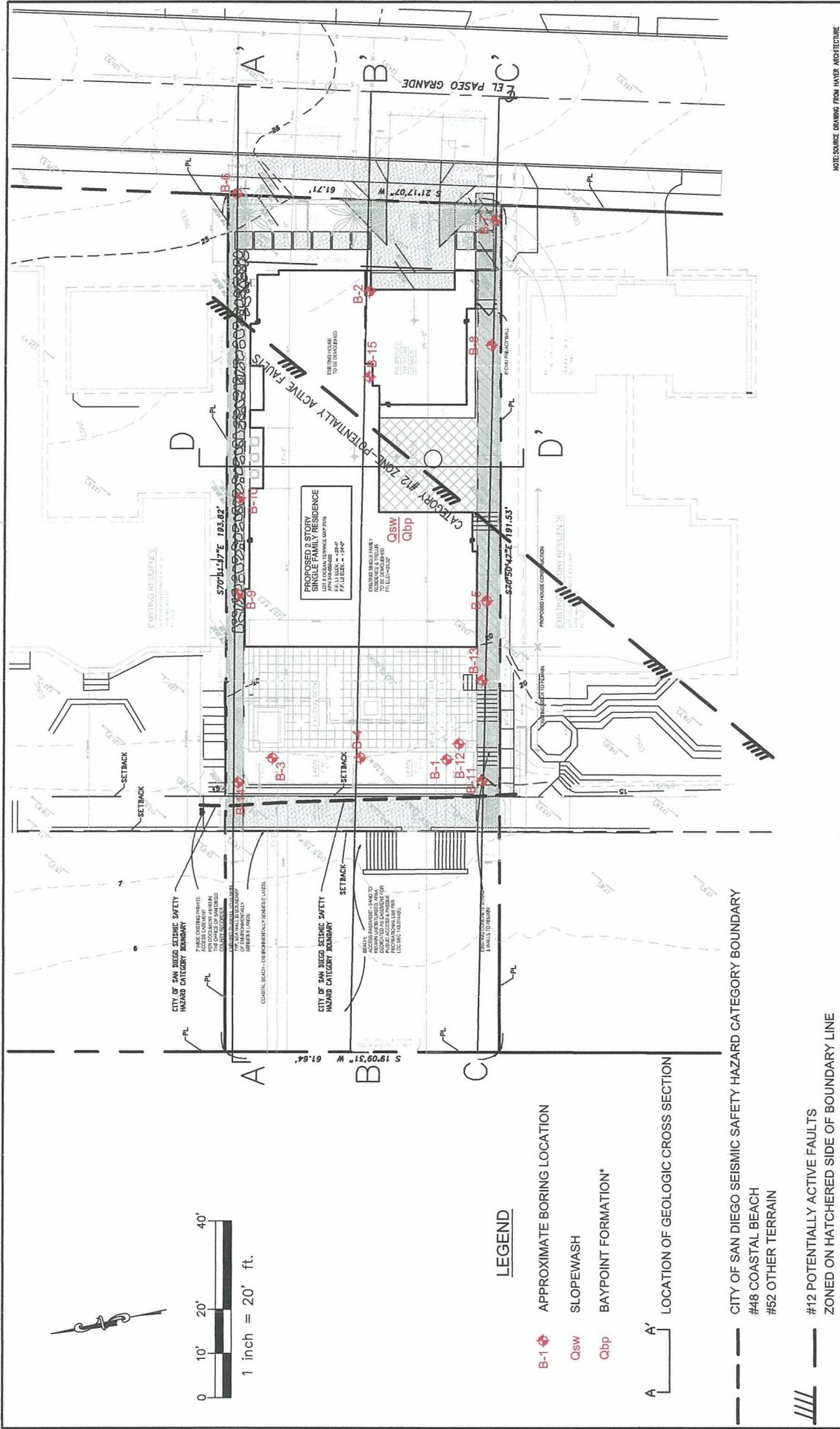
MES/DTM/JFL:nri

Figures:

| | |
|----------------|--|
| Figure 1 | Not Included |
| Figure 2 | Geologic/Exploration Location Map (updated). |
| Figure 3 (a-d) | Updated Geologic/Geotechnical Cross Sections |
| Figure 4 | Tsunami Inundation Map |

Attachments:

| | |
|------------|--|
| Appendix A | References |
| Appendix B | City Comments |
| Appendix C | Update Preliminary Geotechnical Recommendations, Cardenas Residence (formerly Lusardi Residence), 8466 El Paseo Grande, La Jolla California 92037, prepared by Construction Testing & Engineering, Inc., dated November 2, 2009; Project No. 10-10144G; Including: Preliminary Geotechnical Recommendations, Proposed Lusardi Residence, 8466 El Paseo Grande, La Jolla California, 92037, prepared by Construction Testing & Engineering, Inc., dated March 24, 2006; Project No. 10-8264G. |
| Appendix D | Storm Water Standards, Part 1, BMP Design Manual, Appendix C, Worksheet C.4-1. |



NOTE: SOURCE DRAWING FROM HAYEK ARCHITECTURE

SITE EXPLORATION LOCATION MAP

CARDENAS RESIDENCE
 8466 EL PASO GRANDE
 LA JOLLA, CALIFORNIA

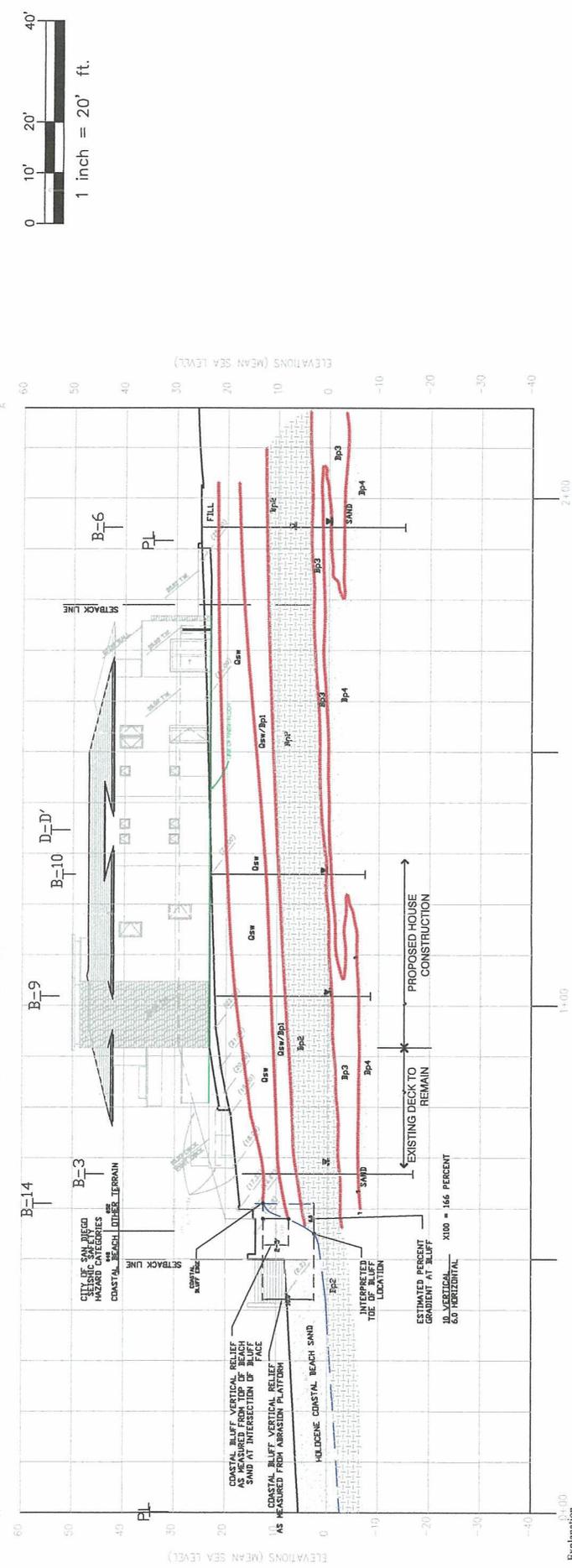
Construction Testing & Engineering, Inc.
 1441 Mortal Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

CTE INC.

DATE: 6/16
 SCALE: 1" = 20'
 DRAWN BY: JH
 PROJECT: 2

*The Quaternary Bay Point Formation map units are based on pre-2008 geologic map nomenclature. Based on recent regional geologic mapping (Kennedy and Tan, 2008), units of the Bay Point Formation are now equivalent to the Quaternary Old Paralic Deposits, map unit Qop-6 of Kennedy and Tan, 2008. The earlier nomenclature has remained unchanged in order to maintain consistency with the nomenclature used in previous completed site investigations and boring logs.

VIEW LOOKING NORTH



FILL: Consists of loose to medium stiff, reworked Quaternary Slope Wash as described below, with loose, silty sand, abundant organics, roots, topsoil from turf and planter areas, minor debris.

Quaternary Slope Wash (Qsw): consists of loose to stiff, moist to wet, yellowish-gray brown to yellowish-olive brown, slightly mottled, silty to sandy clay, varying to sandy clayey silt, with rootlets, locally developed pinhole structure, some carbonate near the upper contact, and occasional carbon fragments. The unit is massive with locally developed weak discontinuous laminations. Upper and lower contacts are gradational.

Unit 1 (Qsw/Bp1): consists of medium stiff to stiff, locally loose when saturated, moist to wet, dark gray brown, light brown, orange brown, black, variably mottled, sandy clay with visually estimated medium to coarse grained sand percentages up to 30 percent, scattered pebbles, abundant organics (carbon fragments and disseminated carbon) throughout. Upper contact is locally gradational to distinct, and the lower contact is gradational with Bp2.

Quaternary Bay Point Formation *

Unit 2 (Bp2): Bp2 consists of stiff to very stiff, locally hard, moist to wet, dark reddish brown, dark gray-brown, black, dark orange-brown, extensively mottled, silty to sandy clay, with distinctive coarse-red sand grains throughout, scattered organics (carbon fragments, disseminated carbon, massive to moderate, subangular-blocky soil structure, with clay films Soil horizons Bp2 to Bp4b). Diffuse upper and lower contacts.

Unit 3 (Bp3): Bp3 consists of a transitional unit between the overlying (Bp2) clay and sands of the underlying unit (Bp4). Bp3 is stiff to very stiff silty sandy clay to medium dense clayey sand, moist to wet, mottled brown, orange-brown, gray, with black, weaker soil structure than overlying unit Bp2, granular to massive, with locally moderate subangular-blocky soil structure.

Unit 4 (Bp4): Bp4 consists of a distinctive change in lithology from the clay and silt of the overlying units to medium dense to dense, wet, gray to black, fine-to coarse-grained silty to clayey sand that grades downward into a poorly graded sand with silt, abundant black mica. Unit is interpreted as a pit-co-beach sand.

*The Quaternary Bay Point Formation map units are based on pre-2008 geologic map nomenclature. Based on recent regional geologic mapping (Kennedy and Tan, 2008), units of the Bay Point Formation are now equivalent to the Quaternary Old Paralic Deposits, map unit Qop-6 of Kennedy and Tan, 2008. The earlier nomenclature has remained unchanged in order to maintain consistency with the nomenclature used in previous completed site investigations and boring logs.

- ##### Gradation contact between mapped units.
- ? --- --- Approximate location or inferred (?) location of geologic contacts
- c c c Zones of carbonate accumulation
- Interpolated Natural Grade/ PreExisting Grade
- Proposed Final grade
- ▽ Perched groundwater observed
- ▽ Groundwater at time of drilling

CTE INC. Construction Testing & Engineering, Inc.
 1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-6955

NOTE: SOURCE DRAWING FROM HAYES ARCHITECTURE

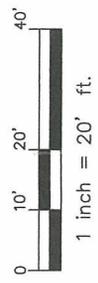
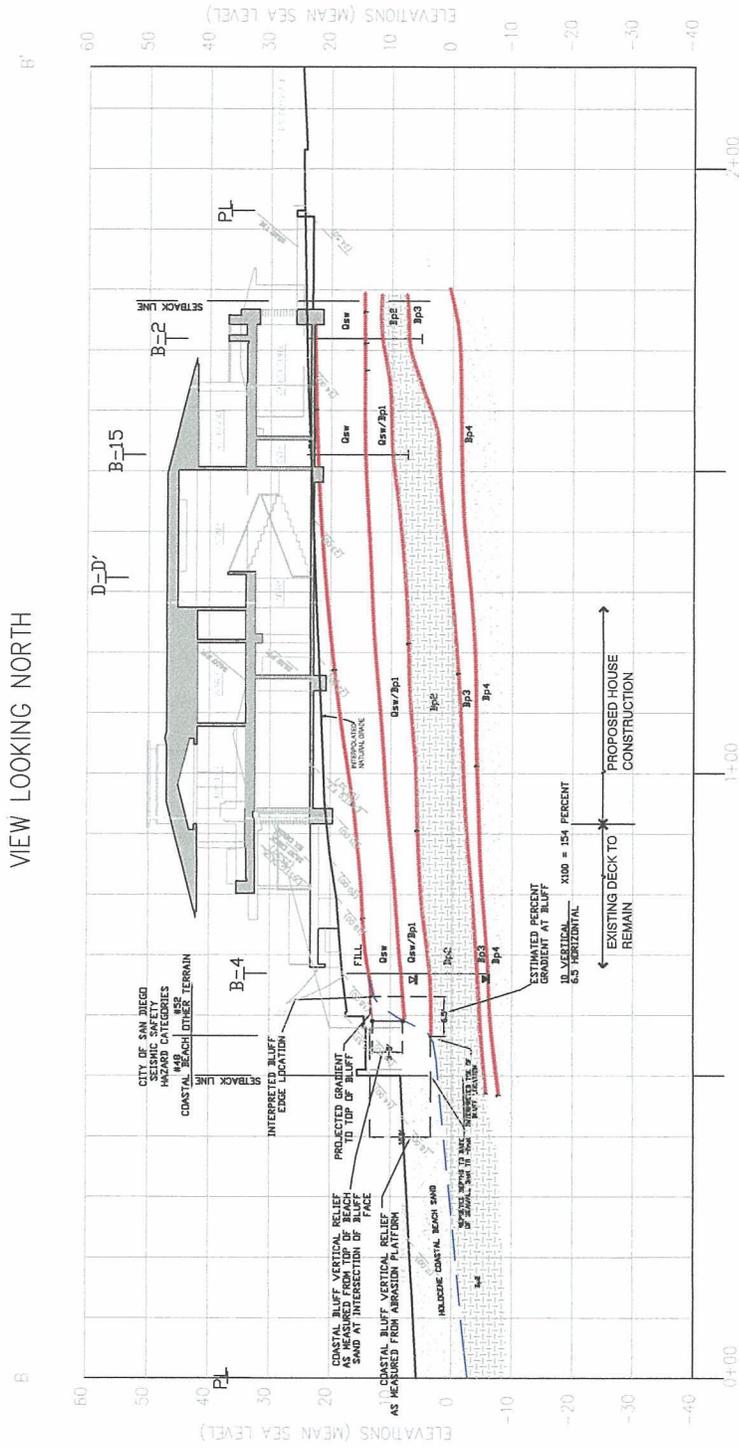
DATE: 8/16 PROJECT: SA

SCALE: 1" = 20'

PROJECT NO: 10-12702G

CROSS SECTION A-A*
CARDENAS RESIDENCE
 8466 EL PASO GRANDE
 LA JOLLA, CALIFORNIA

VIEW LOOKING NORTH

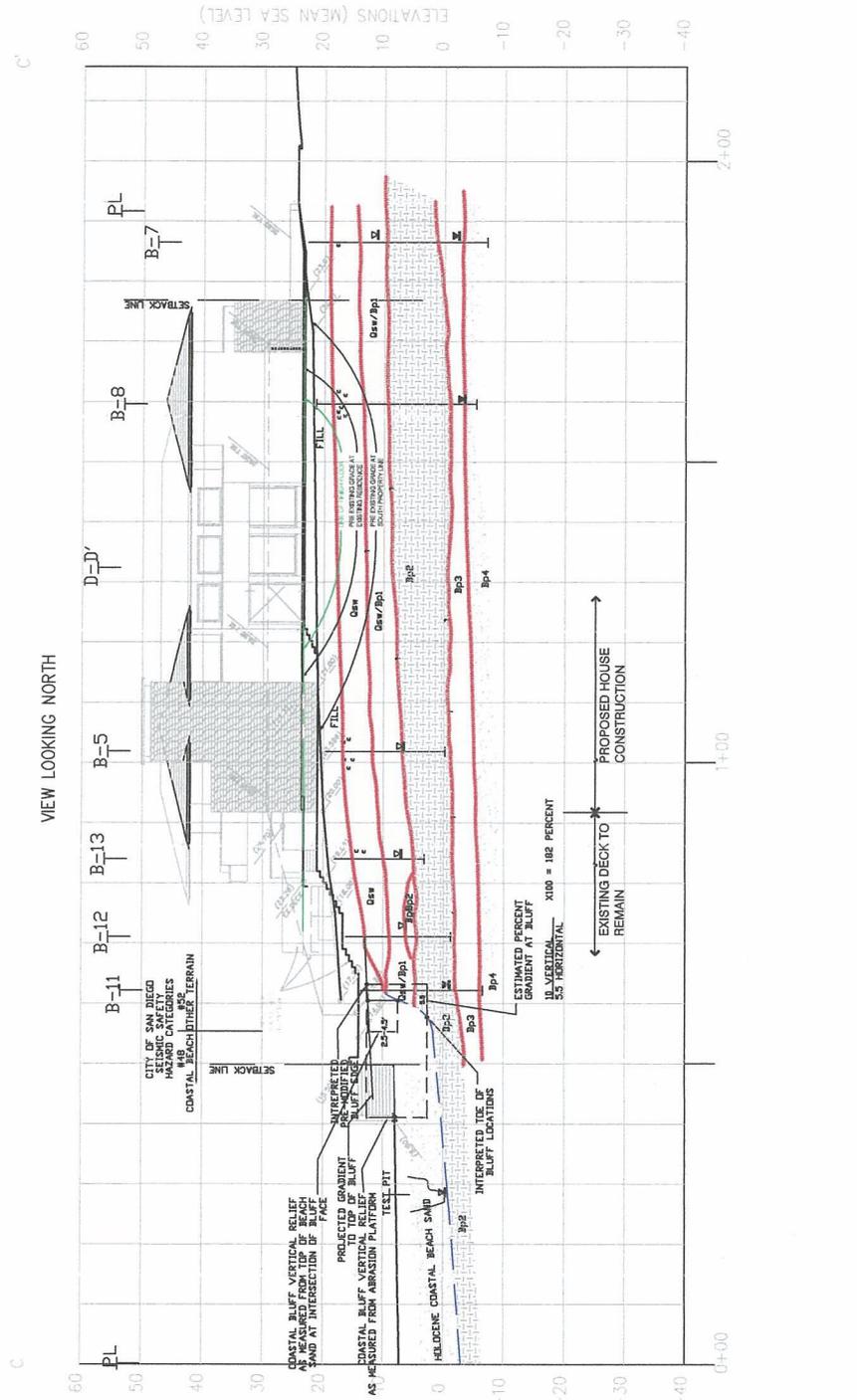


SEE FIGURE 3A FOR EXPLANATION

NOTE: SOURCE DRAWING FROM HAYES ARCHITECTURE
 DATE: 07/16
 SCALE: 1" = 20'
 PROJECT: 3B

CROSS SECTION B-B'
 CARDENAS RESIDENCE
 8466 EL PASO GRANDE
 LA JOLLA, CALIFORNIA

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 Construction Testing & Engineering, Inc.
 1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955



SEE FIGURE 3A FOR EXPLANATION

NOTE: SOURCE DRAWING FROM HAYLER ARCHITECTURE

FILE NO: 10-12702G

SCALE: 1" = 20'

DATE: 9/16

FIGURE: 3C

CROSS SECTION C-C'

CARDENAS RESIDENCE

8466 EL PASO GRANDE

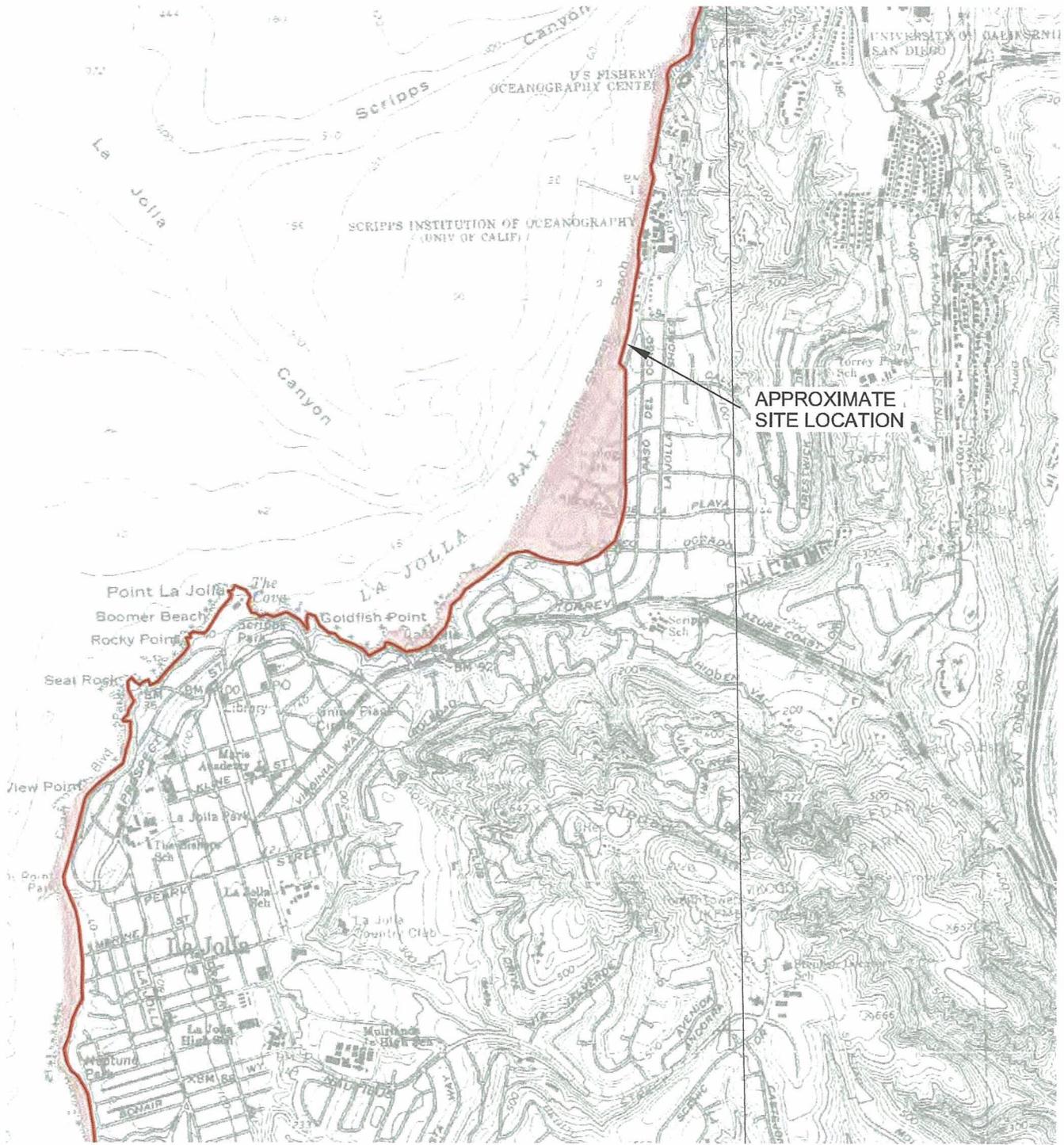
LA JOLLA, CALIFORNIA

Construction Testing & Engineering, Inc.

1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph: (760) 746-4955



\\ESC_SERVER\Projects\10-12000 to 10-12999 Projects\10-12702G\Fig 4 (Tsunami).dwg



MAP EXPLANATION

-  Tsunami Inundation Line
-  Tsunami Inundation Area

TSUNAMI INUNDATION MAP FOR EMERGENCY PLANNING

State of California ~ County of San Diego
LA JOLLA QUADRANGLE

June 1, 2009



Construction Testing & Engineering, Inc.

1441 Montiel Rd Ste 115, Escondido, CA 92026 Ph (760) 746-4955

TSUNAMI INUNDATION MAP

CARDENAS RESIDENCE
 8466 EL PASEO GRANDE
 LA JOLLA, CALIFORNIA

SCALE:
 NOT TO SCALE

DATE:
 6/16

CTE JOB NO.:
 10-12702G

FIGURE:
 4

APPENDIX A
REFERENCES

REFERENCES

1. Addendum 02 Update Geotechnical Report, Proposed Cardenas Residence 8466 El Paseo Grande La Jolla, California, 92037. Completed by Construction Testing & Engineering Inc., dated September 11, 2015. Project Number 10-12702G.
2. Addendum 01 to Updated Preliminary Geotechnical Recommendations Cardenas Residence (formally Lusardi Residence) 8466 El Paseo Grande La Jolla, California, 92037. Completed by Construction Testing & Engineering Inc., dated December 16, 2009. Project Number 10-10144G
3. Updated Preliminary Geotechnical Recommendations Cardenas Residence (formally Lusardi Residence) 8466 El Paseo Grande La Jolla, California, 92037. Completed by Construction Testing & Engineering Inc., dated November 2, 2009. Project Number 10-10144G. City of San Diego-Development Services Project Number 191344
4. Faulting and Bluff Geologic Evaluation Proposed Lusardi Residence 8466 El Paseo Grande, La Jolla, California. Completed by Construction Testing & Engineering Inc., dated February 12, 2007. Project No. 10-8264G
5. Preliminary Geotechnical Investigation Proposed Lusardi Residence 8466 El Paseo Grande, La Jolla, California. Completed by Construction Testing & Engineering Inc., dated March 24, 2006. Project No. 10-8264G

APPENDIX B

CITY OF SAN DIEGO CYCLE ISSUES

CYCLE TYPE 4-SUBMITTED (MULTI_DISCIPLINE): LDR-GEOLOGY, DATED
NOVEMBER 15, 2015



Cycle Issues

THE CITY OF SAN DIEGO
Development Services Department

1222 First Avenue, San Diego, CA 92101-4154

L64A-003A

Review Information

| | | |
|---|--------------------------------------|-------------------------------|
| Cycle Type: 4 Submitted (Multi-Discipline) | Submitted: 10/20/2015 | Deemed Complete on 10/20/2015 |
| Reviewing Discipline: LDR-Geology | Cycle Distributed: 10/20/2015 | |
| Reviewer: Quinn, Jim | Assigned: 10/22/2015 | |
| (619) 446-5334 | Started: 10/22/2015 | |
| jpquinn@sandiego.gov | Review Due: 11/18/2015 | |
| Hours of Review: 2.50 | Completed: 11/25/2015 | COMPLETED LATE |
| Next Review Method: Submitted (Multi-Discipline) | Closed: 03/22/2016 | |

- . The review due date was changed to 02/11/2016 from 11/23/2015 per agreement with customer.
- . The reviewer has indicated they want to review this project again. Reason chosen by the reviewer: New Document Required.
- . We request a 2nd complete submittal for LDR-Geology on this project as: Submitted (Multi-Discipline).
- . The reviewer has requested more documents be submitted.
- . Your project still has 11 outstanding review issues with LDR-Geology (all of which are new).
- . Last month LDR-Geology performed 77 reviews, 87.0% were on-time, and 77.1% were on projects at less than < 3 complete submittals.

445629-4 (11/25/2015)

References

| <u>Cleared?</u> | <u>Issue Num</u> | <u>Issue Text</u> |
|--------------------------|------------------|---|
| <input type="checkbox"/> | 1 | Addendum 02 Update Geotechnical Report, Proposed Cardenas Residence, 8466 El Paseo Grande, La Jolla, California 92037, prepared by Construction Testing & Engineering, Inc., dated September 11, 2015 (their project no. 10-12702G) |
| | | Addendum 01 to Updated Preliminary Geotechnical Recommendations, Cardenas Residence (formally Lusardi Residence), 8466 El Paseo Grande, La Jolla, California 92037, prepared by Construction Testing & Engineering, Inc., dated December 16, 2009 (their project no. 10-10144G) |
| | | (New Issue) |
| <input type="checkbox"/> | 2 | Faulting and Bluff Geologic Evaluation, Proposed Lusardi Residence, 8466 El Paseo Grande, La Jolla, California, prepared by Construction Testing & Engineering, Inc., dated February 12, 2015 (their project no. 10-8264G) |
| | | Proposed Site Plan, Cardenas Residence, 8466 El Paseo Grande, La Jolla, CA 92037, prepared by Hayer Architecture, dated October 15, 2015 |
| | | (New Issue) |

Comments

| <u>Cleared?</u> | <u>Issue Num</u> | <u>Issue Text</u> |
|--------------------------|------------------|--|
| <input type="checkbox"/> | 3 | Submit the following document: Updated Preliminary Geotechnical Recommendations, Cardenas Residence (formally Lusardi Residence), 8466 El Paseo Grande, La Jolla, California 92037, prepared by Construction Testing & Engineering, Inc., dated November 2, 2009 (their project no. 10-10144G) |
| | | (New Issue) |
| <input type="checkbox"/> | 4 | Submit the following document: Preliminary Geotechnical Investigation, Proposed Lusardi Residence, 8466 El Paseo Grande, La Jolla, California, prepared by Construction Testing & Engineering, Inc., dated March 24, 2006 (their project no. 10-8264G) |
| | | (New Issue) |
| <input type="checkbox"/> | 5 | Submit an addendum geotechnical report or update letter that addresses the proposed development for the purposes of environmental review and the following: |
| | | (New Issue) |
| <input type="checkbox"/> | 6 | Provide a geologic/ geotechnical map that shows the distribution of fill and surficial deposits and the proposed development. |
| | | (New Issue) |
| <input type="checkbox"/> | 7 | Provide geologic/ geotechnical cross sections updated to show the proposed development. |
| | | (New Issue) |



Cycle Issues



THE CITY OF SAN DIEGO
Development Services Department
1222 First Avenue, San Diego, CA 92101-4154

3/22/16 9:32 am

Page 13 of 15

L64A-003A

| <u>Cleared?</u> | <u>Issue Num</u> | <u>Issue Text</u> |
|--------------------------|------------------|--|
| <input type="checkbox"/> | 8 | The project's geotechnical consultant should consider updating their description of site geology with respect to current regional geologic mapping by Kennedy and Tan (2008). (New Issue) |
| <input type="checkbox"/> | 9 | The project's geotechnical consultant should reference the Tsunami Inundation Map for Emergency Planning, La Jolla Quadrangle, prepared by the California Emergency Management Agency, dated June 1, 2009 and indicate if there is a potential tsunami hazard for the site. (New Issue) |
| <input type="checkbox"/> | 10 | Provide an updated conclusion regarding geologic hazards of the site and summarize any geologic hazards potentially impacting the proposed development. (New Issue) |
| <input type="checkbox"/> | 11 | Provide an updated conclusion regarding the suitability of the site for the proposed development. (New Issue) |



Worksheet C.4-1: Categorization of Infiltration Feasibility Condition

| Categorization of Infiltration Feasibility Condition | | Worksheet C.4-1 | |
|--|---|-----------------|----|
| Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated? | | | |
| Criteria | Screening Question | Yes | No |
| 1 | Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D. | | X |
| <p>Provide basis: According to the NCRS superficial soil types in the project vicinity consists of Cr (Coastal Beaches), Corralitos loamy sand with 0 to 5 percent slopes (CsB), and Corralitos loamy sand with 5 to 9 percent slopes (CsC). These are all Type A soils with hydraulic conductivities ranging from 5.95 to 19.98 inches per hour.</p> <p>However, these soil types were not confirmed to be present in the near surface of the site based on our Geotechnical borings and laboratory analysis. Based on the boring logs, the soils consisted of previously placed fill material, Quaternary Slope Wash (Qsw) that consisted of loose to wet, silty to sandy Clay and sandy clayey Silt; Quaternary Old Paralic Deposits (previously mapped as Bay Point Formation), that consisted of a stiff to very stiff pedogenic argillic soil horizon (Qbp-Clay layer), a transitional unit between between Qsw and Qbp. There was an old beach sand layer at depth that is more characteristic to the NCRS soil types listed above.</p> <p>According to Appendix F, soils with >20% clay or >40% silt as documented at the site are typically not suitable for infiltration.</p> <p>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</p> | | | |
| 2 | Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2. | | X |
| <p>Provide basis: As shown on geologic cross-sections presented in the Faulting and Bluff Evaluation, dated February 12, 2015, and updated in Addendum 03, dated June 10, 2016; both prepared by Construction Testing & Engineering Inc., the fill and Quaternary Slope Wash material are underlain by an impermeable to low permeability argillic soil horizon. Perched groundwater was recognized above this layer within 7 to 10 feet of the surface. The argillic soil layer slopes to the west towards the beach and a series of retaining walls. Any infiltration of water is anticipated to mound and flow down gradient towards the retaining walls. This would result in saturated conditions beneath the structure and behind the retaining walls creating geotechnical hazards.</p> <p>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</p> | | | |

Appendix C: Geotechnical and Groundwater Investigation Requirements

| Worksheet C.4-1 Page 2 of 4 | | | |
|--|---|-----|--------|
| Criteria | Screening Question | Yes | No |
| 3 | Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | | X |
| Provide basis: Infiltration rates are anticipated to be below 0.5 inches per hour, however any infiltration could increase the risk of storm water pollutants discharging to the public beach. | | | |
| Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |
| 4 | Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | | X |
| Provide basis: Infiltration rates are anticipated to be below 0.5 inches per hour, however any infiltration could increase the risk of storm water pollutants discharging to the public beach. | | | |
| Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability. | | | |
| Part 1 Result* | If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration | | Part 2 |
| | If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2 | | |

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Appendix C: Geotechnical and Groundwater Investigation Requirements

| Worksheet C.4-1 Page 3 of 4 | | | |
|--|--|-----|----|
| Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria | | | |
| Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated? | | | |
| Criteria | Screening Question | Yes | No |
| 5 | Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D. | | X |
| <p>Provide basis: Infiltration at any rate will result in mounding above the argillic (clay) layer, and perched groundwater has already been identified within 10 feet of the existing surface. This is considered an unsuitable condition in Appendix F of the City of San Diego Guidelines for Geotechnical Reports. Also, the fine content of the underlying soils are also considered unsuitable according to Appendix F, as is the slopes along the beach front that are greater than 25% and are retained by retaining walls.</p> <p>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</p> | | | |
| 6 | Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2. | | X |
| <p>Provide basis: Groundwater mounding would be increased above the clay layer and perched groundwater has already been documented to be within 10 feet of the existing surface. These conditions would create geotechnical hazards for the building and retaining wall foundations.</p> <p>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</p> | | | |

Appendix C: Geotechnical and Groundwater Investigation Requirements

| Worksheet C.4-1 Page 4 of 4 | | | |
|--|---|------|----|
| Criteria | Screening Question | Yes | No |
| 7 | Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | | |
| <p>Provide basis: As described above, infiltration of any amount would contribute to rising groundwater levels of the shallow perched groundwater conditions.</p> <p>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</p> | | | |
| 8 | Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3. | | |
| <p>Provide basis: N/A</p> <p>Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</p> | | | |
| Part 2 Result* | <p>If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration.</p> <p>If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.</p> | NONE | |

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings