A.1 PDP WQTR

CITY OF SOLANA BEACH

PRIORITY DEVELOPMENT PROJECT (PDP)
WATER QUALITY TECHNICAL REPORT (WQTR)
FOR
Ida Avenue Apartments
Case No. 17-17-3

Ida Avenue
Solana Beach, CA 92075

ASSESSOR'S PARCEL NUMBER(S):
298-162-37

ENGINEER OF WORK:
Daniel Moussavi
Armstrong & Brooks Consulting Engineers

_____

Daniel Moussavi
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PREPARED FOR:
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DATE OF WQTR:
February 09, 2018

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ACRONYMS

APN	Assessor's Parcel Number
BMP	Best Management Practice
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
WQTR	Water Quality Technical Report

PDP WQTR PREPARER'S CERTIFICATION PAGE

Project Name: Ida Avenue Apartments
Permit Application Number: Case No. 17-17-3

PREPARER'S CERTIFICATION

I hereby declare that I am the Engineer in Responsible Charge of design of storm water best management practices (BMPs) for this project, and that I have exercised responsible charge over the design of the BMPs as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the PDP requirements of the City of Solana Beach BMP Design Manual, which is a design manual for compliance with the City of Solana Beach and the MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2015-0100) requirements for storm water management.

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 BMP Design Manual. I certify that this PDP WQTR has been completed to the best of my ability and accurately reflects the project being proposed and the applicable 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 WQTR 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

Daniel Moussavi_____
Print Name

Armstrong & Brooks Consulting Engineers_____
Company

_____
Date

Engineer's Seal:

PDP WQTR PROJECT OWNER'S CERTIFICATION PAGE

Project Name: Ida Avenue Apartments
Permit Application Number: Case No. 17-17-3

PROJECT OWNER'S CERTIFICATION

This PDP WQTR has been prepared for KNN Management, LLC by Armstrong & Brooks Consulting Engineers. The PDP WQTR is intended to comply with the PDP requirements of the City of Solana Beach BMP Design Manual, which is a design manual for compliance with the City of Solana Beach and the MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2015-0100) requirements for storm water management.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan. Once the undersigned transfers its interests in the property, its successor-in-interest shall bear the aforementioned responsibility to implement the best management practices (BMPs) described within this plan, including ensuring on-going operation and maintenance of structural BMPs. A signed copy of this document shall be available on the subject property into perpetuity.

_____
Project Owner's Signature

Shantu Patel
Print Name

KNN Management, LLC
Company

_____
Date

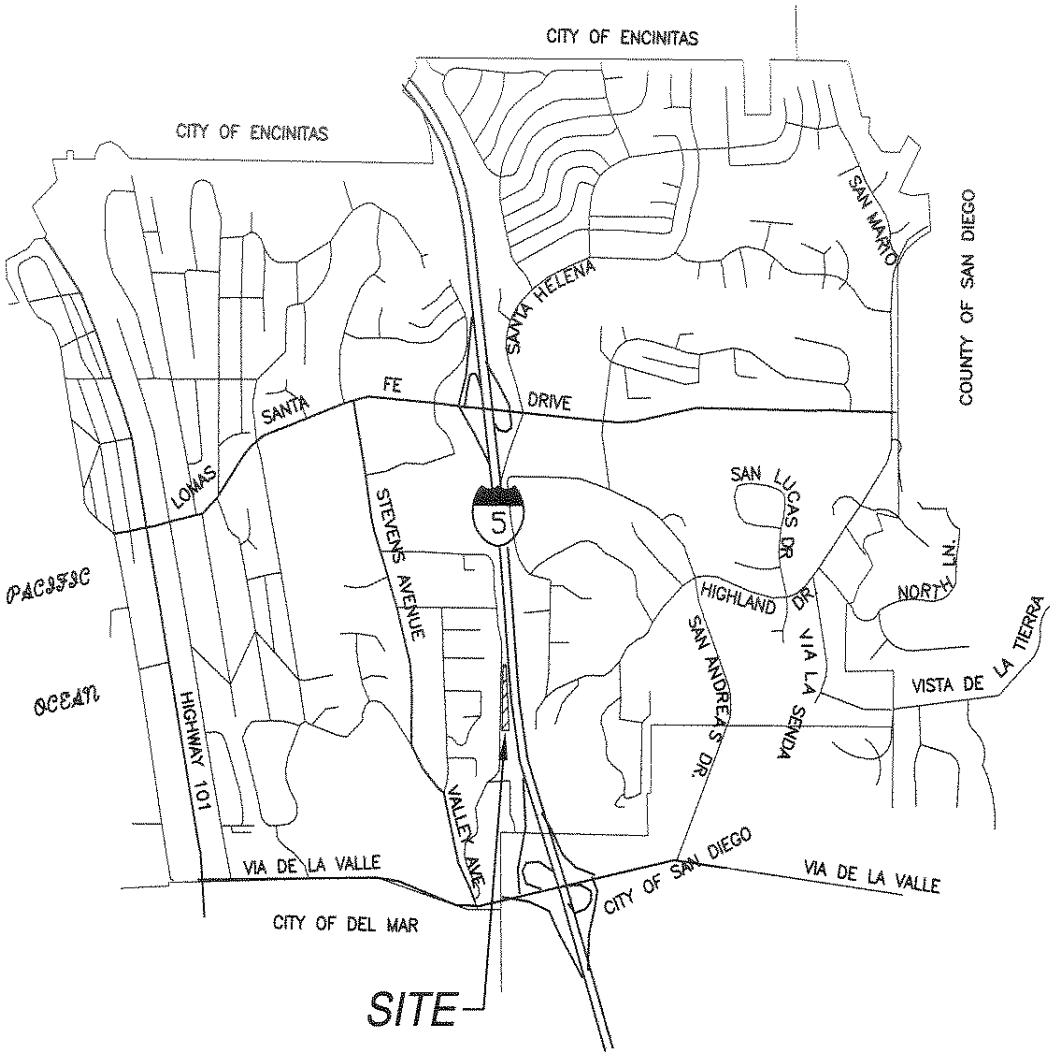
SUBMITTAL RECORD

Use this Table to keep a record of submittals of this PDP WQTR. Each time the PDP WQTR is re-submitted, provide the date and status of the project. In column 4 summarize the changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments behind this page.

Submittal Number	Date	Project Status	Summary of Changes
1		☒ Preliminary Design / Planning/ CEQA ☐ Final Design	Initial Submittal
2		☐ Preliminary Design / Planning/ CEQA ☐ Final Design	
3		☐ Preliminary Design / Planning/ CEQA ☐ Final Design	
4		☐ Preliminary Design / Planning/ CEQA ☐ Final Design	

PROJECT VICINITY MAP

Project Name: Ida Avenue Apartments
Permit Application Number: Case No. 17-17-3



Site Information Checklist For PDPs	Form 1 (PDPs) City of Solana Beach BMP Design Manual
Project Summary Information:	
Project Name:	Ida Avenue Apartments
Project Address:	748 Ida Avenue Solana Beach, CA, 92075
Assessor's Parcel Number(s) (APN(s))	298-162-37
Permit Application Number	Case No. 17-17-3
Project Hydrologic Unit	Select One: ☒ San Dieguito (HA Solana Beach, HSA Rancho Santa Fe) 905.11 ☐ Los Peñasquitos (HA Escondido Creek, HAS San Elijo) 904.61
Project Watershed (Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	San Dieguito Hydrologic Unit, Solana Beach HA, Rancho Santa Fe HSA (905.10, 5.11)
Parcel Area (total area of Assessor's Parcel(s) associated with the project)	0.94 Acres (40,844 Square Feet)
Area to be Disturbed by the Project (Project Area)	0.94 Acres (40,844 Square Feet)
Project Proposed Impervious Area (subset of Project Area)	0.51 Acres (22,400 Square Feet)
Project Proposed Pervious Area (subset of Project Area)	0.42 Acres (18,444 Square Feet)

Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project.

This may be less than the Parcel Area.

Form 1

Description of Existing Site Condition

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

☐ Existing development
☐ Previously graded but not built out
☐ Demolition completed without new construction
☐ Agricultural or other non-impervious use
☒ Vacant, undeveloped/natural

Description / Additional Information:

The site lies on a 3 to 1 slope of undeveloped land in between the I-5 and Ida Ave.

Existing Land Cover Includes (select all that apply):

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

Description / Additional Information:

The site is moderately covered with natural shrubs and grasses. There are no existing improvements or impervious areas.

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

Form 1

Existing Natural Hydrologic Features (select all that apply):

☐ Watercourses
☐ Seeps
☐ Springs
☐ Wetlands
☒ None

Description / Additional Information:

An existing ridge traverses from east to west and divides the site into two drainage management areas (DMA)s: DMA A and DMA B. Offsite flows begin at a high point at the top of the ridge near the I-5 within CALTRANS right of way and sheet through the site to in Ida Ave. Flows are divided by the ridgeline and are conveyed southerly and northerly along Ida Ave. The site area from the proposed project boundary (0.94 acres) was used in the existing conditions to compare pre and post-development flows and volumes.

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) Is runoff from offsite conveyed through the site? if yes, quantify 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 any existing storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels; and

(4) Identify all discharge locations from the existing project site along with a summary of 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.

Describe existing site drainage patterns:

1. *Existing drainage conveyance is natural.*
2. *Runoff is conveyed through the site.*
3. *The proposed site was divided into two DMAs to perpetuate existing drainage patterns: DMA A-2 and DMA B-2. Offsite flows generated upstream of the site within DMAs A-1 (0.3 CFS) and B-1 (0.1 CFS) will be diverted around the site via proposed v-gutters, drop inlet catch basins, and HDPE pipe to prevent comingling of flows generated onsite.*
4. *There are no existing storm drain improvements on site. A natural ridge line divides the site into two DMAs, where flow sheets through.*
5. *See number 2 above. DMA A-2 = 0.52 acres. DMA B-2 = 0.42 acres.*

Form 1
Description of Proposed Site Development
Project Description / Proposed Land Use and/or Activities: *The proposed site consists of two proposed buildings with eight apartment units, driveways, underground parking, sidewalks, landscaping, and a playground area. Sump pumps will be installed in the underground parking garages to convey flow to be treated. Drop inlet catch basins and HDPE pipe will be installed to convey flow generated onsite onto Ida Ave. Two 4'x6' Filterra catch basins will be constructed on Ida Ave. to treat stormwater generated onsite. The onsite flows will then be conveyed to ADS perforated underground storage chambers to detain the post-development 10-year volumes. These flows will be detained and infiltrate into the ground. For storms higher than the 10-year, flows will be bypassed via overflow and continue along Ida Ave. to perpetuate pre-development flow patterns and quantities.* *Offsite flows generated upstream of the site within DMAs A-1 and B-1 will be diverted around the site via proposed v-gutters, drop inlet catch basins, and HDPE pipe to prevent comingling of flows generated onsite.*
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): *A total of 8 residential, two story apartments in 2 buildings (one building of 6 units and one building of 2 units). 6 Unit Building = 10,875 S.F.; 2 Unit Building = 5,463 S.F. Driveways will connect Ida Ave. to underground parking garages. Sidewalks and retaining walls will be constructed.*

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

The project will construct pervious landscape features and maximize area to the maximum extent practicable. A pervious playground area will be constructed at the northerly limits of the site.

Form 1

Does the project include grading and changes to site topography?

☒ Yes
☐ No

Description / Additional Information:

Retaining walls will be constructed to grade pads for the apartment lots. Underground parking garages will be constructed and sump pumps will be installed in the underground parking garages to convey flow to be treated.

Form 1
Description of Proposed Site Drainage Patterns

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 or 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.

Describe proposed site drainage patterns::

The proposed site consists of two proposed buildings with eight apartment units, driveways, underground parking, sidewalks, landscaping, and a playground area. Sump pumps will be installed in the underground parking garages to convey flow to be treated. Drop inlet catch basins and HDPE pipe will be installed to convey flow generated onsite onto Ida Ave. Two 4'x6' Filterra catch basins will be constructed on Ida Ave. to treat stormwater generated onsite. The onsite flows will then be conveyed to ADS perforated underground storage chambers to detain the post-development 10-year volumes. These flows will be detained and infiltrate into the ground. For storms higher than the 10-year, flows will be bypassed via overflow and continue along Ida Ave. to perpetuate pre-development flow patterns and quantities.

The proposed site was divided into two DMAs to perpetuate existing drainage patterns: DMA A-2 and DMA B-2. Offsite flows generated upstream of the site within DMAs A-1 (100-year flow = 0.3 CFS) and B-1 (0.1 CFS) will be diverted around the site via proposed v-gutters, drop inlet catch basins, and HDPE pipe to prevent comingling of flows generated onsite.

DMA A-2 is the onsite northerly watershed tributary to Ida Ave, Filterra Catch Basin A, and Point of Connection 1 (POC 1). DMA A-2 generates a 100-year onsite flow of 1.5 CFS.

DMA B-2 is the onsite southerly watershed tributary to Ida Ave, Filterra Catch Basin B, and POC 2. DMA B-2 generates a 100-year onsite flow of 1.5 CFS.

One unit hydrograph model for proposed conditions was created to determine the total volume generated from the entire 0.94-acre site. The 10-year volume generated from the site was found to be 4662 CF. This volume will be stored within two separate storage chamber systems distributed between DMA A-2 and B-2.

Form 1

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

Description / Additional Information:

Form 1
Identification and Narrative of Receiving Water and Pollutants of Concern
Describe flow path of storm water from the project site discharge location(s), through urban storm conveyance systems as applicable, to receiving creeks, rivers, and lagoons as applicable, and ultimate discharge to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable): *Flows generated onsite will be treated and detained onsite. Overflow and bypass flows will continue to discharge to Ida Ave. and will be capture in storm drain catch basins downstream. The existing Solana Beach storm drain conveyance system will convey the flows to the Pacific Ocean.*
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**
San Dieguito River	Enterococci, fecal coliform, nitrogen, phosphorus, TDS, toxicity	Nutrients / eutrophication / oxygen depletion, silt and sediment, toxicity, pathogens, salinity and dissolved solids, litter / trash / debris

Identification of Project Site Pollutants*

***Identification of project site pollutants is only required if flow-through 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)**

Identify pollutants expected from the project site based on all proposed use(s) of the site (see BMP Design Manual Appendix B.6):

Form 1			
Pollutant	**Not Applicable to the Project Site**	**Expected from the Project Site**	**Also a Receiving Water Pollutant of Concern**
Sediment	X		X
Nutrients	X		
Heavy Metals	X		
Organic Compounds	X		
Trash & Debris		X	X
Oxygen Demanding Substances	X		
Oil & Grease		X	
Bacteria & Viruses	X		

Pesticides	X		

Form 1
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 an exempt receiving water such as the Pacific Ocean, and exempt river reach, or a tidally-influenced area.
☐ 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 the Pacific Ocean, a tidally-influenced area, or an exempt river reach.
☐ 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):

Form 1

Critical Coarse Sediment Yield Areas*

***This Section only required if hydromodification management requirements apply**

Based on the maps provided within the WMAA, do potential critical coarse sediment yield areas exist within the project drainage boundaries?

☐ Yes
☒ No, No critical coarse sediment yield areas to be protected based on WMAA maps

If yes, have any of the optional analyses presented in Section 6.2 of the BMP Design Manual been performed?

☐ 6.2.1 Verification of Geomorphic Landscape Units (GLUs) Onsite
☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment
☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
☐ No optional analyses performed, the project will avoid critical coarse sediment yield areas identified based on WMAA maps

If optional analyses were performed, what is the final result?

☐ No critical coarse sediment yield areas to be protected based on verification of GLUs onsite
☐ Critical coarse sediment yield areas exist but additional analysis has determined that protection is not required. Documentation attached in Attachment 2.b of the WQTR.
☐ Critical coarse sediment yield areas exist and require protection. The project will implement management measures described in Sections 6.2.4 and 6.2.5 as applicable, and the areas are iden tified on the WQTR Exhibit.

Discussion / Additional Information:

N/A

Form 1

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.

DMA A will discharge to POC 1 and DMA B will discharge to POC 2. A site model was created in Clear Creek Solutions software to verify that HCOCs are mitigated.

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)

Form 1
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. N/A

Form 1
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. N/A

Source Control BMP Checklist for All Development Projects	Form 2 (PDPs) City of Solana Beach BMP Design Manual

Project Identification

Project Name: Ida Avenue Apartments

Permit Application Number: Case No. 17-17-3

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 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 City of Solana Beach 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	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-1 not implemented:			
SC-2 Storm Drain Stenciling or Signage	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-2 not implemented:			

Form 2			
Source Control Requirement	**Applied?**		
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-3 not implemented:			
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-4 not implemented:			
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-5 not implemented:			

Form 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	☒ Yes	☐ No	☐ N/A
☒ Interior floor drains and elevator shaft sump pumps	☒ Yes	☐ No	☐ N/A
☒ Interior parking garages	☒ Yes	☐ No	☐ N/A
☐ Need for future indoor & structural pest control	☐ Yes	☐ No	☒ N/A
☐ Landscape/Outdoor Pesticide Use	☐ Yes	☐ No	☒ N/A
☐ Pools, spas, ponds, decorative fountains, and other water features	☐ Yes	☐ No	☒ N/A
☐ Food service	☐ Yes	☐ No	☒ N/A
☐ Refuse areas	☐ Yes	☐ No	☒ N/A
☐ Industrial processes	☐ Yes	☐ No	☒ N/A
☐ Outdoor storage of equipment or materials	☐ Yes	☐ No	☒ N/A
☐ Vehicle and Equipment Cleaning	☐ Yes	☐ No	☒ N/A
☐ Vehicle/Equipment Repair and Maintenance	☐ Yes	☐ No	☒ N/A
☐ uel Dispensing Areas	☐ Yes	☐ No	☒ N/A
☐ Loading Docks	☐ Yes	☐ No	☒ N/A
☐ Fire Sprinkler Test Water	☒ Yes	☐ No	☐ N/A
☐ Miscellaneous Drain or Wash Water			
☒ Plazas, sidewalks, and parking lots			
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.			

Site Design/LID BMP Checklist for All Development Projects	Form 3 (PDPs) City of Solana Beach BMP Design Manual

Project Identification

Project Name: Ida Avenue Apartments

Permit Application Number: Case No. 17-17-3

Site Design/LID BMPs

All development projects must implement site design/LID BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual 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/LID BMP as described in Chapter 4 and/or Appendix E of the City of Solana Beach 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.

Site Design Requirement	Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-1 not implemented:			
SD-2 Conserve Natural Areas, Soils, and Vegetation	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-2 not implemented:			

Form 3			
Source Control Requirement	**Applied?**		
SD-3 Minimize Impervious Area	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-3 not implemented:			
SD-4 Minimize Soil Compaction	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-4 not implemented:			
SD-5 Impervious Area Dispersion	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-5 not implemented:			
SD-6 Runoff Collection	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-6 not implemented:			
SD-7 Landscaping with Native or Drought Tolerant Species	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-7 not implemented:			
SD-8 Harvesting and Using Precipitation	☐ Yes	☐ No	☒ N/A
Discussion / justification if SD-8 not implemented:			

Summary of PDP Structural BMPs	Form 4 (PDPs) City of Solana Beach BMP Design Manual
Project Identification	
Project Name: Ida Avenue Apartments	
Permit Application Number: Case No. 17-17-3	
PDP Structural BMPs	
All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual). 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 local jurisdiction at the completion of construction. This may include requiring the project owner or project owner's representative and engineer of record to certify construction of the structural BMPs (see Section 1.12 of the BMP Design Manual). PDP structural BMPs must be maintained into perpetuity, and the local jurisdiction must confirm the maintenance (see Section 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).	

Form 4

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.

Drop inlet catch basins and HDPE pipe will be installed to convey flow generated onsite onto Ida Ave. Two 4'x6' Filterra catch basins will be constructed on Ida Ave. to treat stormwater generated onsite. The onsite flows will then be conveyed to ADS perforated underground storage chambers to detain the post-development 10-year volumes. These flows will be detained and infiltrate into the ground. For storms higher than the 10-year, flows will be bypassed via overflow and continue along Ida Ave. to perpetuate pre-development flow patterns and quantities.

Due to limited site are from existing slopes, flat area for treatment basins are not feasible. Due to limited landscaped area compared to the design capture volume, harvest and reuse is not feasible. Filterra catch basins will sufficiently treat pollutants in stormwater and storage chambers will infiltrate underground to perpetuate existing condtions.

One unit hydrograph model for proposed conditions was created to determine the total volume generated from the entire 0.94-acre site. The 10-year volume generated from the site was found to be 4662 CF. This volume will be stored within two separate storage chamber systems distributed between DMA A-2 and B-2.

Each storage chamber was calculated to store approximately 215.1 CF of stormwater within the tank and the gravel trench surrounding the tank. The total required storage of 4662 CF will be stored in 22 storage chambers (22 x 215.1 CF = 4732 CF).

Using CCS software, the onsite pre and post conditions were modeled to compare hydrologic conditions at the outlet points. The software showed that the proposed site mitigates and reduces flow rates for the 2-25 year storms. The 2 year storm goes from 0.197 CFS for existing conditions to 0.116 CFS for proposed conditions. The 25 year storm goes from 0.494 CFS to 0.427 CFS.

The design capture volume (DCV) was calculated to be 917 CF for the site per the City of Solana Beach BMP Design Manual Appendix B.1. However, Filterra catch basins were sized per the manufacturer-recommended sizing table, which is based on site area and impervious fraction. For a site area of 0.5 acres (DMA A and DMA B) and a C value of 0.5, 4'x6' Filterra catch basins will be installed.

Form 4
(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)
Continued from page 1)
Form 4 (Copy as many as needed)

Structural BMP Summary Information
(Copy this page as needed to provide information for each individual proposed structural BMP)

Structural BMP ID No. 1 , 2

Construction Plan Sheet No. CGP-02

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)
☐ Biofiltration with Nutrient Sensitive Media Design (BF-2)
☒ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F
☐ Flow-through treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below)
☐ Flow-through 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)
☒ 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)

Form 4 (Copy as many as needed)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the City Engineer (See Section 1.12 of the BMP Design Manual).	KNN Management, LLC
Who will be the final owner of this BMP?	Shantu Patel
Who will maintain this BMP into perpetuity?	Shantu Patel
What is the funding mechanism for maintenance?	Shantu Patel

Form 4 (Copy as many as needed)
Structural BMP ID No. 1, 2
Construction Plan Sheet No. CGP-02
Discussion (as needed): *Two 4'X6' Filterra Catch Basins will be installed.* *Two sets of ADS stormwater chambers will be installed. 22 chambers total will be installed for a storage volume of approximately 4,732 CF.*

<table>
<tr><th colspan="2">Harvest and Use Feasibility Checklist</th><th>Form 5 (PDPs)
City of Solana Beach BMP Design Manual</th></tr>
<tr><td colspan="3">1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?
☒ Toilet and urinal flushing
☒ Landscape irrigation
☐ Other:_____</td></tr>
<tr><td colspan="3">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.
35 CF</td></tr>
<tr><td colspan="3">3. Calculate the DCV using worksheet B-2.1.
DCV = ___1071_____ (cubic feet)</td></tr>
<tr><td>3a. Is the 36 hour demand greater than or equal to the DCV?
☐ Yes / ☐ No ⇨
⇩</td><td>3b. Is the 36 hour demand greater than 0.25DCV but less than the full DCV?
☐ Yes / ☐ No ⇨
⇩</td><td>3c. Is the 36 hour demand less than 0.25DCV?
☒ Yes
⇩</td></tr>
<tr><td>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.</td><td>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.</td><td>Harvest and use is considered to be infeasible.</td></tr>
<tr><td colspan="3">Is harvest and use feasible based on further evaluation?
☐ Yes, refer to Appendix E to select and size harvest and use BMPs.
☒ No, select alternate BMPs.</td></tr>
</table>

Categorization of Infiltration Feasibility Condition	Form 6 (PDPs) City of Solana Beach BMP Design Manual

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?

Criteri	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	

Provide basis:

USGS maps show that the site is underlaid with hydrologic soils Group A and Group B soils and the geotechnical report notes that the majority of soils found were silty sand.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

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	

Provide basis:

The site geotechnical report does not preclude the use of infiltration.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Form 6			
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: Groundwater was not found in borings. The site geotechnical report does not preclude the use of infiltration. 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: The site geotechnical report does not preclude the use of infiltration. 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** 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 Agency/Jurisdictions to substantiate findings

Form 6

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.		

Provide basis:

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.

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.		

Provide basis:

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.

Form 6			
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.		
Provide basis: 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.			
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.		
Provide basis: 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.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** 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.**		

*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 Agency/Jurisdictions to substantiate findings

Factor of Safety and Design Infiltration Rate Worksheet					Form 7 (PDPs) City of Solana Beach BMP Design Manual
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	3	0.75
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.5
B	Design	Level of pretreatment/ expected sediment loads	0.5	3	1.5
		Redundancy/resiliency	0.25	2	0.5
		Compaction during construction	0.25	2	0.5
		Design Safety Factor, $S_B = \Sigma p$			2.5
Combined Safety Factor, $S_{total} = S_A \times S_B$				3.75	
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)				6	
Design Infiltration Rate, in/hr, $K_{design} = K_{observed} / S_{total}$				1.6	
Supporting Data					
Briefly describe infiltration test and provide reference to test forms: Record maps were used to estimate infiltration rate.					

Downstream Systems Requirements for Preservation of Coarse Sediment Supply		Form 8 (PDPs) City of Solana Beach BMP Design Manual	
When it has been determined that potential critical coarse sediment yield areas exist within the project site, the next step is to determine whether downstream systems would be sensitive to reduction of coarse sediment yield from the project site. Use this form to document the evaluation of downstream systems requirements for preservation of coarse sediment supply.			
Project Name: Ida Avenue Apartments			
Project Tracking Number / Permit Application Number: Case No. 17-17-3			
1	Will the project discharge runoff to a hardened MS4 system (pipe or lined channel) or an un-lined channel?	☒ Hardened MS4 system	Go to 2
		☐ Un-lined channel	Go to 4
2	Will the hardened MS4 system convey sediment (e.g., a concrete-lined channel with steep slope and cleansing velocity) or sink sediment (e.g., flat slopes, constrictions, treatment BMPs, or ponds with restricted outlets within the system will trap sediment and not allow conveyance of coarse sediment from the project site to an un-lined system).	☒ Convey	Go to 3
		☐ Sink	Go to 7
3	What kind of receiving water will the hardened MS4 system convey the sediment to?	☒ Un-lined channel	Go to 4
		☐ Lake ☐ Reservoir ☐ Bay	Go to 7
		☐ Lagoon ☐ Ocean	Go to 6
4	Is the un-lined channel impacted by deposition of sediment? This condition must be documented by the local agency.	☐ Yes	Go to 7
		☒ No	Go to 5

Form 8	
5	End – Preserve coarse sediment supply to protect un-lined channels from accelerated erosion due to reduction of coarse sediment yield from the project site unless further investigation determines the sediment is not critical to the receiving stream. Sediment that is critical to receiving streams is the sediment that is a significant source of bed material to the receiving stream (bed sediment supply) (see Section 6.2.3 and Appendix H.2 of the manual).
6	End – Provide management measures for preservation of coarse sediment supply (protect beach sand supply).
7	End – Downstream system does not warrant preservation of coarse sediment supply, no measures for protection of critical coarse sediment yield areas onsite are necessary. Use the space below to describe the basis for this finding for the project.

ATTACHMENT 1
BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	**Contents**	**Checklist**
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet.	☒ 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 1.a	☒ Included on DMA Exhibit in Attachment 1.a ☐ Included as Attachment 1.b, separate from DMA Exhibit
Attachment 1c	Form 5, 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 5.	☒ Included ☐ Not included because the entire project will use infiltration BMPs
Attachment 1d	Form 6, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form 6.	☒ Included ☐ Not included because the entire project will use harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines	☒ 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 demolition
- ☒ 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 1)
- ☒ Structural BMPs (identify location, type of BMP, and size/detail)

DRAINAGE SUMMARY
2/6/2018

PROPOSED CONDITIONS

DMA	SITE	A-2	B-2
AREA (SF)	40844	19334	21510
AREA (AC)	0.94	0.44	0.49
AREA IMP (SF)	22400		
AREA PERV (SF)	18444		
C	0.539		
RAINFALL d (IN)	0.5		
DCV (CF)	917		
Tc-10 (MIN)	8.3		
Q-10 (CFS)	1.5		
V-10 (CF)	4662		
V-CHAMBERS (CF)	4900		
Q-100 (CFS)		1.5	1.7

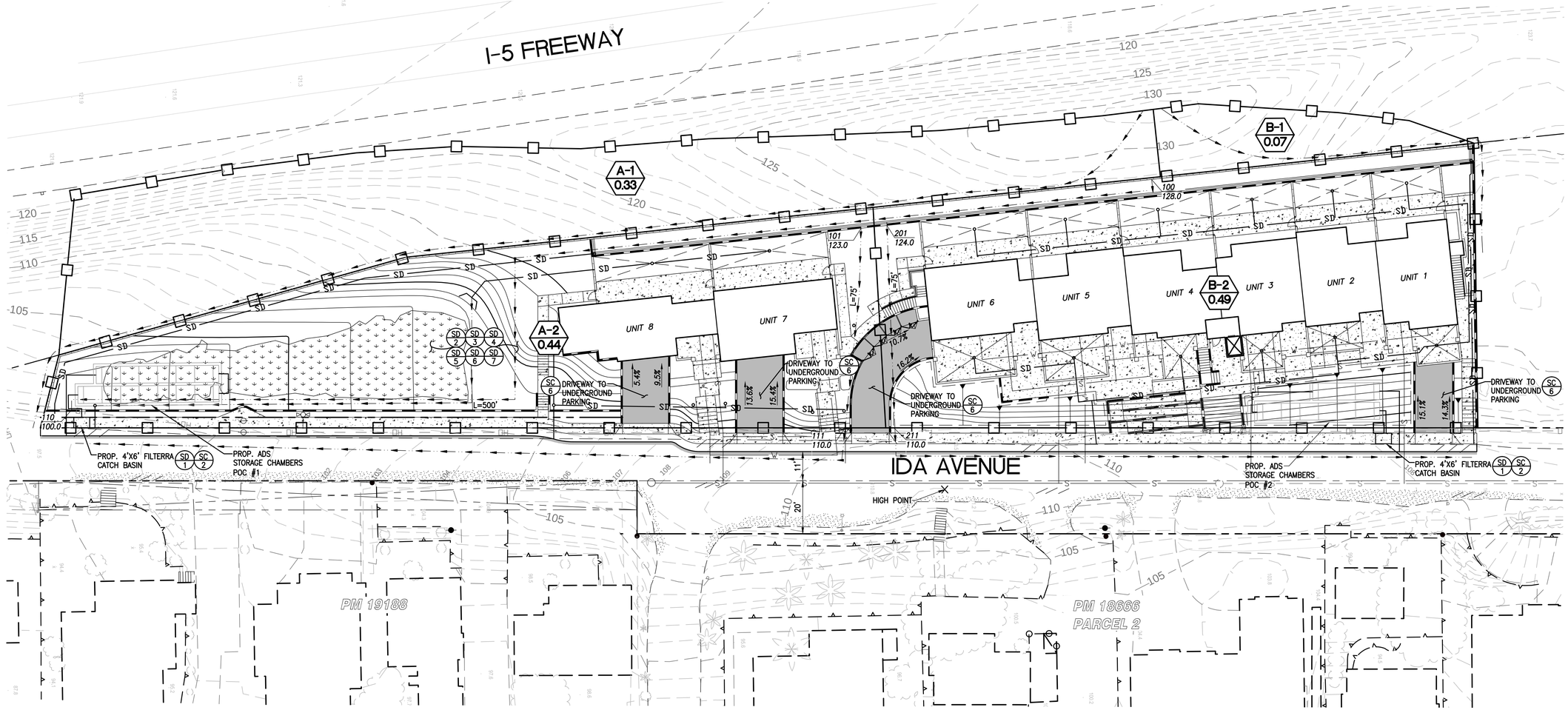
EXISTING CONDITIONS

DMA	SITE (A-2+B-2)	A-1	A-2	SUM	B-1	B-2	SUM
AREA (SF)	40810	14384	22621		2975	18189	
AREA (AC)	0.94	0.33	0.52		0.07	0.42	
AREA IMP (SF)	0	0	0		0	0	
AREA PERV (SF)	40810	14384	22621		2975	18189	
TC-10 (MIN)	11.5						
Q-10 (CFS)	0.5						
Q-100 (CFS)		0.3	0.4	0.7	0.1	0.3	0.4
V-10 (CF)	0						

RAINFALL

2YR, 6HR	1.2
2YR, 24HR	1.8
5YR, 6HR	1.5
5YR, 24HR	2.5
10YR, 6HR	1.6
10YR, 24HR	3
25YR, 6HR	2
25YR, 24HR	3.5
50YR, 6HR	2.5
50YR, 24HR	4
100YR, 6HR	2.5
100YR, 24HR	4

WQTR / HYDROMODIFICATION EXHIBIT



BMP's FOR SOURCE CONTROLS	
NUMBER	DESCRIPTION
SC-1	PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
SC-2	STORM DRAIN STENCILING OR SIGNAGE
SC-3	PROTECT OUTDOOR MATERIALS STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF, AND WIND DISPERSAL
SC-4	PROTECT MATERIALS STORED IN OUTDOOR WORK AREAS FROM RAINFALL, RUN-ON, RUNOFF, AND WIND DISPERSAL
SC-5	PROTECT TRASH STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF, AND WIND DISPERSAL
SC-6	ADDITIONAL BMP'S BASED ON POTENTIAL SOURCES OF RUNOFF POLLUTANTS
SD-1	NATURAL DRAINAGE/HYDROLOGIC MAINTENANCE
SD-2	CONSERVE NATURAL AREAS, SOILS & VEGETATION
SD-3	MINIMIZE IMPERVIOUS AREA
SD-4	MINIMIZE SOIL COMPACTION
SD-5	IMPERVIOUS AREA DISPERSION
SD-6	RUNOFF COLLECTION
SD-7	LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES
SD-8	HARVESTING & USING PRECIPITATION

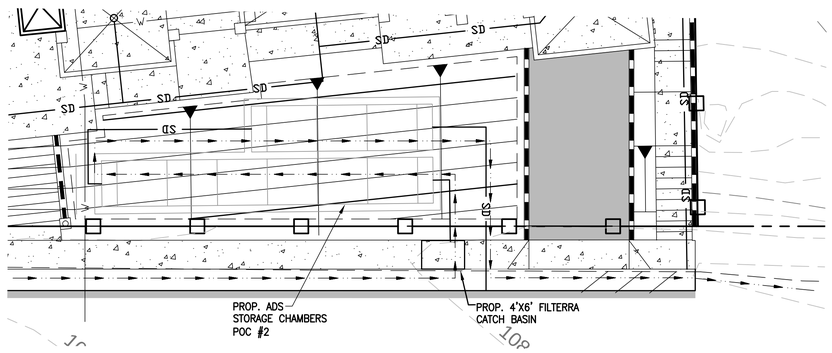
N

20 0 20 40

SCALE 1" = 20'

* NOTE

GROUNDWATER NOT ENCOUNTERED IN BORINGS



FLOW EXHIBIT

1"=10'

LEGEND

- DMA BOUNDARY
- FLOWLINE
- PROPERTY LINE
- SD — STORM DRAIN
- X / XX — DRAINAGE MANAGEMENT AREA / ACREAGE
- EXIST. AC
- PROP. AC
- PCC
- PROP. LDSCP (SOILS GROUP A)

WATER QUALITY TECHNICAL REPORT
FOR
IDA AVE. APARTMENTS

PREPARED BY:

ARMSTRONG & BROOKS CONSULTING ENGINEERS
PLANNING INFRASTRUCTURE SITE DEVELOPMENT WATER RESOURCES
1350 EAST CHASE DRIVE CORONA, CA 92882
P: 951-279-5000 F: 951-279-5430

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RAINFALL MAP

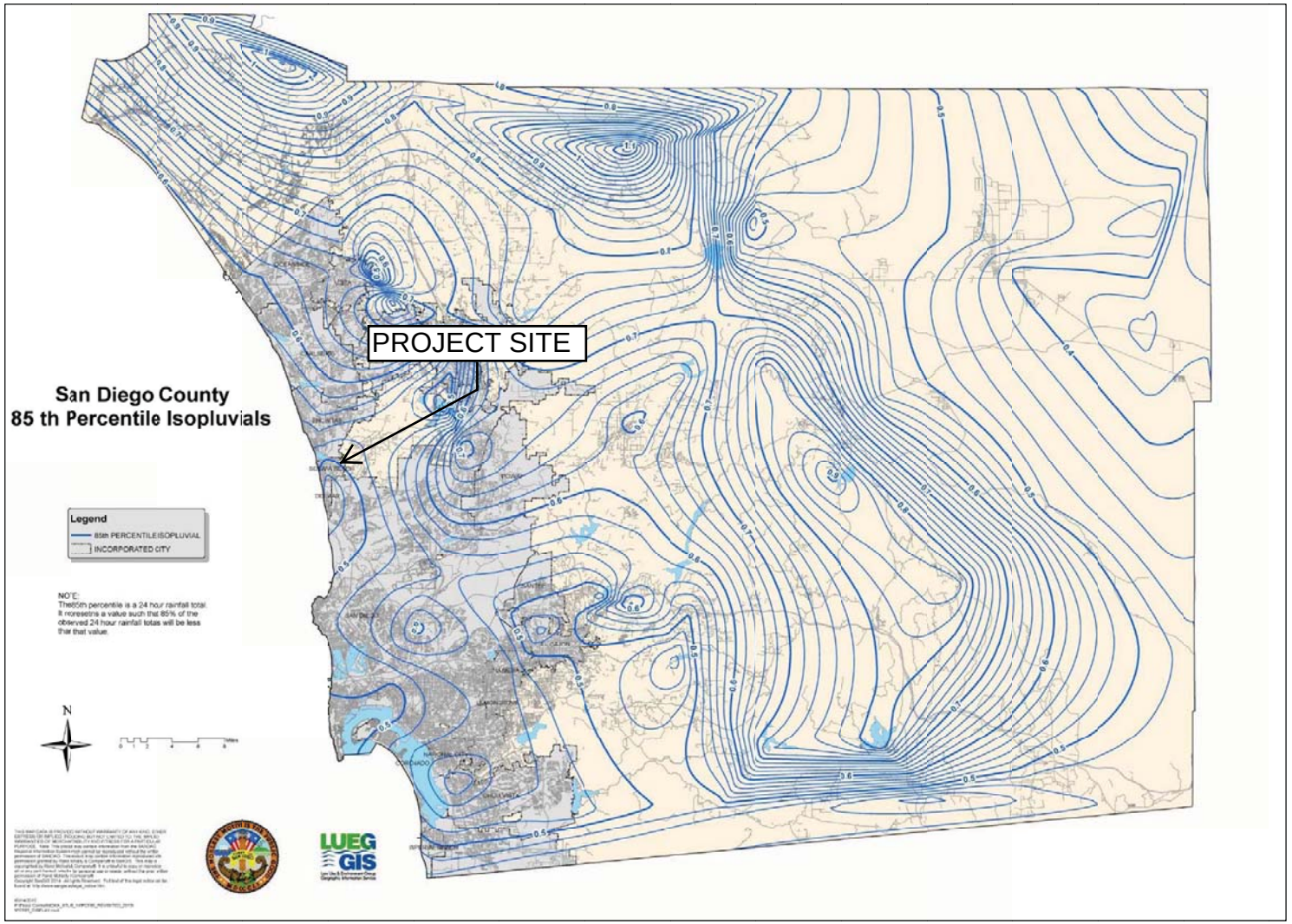


Figure B.1-1: 85th Percentile 24-hour Isopluvial Map

filterra
Bioretention Systems
CELEBRATING 10 YEARS
by KRISTAR

Table 1: Filterra® Quick Sizing Table
(Western Zone - 0.2 in/hr Uniform Intensity Approach)

Filterra® Box Sizes (feet)	Recommended Commercial Contributing Drainage Area (acres) where C = 0.85	Outlet Pipe
4x4	up to 0.22	4” SCH-40 PVC
4x6 or 6x4	0.23 to 0.33	4" SCH-40 PVC
4x6.5 or 6.5x4	0.23 to 0.35	4" SCH-40 PVC
4x8 or 8x4	0.34 to 0.44	4” SCH-40 PVC
4x16 or 16x4	up to 0.87	6” SCH-40 PVC
Standard 6x6	0.45 to 0.49	4” SCH-40 PVC
6x8 or 8x6	0.50 to 0.65	4” SCH-40 PVC
6x10 or 10x6	0.66 to 0.82	4” SCH-40 PVC
6x12 or 12x6	0.83 to 0.98	6” SCH-40 PVC
8x12 or 12x8	0.99 to 1.31	6" SCH-40 PVC
8x16 or 16x8	up to 1.75	6” SCH-40 PVC
8x18 or 18x8	up to 1.96	6” SCH-40 PVC
8x20 or 20x8	up to 2.18	6” SCH-40 PVC

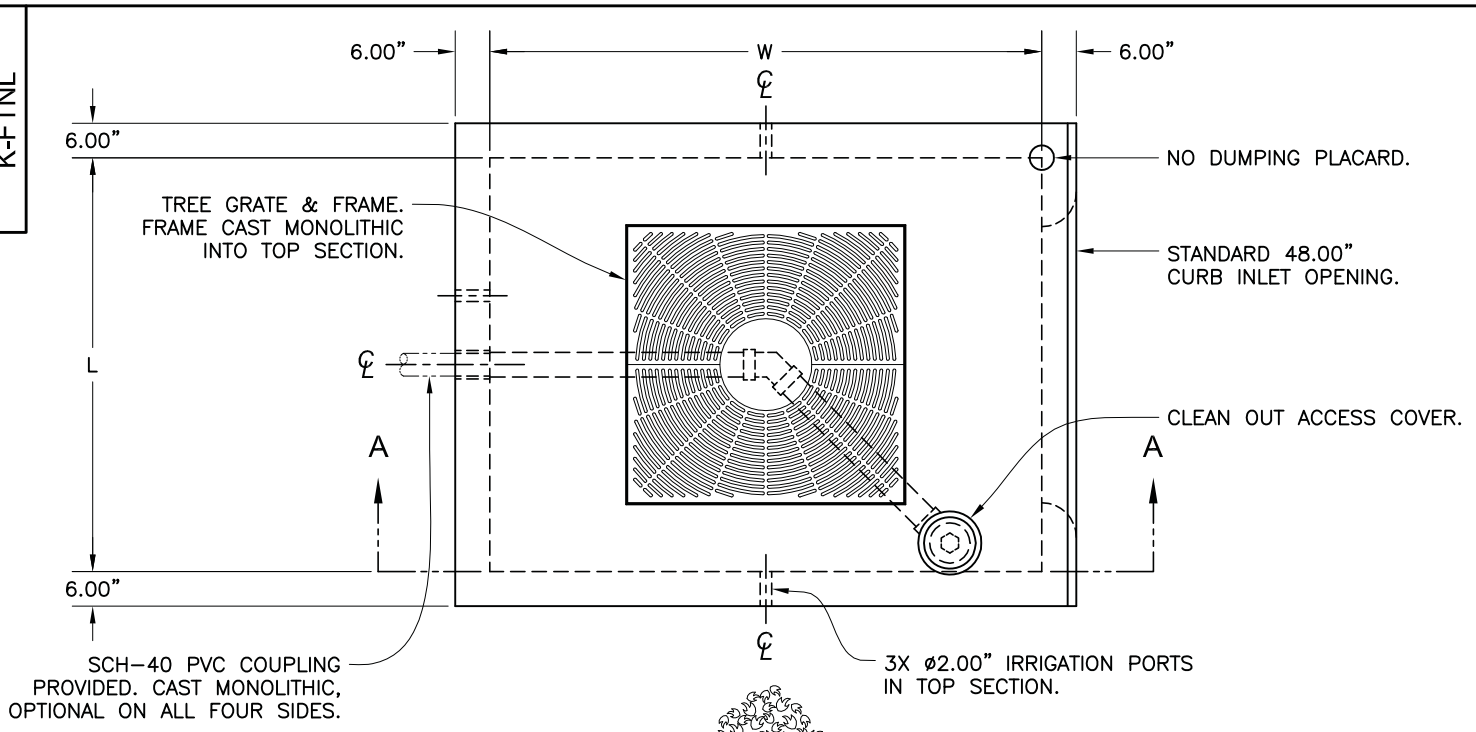
DMA A & B
A = 0.5 ACRES

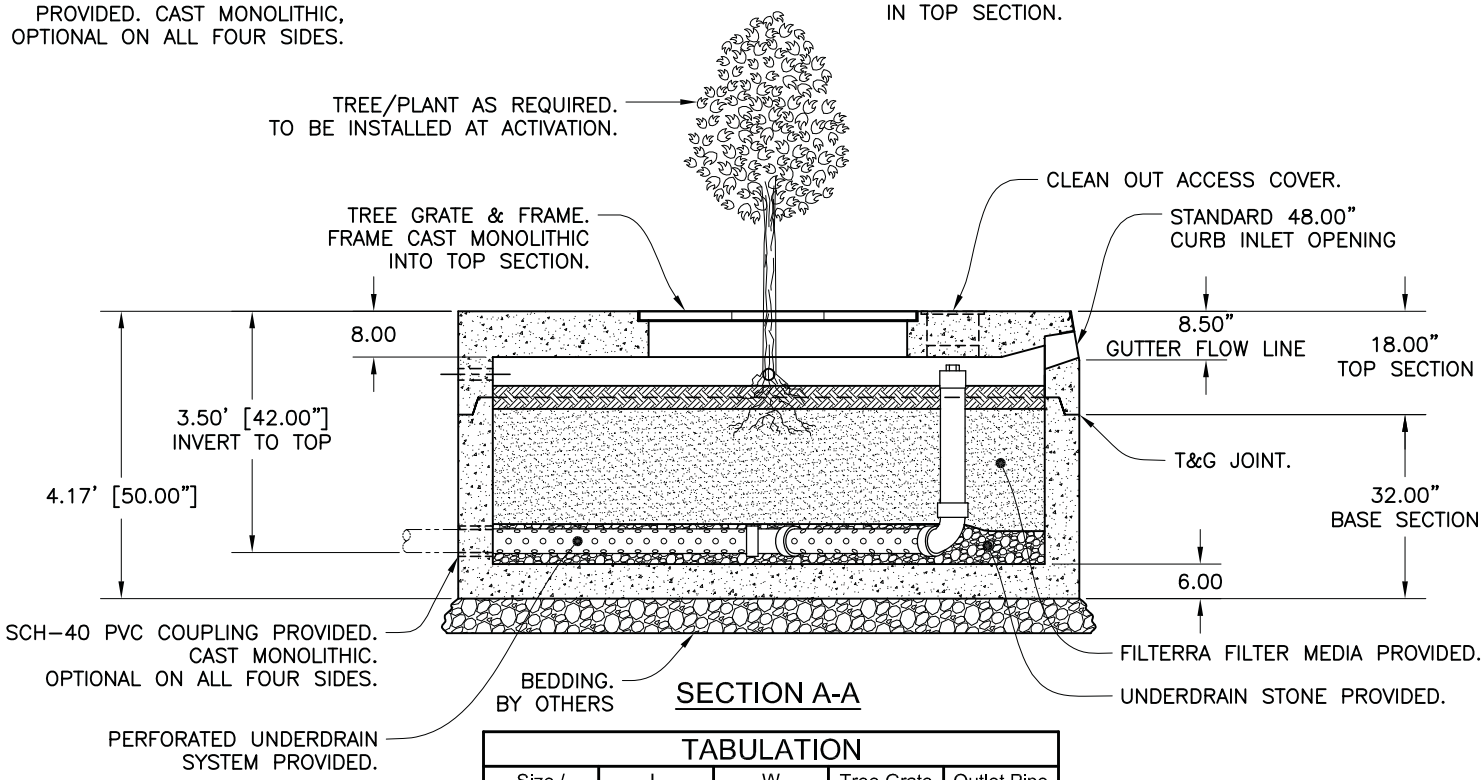
Filterra® Box Sizes (feet)	Recommended Residential Contributing Drainage Area (acres) where C = 0.50	Outlet Pipe
4x4	up to 0.37	4” SCH-40 PVC
4x6 or 6x4	0.38 to 0.60	4" SCH-40 PVC
4x6.5 or 6.5x4	0.38 to 0.60	4" SCH-40 PVC
4x8 or 8x4	0.61 to 0.74	4” SCH-40 PVC
4x16 or 16x4	up to 1.48	6” SCH-40 PVC
Standard 6x6	0.75 to 0.83	4” SCH-40 PVC
6x8 or 8x6	0.84 to 1.11	4” SCH-40 PVC
6x10 or 10x6	1.12 to 1.39	6” SCH-40 PVC
6x12 or 12x6	1.40 to 1.67	6” SCH-40 PVC
8x12 or 12x8	1.68 to 2.22	6" SCH-40 PVC
8x16 or 16x8	up to 2.97	6” SCH-40 PVC
8x18 or 18x8	up to 3.34	6” SCH-40 PVC
8x20 or 20x8	up to 3.71	6” SCH-40 PVC

Notes:

1. Additional Filterra Box sizes are available by contacting KriStar.
2. All boxes are standard 3.5 feet depth (INV to TC).
3. A standard PVC pipe coupling is cast into the wall for easy connection to discgarge drain.
4. Dimensions shown are internal. Please add 1’ to the internal dimensions to obtain the external dimensions (using 6" walls).
5. In line with TR55 data, for Commerical Developments a minimum (runoff coefficient) C factor of 0.85 is recommended. For Residential Developments, use of C factors less than 0.5 require individual site review by KriStar.
6. Please ask for Sizing Tables for other target treatment goals, e.g. 0.3 in/hr.
7. This sizing table is valid for CA, NV, AZ, CO, UT, NM. For the state of HI, please contact a Filterra® representative.

K-FTNL





SECTION A-A

TABULATION

Size / Designation	L (Feet)	W (Feet)	Tree Grate Quantity / Size	Outlet Pipe PVC SCH-40
4' X 6'	4.00'	6.00'	1ea. / 3' x 3'	Ø4.00"
4' x 6.5'	4.00'	6.50'	1ea. / 3' x 3'	Ø4.00"
4' x 8'	4.00'	8.00'	1ea. / 3' x 3'	Ø4.00"
4' x 16'	4.00'	16.00'	2ea. / 3' x 3'	Ø4.00"
6' x 8'	6.00'	8.00'	1ea. / 4' x 4'	Ø4.00"
6' x 10'	6.00'	10.00'	1ea. / 4' x 4'	Ø6.00"
6' x 12'	6.00'	12.00'	2ea. / 4' x 4'	Ø6.00"
8' x 12'	8.00'	12.00'	2ea. / 4' x 4'	Ø6.00"
8' x 16'	8.00'	16.00'	2ea. / 4' x 4'	Ø6.00"
8' x 18'	8.00'	18.00'	3ea. / 4' x 4'	Ø6.00"
8' x 20'	8.00'	20.00'	3ea. / 4' x 4'	Ø6.00"

MODIFICATION OF DRAWINGS IS PERMITTED ONLY BY WRITTEN AUTHORIZATION FROM KRISTAR ENTERPRISES, INC.

TITLE

Precast Filterra® Unit
Narrow Length Configuration

KriStar Enterprises, Inc.
360 Sutton Place, Santa Rosa, CA 95407
Ph: 800.579.8819, Fax: 707.524.8186, www.kristar.com

filterra®
US PAT 6,277,274
AND 6,569,321

DRAWING NO.	REV	F-ECO	DATE
K-FTNL	03	0006 JPR 6/17/11	JPR 1/7/11



filterra®
Bioretention Systems

Filterra® Stormwater Bioretention Filtration System

The Urban Solution for LID

Standard Filterra® System

The Standard Filterra® System is similar in concept to bioretention in its function and applications but has been optimized for high volume/flow treatment and high pollutant removal. Its small footprint allows it to be used on highly developed sites such as landscaped areas, parking lots and streetscapes. Filterra® is exceedingly adaptable and can be used alone or in combination with other BMPs.

Stormwater runoff enters the Standard Filterra System through a curb-inlet opening and flows through a specially designed filter media mixture contained in a landscaped concrete container. The filter media captures and immobilizes pollutants; those pollutants 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.

Features and Benefits

Best Value. Filterra offers the most cost effective stormwater treatment system featuring low cost, easy installation and simple maintenance.

Regulatory Compliance. Third party field testing confirmed that Filterra meets state regulatory requirements for pollutant removal under TAPE and TARP testing.

Aesthetics. Landscaping enhances the appearance of your site making it more attractive while removing pollutants.

Maintenance. Maintenance is simple and safe (no confined space access), and the first year is FREE with the purchase of every unit.

Versatile. Filterra is ideal for both new construction and urban retrofits, as well as:

- **Streetscapes**
- **Parking lots**
- **Highways**
- **Urban settings**
- **Daylighted Roof drains**
- **Industrial settings**

Design Support. Our engineers can assist you with all aspects of each Filterra application, including flora selection and sizing.[1]

Printed on FSC certified paper.

A Highly Effective System

Filterra is well-suited for the ultra-urban environment with proven high removal efficiency for many toxic substances such as petroleum and heavy metals.



Filterra® monitoring unit at an industrial port.

The Filterra System meets or exceeds federal and state regulatory guidelines for pollutant removal efficiencies of Total Suspended Solids (TSS), nutrients and metals.

Expected Pollutant Removal

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

TSS Removal	85%
Phosphorus Removal	60% - 70%
Nitrogen Removal	43%
Total Copper Removal	> 58%
Dissolved Copper Removal	46%
Total Zinc Removal	> 66%
Dissolved Zinc Removal	58%
Oil & Grease	> 93%

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

[1] For more details, see the Sizing Table for your project's region.



Maintenance is simple and safe.

filterra®
Bioretention Systems

Filterra® Stormwater Bioretention Filtration System

The Urban Solution for LID

Design Assistance

Visit www.filterra.com to receive your Filterra DAKit (Design Assistance Kit). This includes placement "Do's and Don'ts", example scenarios, detail drawings, specifications, project information form, and other essential design information.

Sizing Procedure

1) Use your project's Regional Filterra DAKit as a reference.

2) Determine Filterra locations (with effective bypass) in accordance with placement guidelines.

3) Determine contributing drainage areas to each Filterra.

4) Choose the corresponding size Filterra from the project's Regional Sizing Table.

5) For best results, get us involved early in the design process. Please send your completed project information form along with plans to Filterra for placement and application review.



Proper Placement

1) Do not place in a sump condition. The Standard Filterra cannot be used as a standalone inlet - it will need effective bypass during higher intensity rainfall events.

2) Do not direct surface flow to Filterra in a "head on" configuration. The ideal way to load Filterra to prevent system damage is a cross linear flow (left-to-right or right-to-left) in the gutter in front of the Filterra. This prevents the re-suspension and possible exit of the trapped pollutants, mulch, and engineered media from within Filterra during the high flow bypass stage.

3) Refer to example scenarios in the Filterra DAKit

Standard Filterra Placement Example



Standard Filterra System showing curb-inlet opening.

Placement Review

Because we want your project with Filterra to be a great success, we respectfully require that each Filterra 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.

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Filterra® is protected by U.S. Patents #6,277,274, #6,569,321 & #7,625,485. Other patents pending.
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Table C-1 presents the beneficial use designations of the 303(d) listed waterbodies in the San Dieguito River WMA. Beneficial uses specifically identified as impaired by the 2010 303(d) list are shaded blue. This table does not present waterbodies that were not identified as impaired on the 303(d) list. Approximately 97% of the waterbodies in the San Dieguito River WMA are not impaired or have not been assessed. Of those waterbodies that are listed as having impairments, most beneficial uses are attained.

Table C-1
Beneficial Uses of the 2010 303(d) Listed Waterbodies in the San Dieguito River WMA

303(d) Listed Waterbody Name	Beneficial Use																			
	IND	NAV	COMM	MUN	AGR	IND	PROC	GWR	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	MAR	AQUA	MIGR	SPWN	SHELL
Santa Ysabel Creek (905.53 and 905.54)				●	●	●	●		●	●		●	●	●					●	
Sutherland Reservoir (905.53)				●	●	●	●		●	●		●	●	●	●					
Cloverdale Creek (905.32)				●	●	●	●		○	●		●		●	●					
Kit Carson Creek (905.21)				●	●	●	●	○	●	●		●		●	●					
Green Valley Creek (905.21 and 905.22)				●	●	●	●	○	●	●		●		●						
Felicita Creek (905.23)				●	●	●	●	○	●	●		●		●						
Lake Hodges (905.21)				●	●	●	●		●	●		●	●	●	●					
San Dieguito River (905.11 and 905.21)				●	●	●	●		●	●	●	●	●	●	●				●	
Pacific Ocean Shoreline at San Dieguito Lagoon Mouth (905.11)	●	●	●						●	●	●			●	●	●	●	●	●	●

Beneficial use is impaired based on the 2010 303(d) list

○ Potential beneficial use
● Existing beneficial use

The beneficial uses that are impaired in 303(d)-listed waterbodies the San Dieguito River WMA are defined in the Basin Plan as follows:

- **AGR (Agricultural Supply)** includes uses of water for farming, horticulture, or ranching, including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.
- **MUN (Municipal and Domestic Supply)** includes uses of water for community, military, or individual water supply systems, including, but not limited to, drinking water supply.

- **REC-1 (Contact Water Recreation)** includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and SCUBA diving, surfing, white water activities, fishing, or use of natural hot springs.
- **REC-2 (Non-Contact Water Recreation)** includes the uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.
- **SHELL (Shellfish Harvesting)** includes uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sport purposes.
- **WARM (Warm Freshwater Habitat)** includes uses of water that support warm water ecosystems, including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

The beneficial uses in the San Dieguito WMA which are not impaired are defined in the Basin Plan as follows:

- **AQUA (Aquaculture)** includes the uses of water for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, or harvesting of aquatic plants and animals for human consumption or bait purposes.
- **BIOL** (**Preservation of Biological Habitats of Special Significance)** includes uses of water that support designated areas or habitats, such as established refuges, parks, sanctuaries, ecological reserves, or Areas of Special Biological Significance (ASBS), where the preservation or enhancement of natural resources requires special protection.
- **COLD (Cold Freshwater Habitat)** includes uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.
- **COMM** (**Commercial and Sport Fishing)** includes the uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.
- **GWR** (**Ground Water Recharge)** includes uses of water for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.
- **IND** (**Industrial Service Supply)** includes uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining,

cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.

- **MAR (Marine Habitat)** includes uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).

- **MIGR** (**Migration of Aquatic Organisms)** includes uses of water that support habitats necessary for migration, acclimatization between fresh and salt water, or other temporary activities by aquatic organisms, such as anadromous fish.

- **NAV (Navigation)** includes uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.

- **PROC (Industrial Process Supply)** includes uses of water for industrial activities that depend primarily on water quality.

- **RARE (Rare, Threatened, or Endangered Species)** includes uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened, or endangered.

- **SPWN (Spawning, Reproduction, and/or Early Development)** includes uses of water that support high quality habitats suitable for reproduction, early development and sustenance of marine fish and/or cold freshwater fish.

- **WILD (Wildlife Habitat)** includes uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

Document:
City of San Diego San Dieguito Bacteria and Nutrients TMDL- Watershed Characterization Study prepared by AMEC, 2011

Locations within watershed:
San Dieguito River south of Lake Hodges, Green Valley Creek, Boden Creek
Conditions:

Table 1-1: Water Bodies on the 2010 State Board Section §303(d) List in San Dieguito River Watershed

Water Body Name	HSA	HSA No.	Constituent
Pacific Ocean Shoreline at San Dieguito Lagoon Mouth	Rancho Santa Fe	905.11	Indicator bacteria
San Dieguito River	Rancho Santa Fe	905.11	Enterococci, fecal coliform, nitrogen, phosphorus, TDS, and toxicity
Green Valley Creek	Del Dios	905.21	Sulfates, chloride, manganese, and pentachlorophenol (PCP)
Lake Hodges	Del Dios	905.21	Color, nitrogen, phosphorus, turbidity, manganese, mercury and pH
Kit Carson Creek	Del Dios	905.21	Total dissolved solids (TDS) and PCP
Felicita Creek	Felicita	905.23	TDS and aluminum
Cloverdale Creek	Highland	905.32	Phosphorus and TDS
Sutherland Reservoir	Sutherland	905.53	Color, manganese, iron, pH and total nitrogen
Santa Ysabel Creek	Sutherland	905.53	Toxicity

HSA = Hydrologic Sub Area
TDS = Total dissolved solids
PCP = Pentachlorophenal
Source: SWRCB, 2010.

Dry weather:
Generally, analytical results were below WQOs. Constituents that exceeded WQOs during dry weather include chloride, sulfate, TDS, total nitrogen, total phosphorus, turbidity, total metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, iron, manganese, nickel, selenium, and thallium), enterococci, and fecal coliform. Calculated event mean concentration (EMC) results varied across most sites and parameters; however, total metals and total nitrogen were above WQOs at all sites for dry weather events. These results suggest constituent concentrations remained elevated throughout the dry season at all sites.

Wet weather:
Constituents that exceeded water quality objectives during wet weather include nitrite, TDS, total nitrogen, total phosphorus, turbidity, total metals (arsenic, cadmium, chromium, nickel and selenium), enterococci, fecal coliform and total coliform. Calculated EMC results varied across

most sites and parameters; however, total nitrogen, total phosphorus, and total metals were above WQOs at all sites for both wet weather events. This suggests those constituent concentrations remained elevated throughout the storm hydrographs at all sites. Indicator bacteria were above the WQOs at both the mixed land use site, LC-1 (MIXED), and the urbanized site, SDC-TWAS-1 (URBAN). However, indicator bacteria was within the WQO at the reference site, BC-1(REF) during Wet Weather 1, indicating during wet weather, land use may potentially influence bacteria concentrations.

Sources:
Urbanization

Strategies:
• Verify land use characterization
• Characterize how pollutants vary between wet and dry season.
• Bioassessment.

Document:
San Dieguito Watershed Management Plan, input from Consultation Committee

Locations within watershed:
Not specified.

Conditions:
The priority conditions were identified as:
• Nutrients/eutrophication/oxygen depletion
• Silt and Sediment
•Toxicity
• Pathogens in water
• Salinity and dissolved solids
• Litter/trash/debris

Sources:
The priority sources were identified as:
• Increased Development, which could result in an increase in urban stormwater discharges which could contribute nutrients, suspended solids, bacteria, metals, and organics.
• Agricultural and Turf Related Activities which could contribute sediments, nutrients, pesticides, and bacteria

Strategies:
The WMP identifies 6 main programmatic elements in addition to the municipal requirements:
• Reduce hardscape
• Reduce ongoing discharge impairments
• Actions to evaluate and implement land-use BMPs
• Actions to reduce erosion
• Actions to reduce litter
• Education

Document:
City of San Diego Strategic Plan for Watershed Activity Implementation, input from Consultation Committee

Locations within watershed:
Not specified.

Conditions:
The priority conditions were identified as:
• Bacteria
• Nutrients
• Total Dissolved Solids

Sources:
Potential Sources include:
• Eating and Drinking Establishments
• Residential Areas and Activities
• Commercial Landscaping
• Animal Related Facilities
• Golf Courses, Parks, and Recreational Activities
• Municipal Facilities and Activities
• Auto Related Facilities
• Roads, Streets, Highways, and Parking Facilities
• Construction Activities

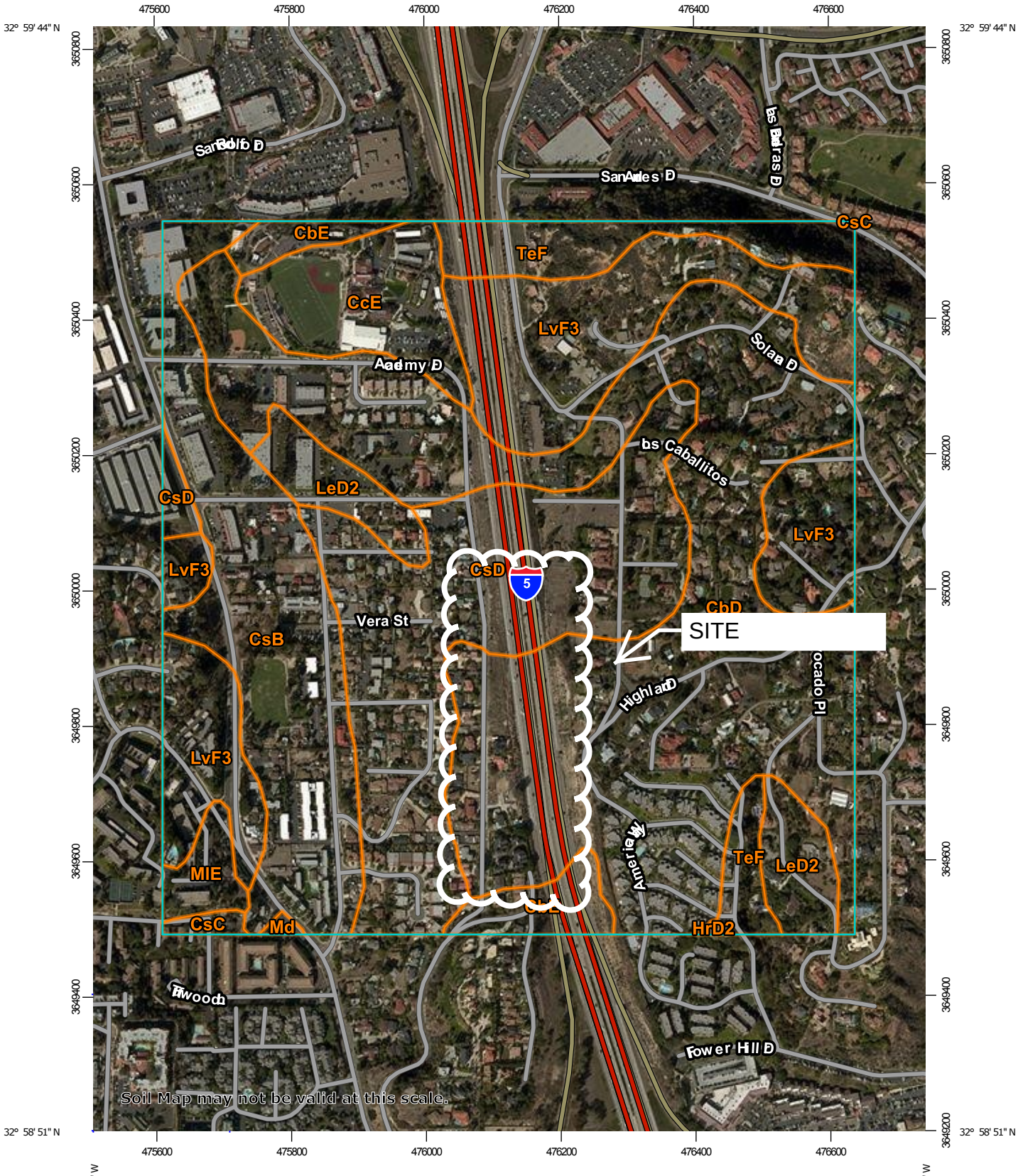
Strategies:
No data (Strategies identified through 2011 only)

Document:
City of San Diego Public Utilities Department Lake Hodges Watershed Monitoring Data, 2013

Locations within watershed:
The following creeks above Sutherland reservoir
• Bloomdale Creek
• Witch Creek
The following creeks above Lake Hodges
• Temescal Creek
• Sycamore Creek
• Kit Carson Creek
• Del Dios Creek
• Felicita Creek
• Green Valley Creek
• Moonsong Creek
• Santa Maria Creek
• Guejito Creek
• Santa Ysabel Creek
• Cloverdale Creek

Conditions:
No Data

Soil Map—San Diego County Area, California
(1574-IDA AVE APARTMENTS)



Map Scale: 1:7,960 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 100 200 400 600

Feet
0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 12, Sep 13, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 3, 2014—Nov 22, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CbD	Carlsbad gravelly loamy sand, 9 to 15 percent slopes	97.1	36.2%
CbE	Carlsbad gravelly loamy sand, 15 to 30 percent slopes	6.8	2.5%
CcE	Carlsbad-Urban land complex, 9 to 30 percent slopes	13.0	4.9%
CsB	Corralitos loamy sand, 0 to 5 percent slopes	34.5	12.9%
CsC	Corralitos loamy sand, 5 to 9 percent slopes	0.9	0.3%
CsD	Corralitos loamy sand, 9 to 15 percent slopes	47.2	17.6%
HrD2	Huerhuero loam, 9 to 15 percent slopes, eroded	0.1	0.0%
LeD2	Las Flores loamy fine sand, 9 to 15 percent slopes, eroded	10.6	3.9%
LvF3	Loamy alluvial land-Huerhuero complex, 9 to 50 percent slopes, severely eroded	42.2	15.7%
Md	Made land	0.3	0.1%
MlE	Marina loamy coarse sand, 9 to 30 percent slopes	3.3	1.2%
TeF	Terrace escarpments	12.4	4.6%
Totals for Area of Interest		**268.4**	**100.0%**

Engineering Properties

This table gives the engineering classifications and the range of engineering properties for the layers of each soil in the survey area.

Hydrologic soil group is a group of soils having similar runoff potential under similar storm and cover conditions. The criteria for determining Hydrologic soil group is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Listing HSGs by soil map unit component and not by soil series is a new concept for the engineers. Past engineering references contained lists of HSGs by soil series. Soil series are continually being defined and redefined, and the list of soil series names changes so frequently as to make the task of maintaining a single national list virtually impossible. Therefore, the criteria is now used to calculate the HSG using the component soil properties and no such national series lists will be maintained. All such references are obsolete and their use should be discontinued. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. These properties are depth to a seasonal high water table, saturated hydraulic conductivity after prolonged wetting, and depth to a layer with a very slow water transmission rate. Changes in soil properties caused by land management or climate changes also cause the hydrologic soil group to change. The influence of ground cover is treated independently. There are four hydrologic soil groups, A, B, C, and D, and three dual groups, A/D, B/D, and C/D. In the dual groups, the first letter is for drained areas and the second letter is for undrained areas.

The four hydrologic soil groups are described in the following paragraphs:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

Classification of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2004).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Percentage of rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination. Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

References:

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

Report—Engineering Properties

Absence of an entry indicates that the data were not estimated. The asterisk '*' denotes the representative texture; other possible textures follow the dash. The criteria for determining the hydrologic soil group for individual soil components is found in the National Engineering Handbook, Chapter 7 issued May 2007(http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba). Three values are provided to identify the expected Low (L), Representative Value (R), and High (H).

Engineering Properties–San Diego County Area, California														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
CbD—Carlsbad gravelly loamy sand, 9 to 15 percent slopes														
Carlsbad	85	B	0-21	Gravelly loamy sand	SM	A-1	0- 0- 0	0- 0- 0	80-85-90	60-68-75	30-40-50	10-15-20	0-0 -0	NP
			21-33	Loamy sand	SM	A-1, A-2	0- 0- 0	0- 0- 0	95-98-100	90-95-100	45-55-65	15-20-25	0-0 -0	NP
			33-50	Indurated	—	—	—	—	—	—	—	—	—	—
CbE—Carlsbad gravelly loamy sand, 15 to 30 percent slopes														
Carlsbad	85	B	0-21	Gravelly loamy sand	SM	A-1	0- 0- 0	0- 0- 0	80-85-90	60-68-75	30-40-50	10-15-20	0-0 -0	NP
			21-28	Loamy sand	SM	A-1, A-2	0- 0- 0	0- 0- 0	95-98-100	90-95-100	45-55-65	15-20-25	0-0 -0	NP
			28-42	Indurated	—	—	—	—	—	—	—	—	—	—

Engineering Properties–San Diego County Area, California														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
CcE—Carlsbad-Urban land complex, 9 to 30 percent slopes														
Carlsbad	50	B	0-21	Gravelly loamy sand	SM	A-1	0- 0- 0	0- 0- 0	80-85-90	60-68-75	30-40-50	10-15-20	0-0 -0	NP
			21-39	Loamy sand	SM	A-1, A-2	0- 0- 0	0- 0- 0	95-98-100	90-95-100	45-55-65	15-20-25	0-0 -0	NP
			39-50	Indurated	—	—	—	—	—	—	—	—	—	—
Urban land	30		0-6	Variable	—	—	—	—	—	—	—	—	—	—
CsB—Corralitos loamy sand, 0 to 5 percent slopes														
Corralitos	85	A	0-12	Loamy sand	SM	A-2	0- 0- 0	0- 0- 0	95-98-100	90-95-100	50-55-60	15-23-30	0-0 -0	NP
			12-43	Loamy fine sand, loamy sand	SM	A-2	0- 0- 0	0- 0- 0	95-98-100	90-95-100	50-60-70	15-23-30	0-0 -0	NP
			43-72	Sand, fine sand	SP-SM	A-1, A-2, A-3	0- 0- 0	0- 0- 0	95-98-100	90-95-100	40-58-75	5-10- 15	0-0 -0	NP
CsC—Corralitos loamy sand, 5 to 9 percent slopes														
Corralitos	85	A	0-9	Loamy sand	SM	A-2	0- 0- 0	0- 0- 0	95-98-100	90-95-100	50-55-60	15-23-30	0-0 -0	NP
			9-43	Loamy fine sand, loamy sand	SM	A-2	0- 0- 0	0- 0- 0	95-98-100	90-95-100	50-60-70	15-23-30	0-0 -0	NP
			43-72	Sand, fine sand	SP-SM	A-1, A-2, A-3	0- 0- 0	0- 0- 0	95-98-100	90-95-100	40-58-75	5-10- 15	0-0 -0	NP

Engineering Properties–San Diego County Area, California														
Map unit symbol and soil name	Pct. of map unit	Hydrologic group	Depth	USDA texture	Classification		Pct Fragments		Percentage passing sieve number—				Liquid limit	Plasticity index
					Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
			In				*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*	*L-R-H*
CsD—Corralitos loamy sand, 9 to 15 percent slopes														
Corralitos	85	A	0-9	Loamy sand	SM	A-2	0- 0- 0	0- 0- 0	95-98-100	90-95-100	50-55-60	15-23-30	0-0 -0	NP
			9-43	Loamy fine sand, loamy sand	SM	A-2	0- 0- 0	0- 0- 0	95-98-100	90-95-100	50-60-70	15-23-30	0-0 -0	NP
			43-72	Sand, fine sand	SP-SM	A-1, A-2, A-3	0- 0- 0	0- 0- 0	95-98-100	90-95-100	40-58-75	5-10- 15	0-0 -0	NP
HrD2—Huerhuero loam, 9 to 15 percent slopes, eroded														
Huerhuero	85	D	0-12	Loam	CL-ML, ML	A-4	0- 0- 0	0- 0- 0	95-98-100	90-95-100	80-88-95	50-63-75	25-30 -35	5-8 -10
			12-55	Clay loam, clay	CH, CL	A-7	0- 0- 0	0- 0- 0	95-98-100	90-95-100	90-95-100	70-83-95	40-50 -60	20-25-30
			55-72	Stratified sand to sandy loam	SC-SM	A-2	0- 0- 0	0- 0- 0	90-95-100	90-95-100	50-63-75	25-30-35	15-20 -25	5-8 -10

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 behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☒ Included See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet.
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 .	☒ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☒ Not performed ☐ Included ☐ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required) See Chapter 6 and Appendix G of the BMP Design Manual	☒ Included ☐ Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐ Included ☒ 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:

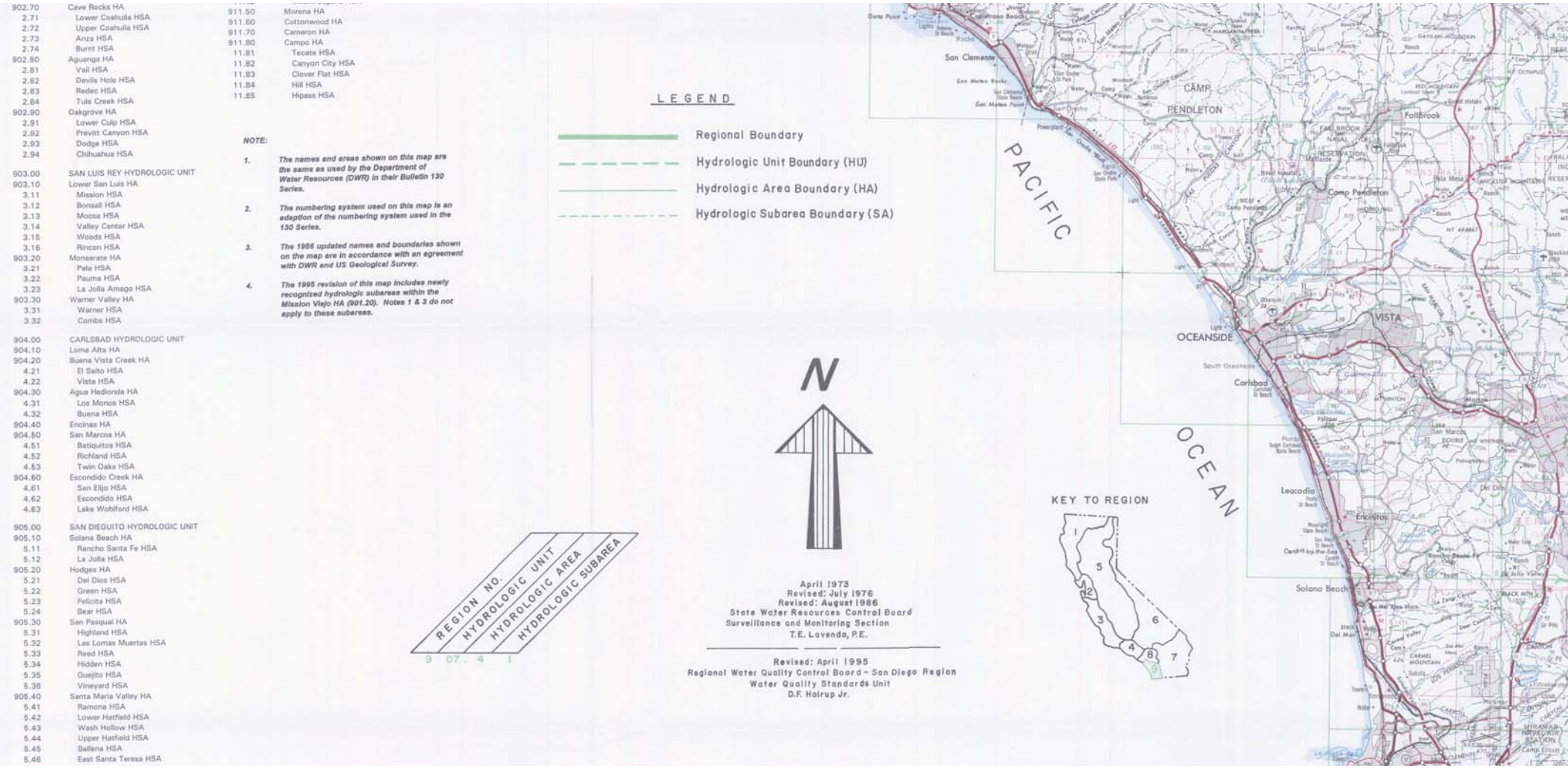
The Hydromodification Management Exhibit must identify:

☒ 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)

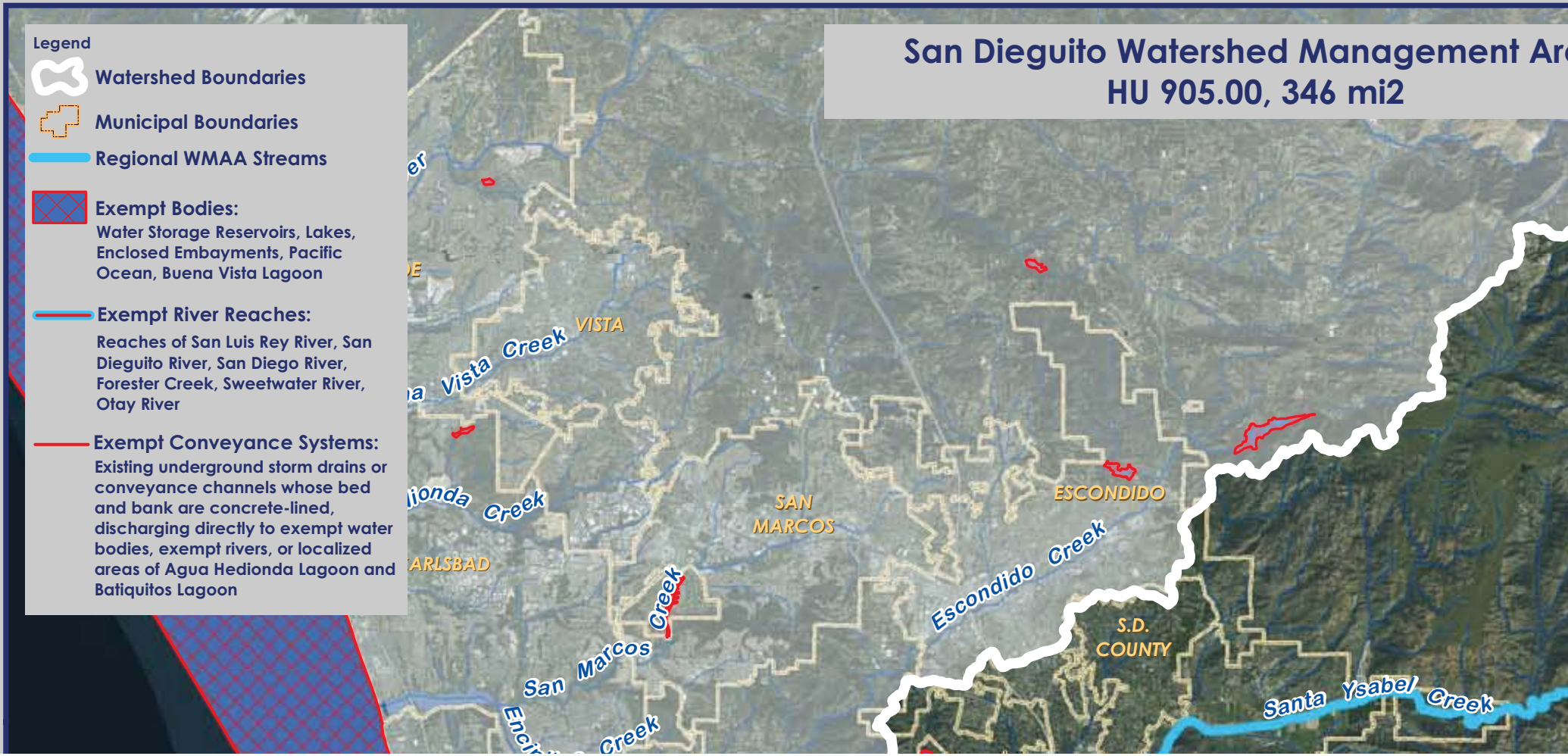
SDRWQCB BASIN PLAN MAP



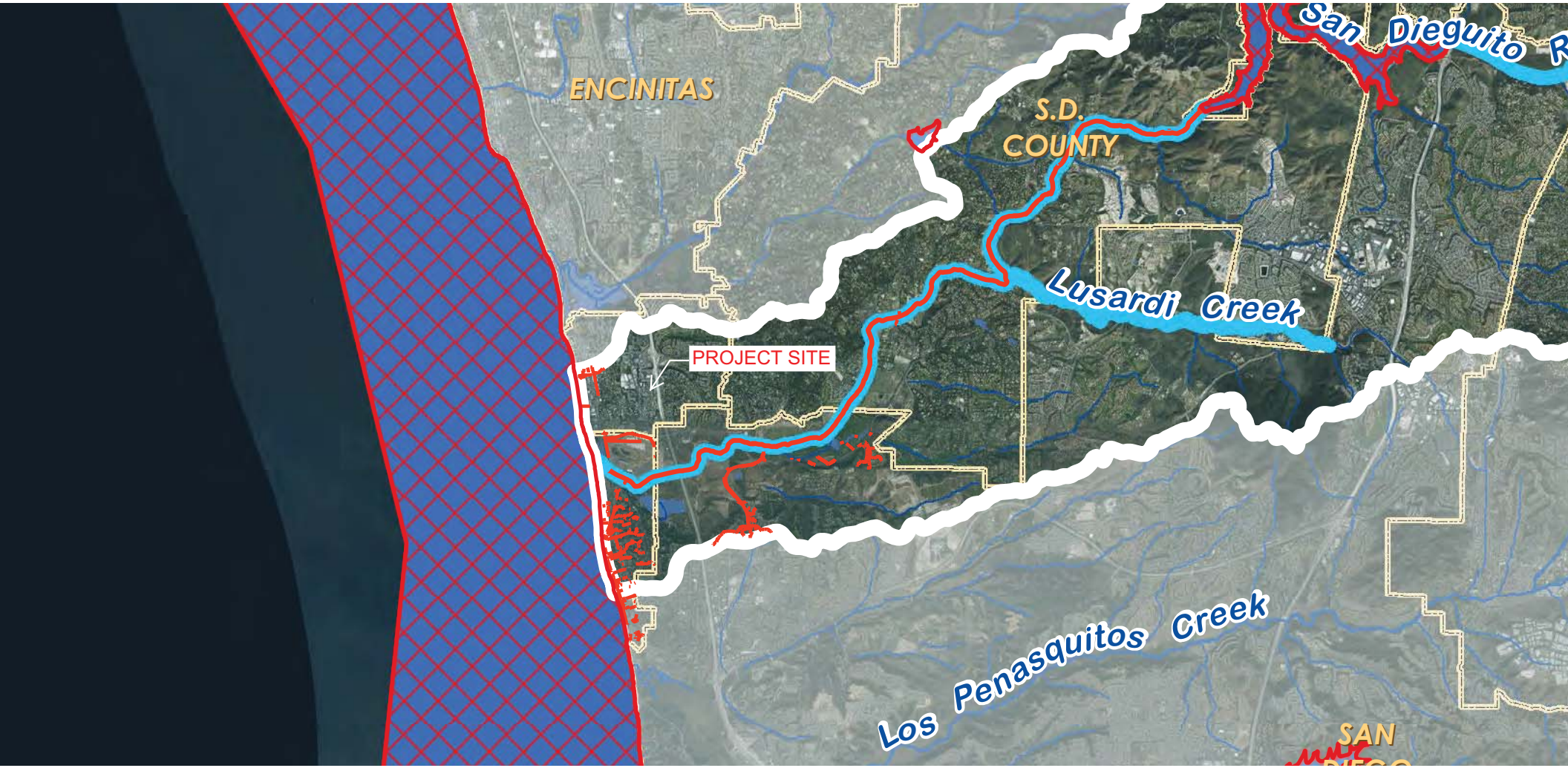
SDRWQCB BASIN PLAN MAP (LEGEND)



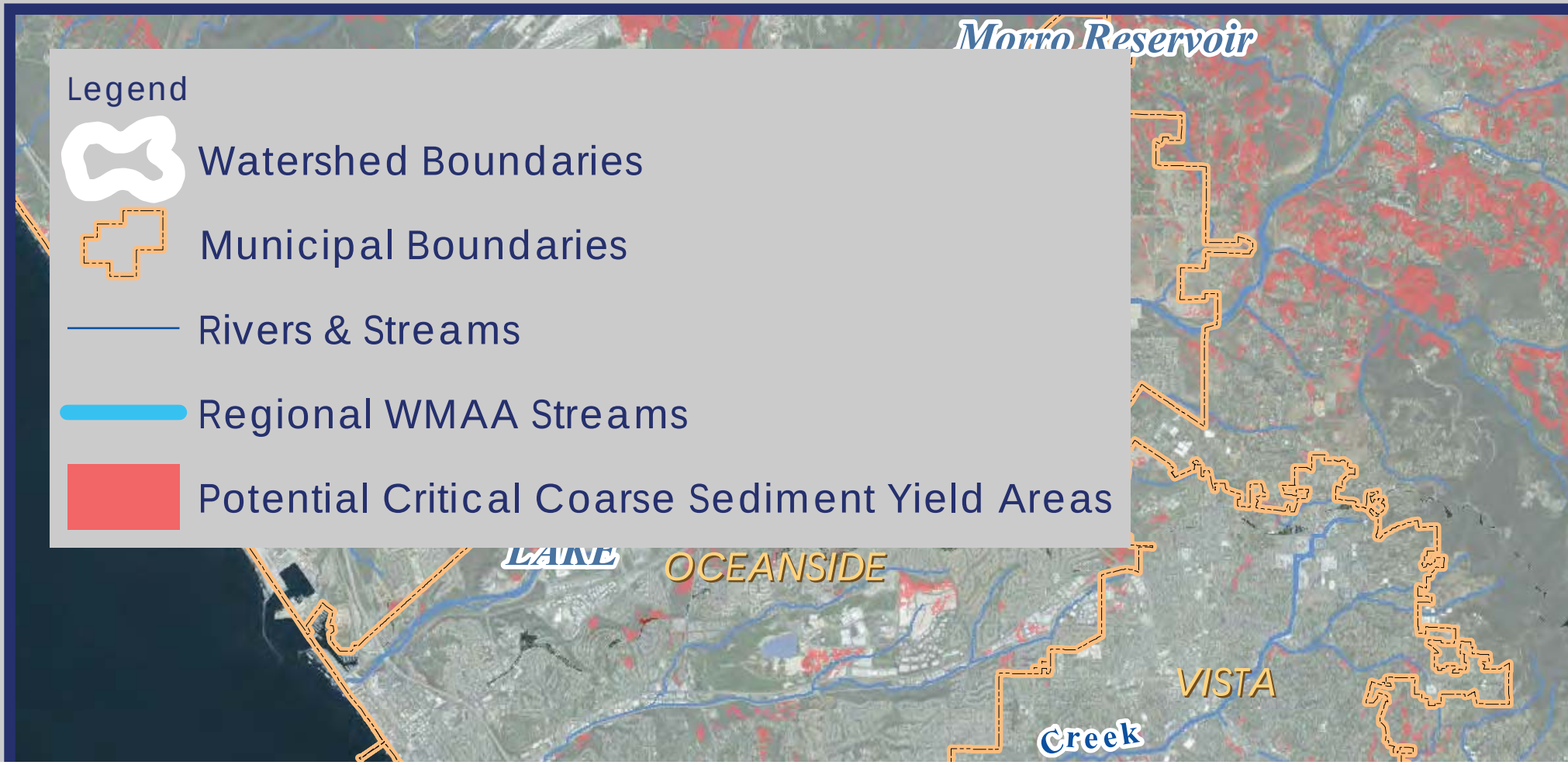
HYDROMOFICATION MANAGEMENT
EXEMPT AREAS (LEGEND)



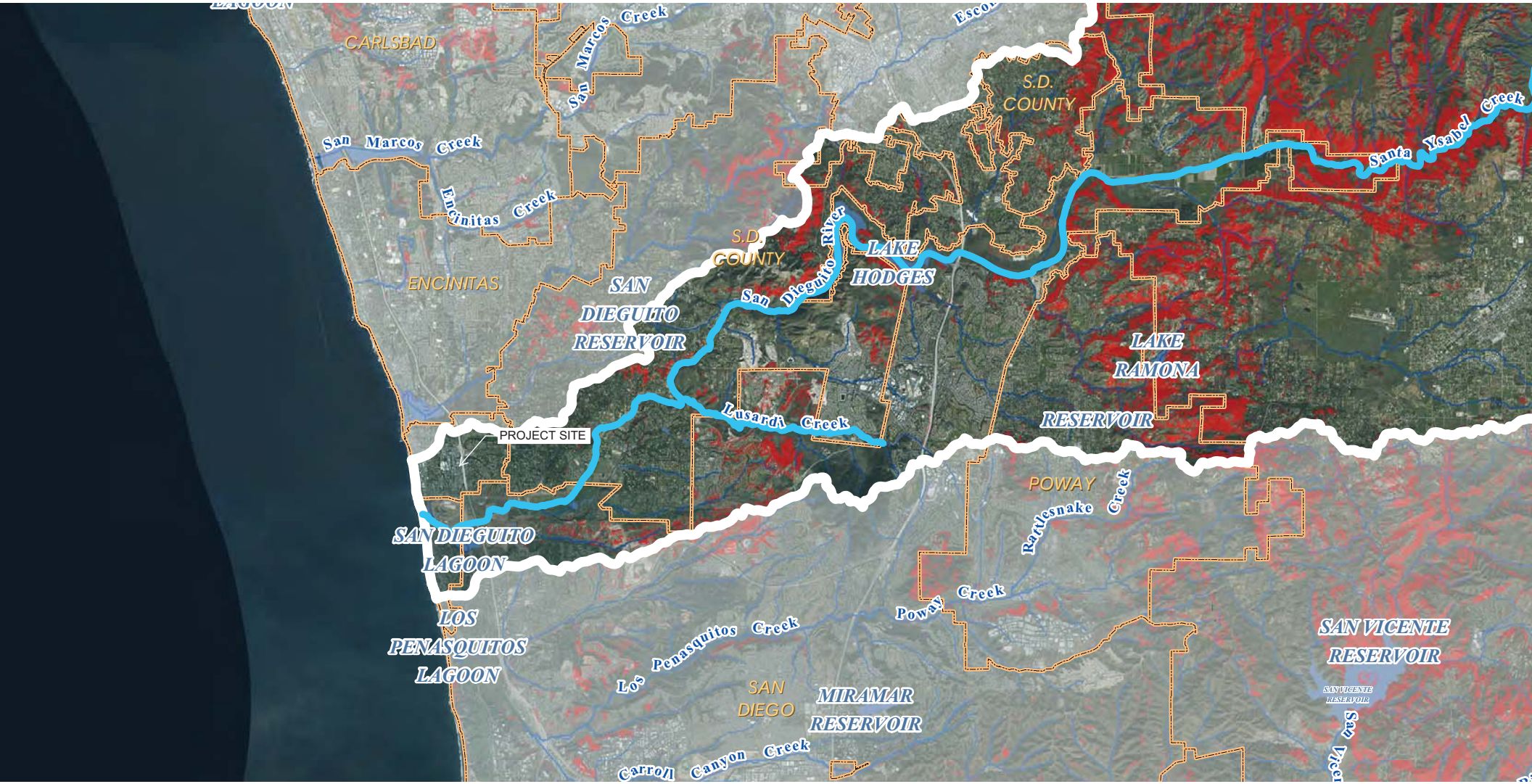
HYDROMODIFICATION
MANAGEMENT EXEMPT AREAS



POTENTIAL CRITICAL COARSE
SEDIMENT TIELD AREAS (LEGEND)



POTENTIAL CRITICAL SOARSE
SEDIMENT YIELD AREAS



SDHM 3.1

PROJECT REPORT

General Model Information

Project Name:	1574
Site Name:	Ida Ave Apartments
Site Address:	748 Ida Avenue
City:	Solana Beach
Report Date:	2/9/2018
Gage:	ENCINITA
Data Start:	10/01/1963
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2017/08/18

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

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Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A,NatVeg,Steep	0.94
Pervious Total	0.94
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.94

Element Flows To:

Surface	Interflow	Groundwater

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Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A,NatVeg,Steep	0.5
Pervious Total	0.5
Impervious Land Use	acre
IMPERVIOUS-MOD	0.5
Impervious Total	0.5
Basin Total	1

Element Flows To:

Surface	Interflow	Groundwater
Tank 1	Tank 1	

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Routing Elements
Predeveloped Routing

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Mitigated Routing

Tank 1

Dimensions

Depth:	3.75 ft.
Tank Type:	Arched
Width:	6.42 ft.
Height:	3.75 ft.
Length:	160 ft.

Infiltration On

Infiltration rate:	1.6
Infiltration safety factor:	1

Total Volume Infiltrated (ac-ft.):	13.537
Total Volume Through Riser (ac-ft.):	1.097
Total Volume Through Facility (ac-ft.):	14.634
Percent Infiltrated:	92.5
Total Precip Applied to Facility:	0
Total Evap From Facility:	0

Discharge Structure

Riser Height:	1.67 ft.
Riser Diameter:	24 in.

Element Flows To:

Outlet 1 Outlet 2

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Tank Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
90.000	0.000	0.000	0.000	0.000
90.042	0.004	0.000	0.000	0.008
90.083	0.007	0.000	0.000	0.011
90.125	0.008	0.000	0.000	0.013
90.167	0.009	0.001	0.000	0.015
90.208	0.010	0.001	0.000	0.017
90.250	0.011	0.002	0.000	0.019
90.292	0.012	0.002	0.000	0.020
90.333	0.013	0.003	0.000	0.021
90.375	0.014	0.003	0.000	0.022
90.417	0.014	0.004	0.000	0.023
90.458	0.015	0.004	0.000	0.024
90.500	0.016	0.005	0.000	0.025
90.542	0.016	0.006	0.000	0.026
90.583	0.017	0.006	0.000	0.027
90.625	0.017	0.007	0.000	0.028
90.667	0.018	0.008	0.000	0.029
90.708	0.018	0.009	0.000	0.029
90.750	0.018	0.009	0.000	0.030
90.792	0.019	0.010	0.000	0.031
90.833	0.019	0.011	0.000	0.031
90.875	0.019	0.012	0.000	0.032
90.917	0.020	0.013	0.000	0.032
90.958	0.020	0.014	0.000	0.033
91.000	0.020	0.014	0.000	0.033
91.042	0.021	0.015	0.000	0.034
91.083	0.021	0.016	0.000	0.034
91.125	0.021	0.017	0.000	0.034
91.167	0.021	0.018	0.000	0.035

91.208	0.022	0.019	0.000	0.035
91.250	0.022	0.020	0.000	0.035
91.292	0.022	0.021	0.000	0.036
91.333	0.022	0.022	0.000	0.036
91.375	0.022	0.023	0.000	0.036
91.417	0.022	0.024	0.000	0.036
91.458	0.023	0.025	0.000	0.037
91.500	0.023	0.025	0.000	0.037
91.542	0.023	0.026	0.000	0.037
91.583	0.023	0.027	0.000	0.037
91.625	0.023	0.028	0.000	0.037
91.667	0.023	0.029	0.000	0.037
91.708	0.023	0.030	0.159	0.037
91.750	0.023	0.031	0.479	0.038
91.792	0.023	0.032	0.898	0.038
91.833	0.023	0.033	1.395	0.038
91.875	0.023	0.034	1.957	0.038
91.917	0.023	0.035	2.571	0.038
91.958	0.023	0.036	3.230	0.038
92.000	0.023	0.037	3.922	0.038
92.042	0.023	0.038	4.639	0.038
92.083	0.023	0.039	5.369	0.038
92.125	0.023	0.040	6.102	0.038
92.167	0.023	0.041	6.830	0.038
92.208	0.023	0.042	7.540	0.038
92.250	0.023	0.043	8.223	0.038
92.292	0.023	0.044	8.872	0.038
92.333	0.022	0.045	9.476	0.038
92.375	0.022	0.046	10.03	0.038
92.417	0.022	0.047	10.53	0.038
92.458	0.022	0.048	10.97	0.038
92.500	0.022	0.049	11.35	0.038
92.542	0.022	0.050	11.69	0.038
92.583	0.021	0.051	11.97	0.038
92.625	0.021	0.051	12.22	0.038
92.667	0.021	0.052	12.44	0.038
92.708	0.021	0.053	12.83	0.038
92.750	0.020	0.054	13.09	0.038
92.792	0.020	0.055	13.34	0.038
92.833	0.020	0.056	13.58	0.038
92.875	0.019	0.057	13.83	0.038
92.917	0.019	0.058	14.06	0.038
92.958	0.019	0.058	14.30	0.038
93.000	0.018	0.059	14.52	0.038
93.042	0.018	0.060	14.75	0.038
93.083	0.018	0.061	14.97	0.038
93.125	0.017	0.061	15.19	0.038
93.167	0.017	0.062	15.41	0.038
93.208	0.016	0.063	15.62	0.038
93.250	0.016	0.063	15.83	0.038
93.292	0.015	0.064	16.04	0.038
93.333	0.014	0.065	16.24	0.038
93.375	0.014	0.065	16.45	0.038
93.417	0.013	0.066	16.65	0.038
93.458	0.012	0.067	16.84	0.038
93.500	0.011	0.067	17.04	0.038
93.542	0.010	0.067	17.23	0.038
93.583	0.009	0.068	17.42	0.038

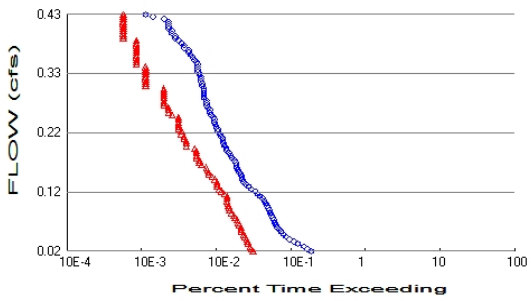
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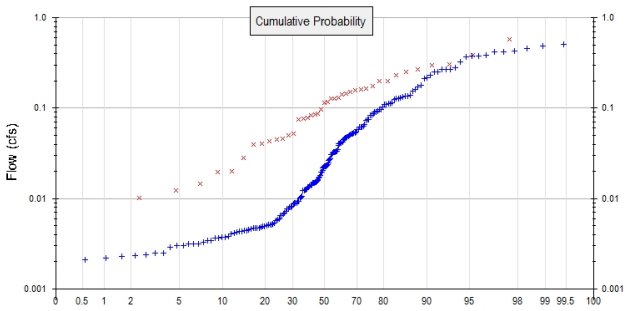
93.625	0.008	0.068	17.61	0.038
93.667	0.007	0.069	17.80	0.038
93.708	0.004	0.069	17.98	0.038
93.750	0.000	0.069	18.17	0.038
93.792	0.000	0.000	18.35	0.038

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Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.94
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.5
Total Impervious Area: 0.5

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.197184
5 year	0.379858
10 year	0.42951
25 year	0.494417

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.115743
5 year	0.200968
10 year	0.297318
25 year	0.42749

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Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0197	659	109	16	Pass
0.0239	584	103	17	Pass
0.0280	523	100	19	Pass
0.0321	438	93	21	Pass
0.0363	387	92	23	Pass
0.0404	339	90	26	Pass
0.0446	306	86	28	Pass
0.0487	284	81	28	Pass
0.0528	260	76	29	Pass
0.0570	245	76	31	Pass
0.0611	231	76	32	Pass
0.0653	220	72	32	Pass
0.0694	214	69	32	Pass
0.0735	207	67	32	Pass
0.0777	201	63	31	Pass
0.0818	195	60	30	Pass
0.0859	189	57	30	Pass
0.0901	181	53	29	Pass
0.0942	174	52	29	Pass
0.0984	168	51	30	Pass
0.1025	163	50	30	Pass
0.1066	154	49	31	Pass
0.1108	147	49	33	Pass
0.1149	135	49	36	Pass
0.1191	126	45	35	Pass
0.1232	117	41	35	Pass
0.1273	105	39	37	Pass
0.1315	95	36	37	Pass
0.1356	87	36	41	Pass
0.1398	82	36	43	Pass
0.1439	79	34	43	Pass
0.1480	78	31	39	Pass
0.1522	75	28	37	Pass
0.1563	72	28	38	Pass
0.1605	68	27	39	Pass
0.1646	67	26	38	Pass
0.1687	65	22	33	Pass
0.1729	64	21	32	Pass
0.1770	62	21	33	Pass
0.1812	57	19	33	Pass
0.1853	55	19	34	Pass
0.1894	52	19	36	Pass
0.1936	49	19	38	Pass
0.1977	48	18	37	Pass
0.2018	45	14	31	Pass
0.2060	44	14	31	Pass
0.2101	43	14	32	Pass
0.2143	43	13	30	Pass
0.2184	41	13	31	Pass
0.2225	40	12	30	Pass
0.2267	37	12	32	Pass
0.2308	37	11	29	Pass
0.2350	35	11	31	Pass

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0.2391	34	11	32	Pass
0.2432	33	11	33	Pass
0.2474	33	11	33	Pass
0.2515	32	11	34	Pass
0.2557	30	9	30	Pass
0.2598	29	8	27	Pass
0.2639	29	8	27	Pass
0.2681	27	8	29	Pass
0.2722	26	7	26	Pass
0.2764	26	7	26	Pass
0.2805	26	7	26	Pass
0.2846	24	7	29	Pass
0.2888	24	7	29	Pass
0.2929	24	7	29	Pass
0.2971	24	7	29	Pass
0.3012	24	7	29	Pass
0.3053	23	4	17	Pass
0.3095	23	4	17	Pass
0.3136	22	4	18	Pass
0.3177	22	4	18	Pass
0.3219	22	4	18	Pass
0.3260	21	4	19	Pass
0.3302	20	4	20	Pass
0.3343	20	4	20	Pass
0.3384	20	4	20	Pass
0.3426	20	3	15	Pass
0.3467	19	3	15	Pass
0.3509	18	3	16	Pass
0.3550	17	3	17	Pass
0.3591	16	3	18	Pass
0.3633	15	3	20	Pass
0.3674	15	3	20	Pass
0.3716	13	3	23	Pass
0.3757	13	3	23	Pass
0.3798	12	3	25	Pass
0.3840	11	3	27	Pass
0.3881	10	2	20	Pass
0.3923	10	2	20	Pass
0.3964	9	2	22	Pass
0.4005	9	2	22	Pass
0.4047	8	2	25	Pass
0.4088	8	2	25	Pass
0.4130	8	2	25	Pass
0.4171	8	2	25	Pass
0.4212	7	2	28	Pass
0.4254	5	2	40	Pass
0.4295	4	2	50	Pass

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Water Quality

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Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

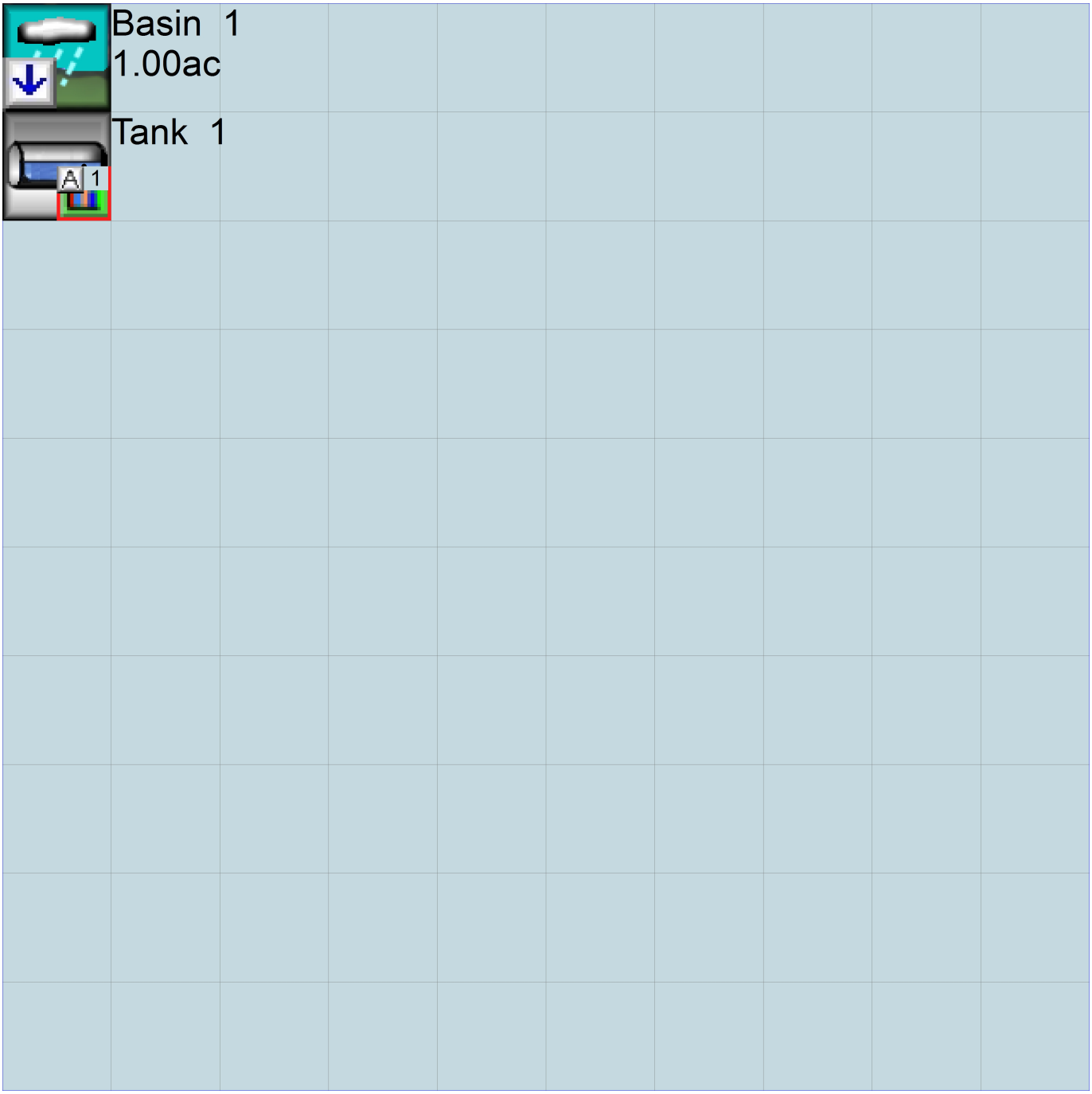
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Appendix

Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   1574.wdm
MESSU       25   Pre1574.MES
            27   Pre1574.L61
            28   Pre1574.L62
            30   POC15741.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND       3
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                         User  t-series Engl Metr ***
                                      in  out           ***
    3      A,NatVeg,Steep         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    3         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    3         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

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```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    3         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    3               0       3.5     0.045        75      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    3               0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    3               0       0.6      0.04         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
    3       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
    3       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    3               0         0      0.01         0       0.4      0.01         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2
```

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```
  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND   3                        0.94     COPY   501     12
PERLND   3                        0.94     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG            ***
                                     in  out                                ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES
```

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```
SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

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Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1963 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   1574.wdm
MESSU       25   Mit1574.MES
            27   Mit1574.L61
            28   Mit1574.L62
            30   POC15741.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND       3
      IMPLND       2
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Tank  1                    MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                      in  out           ***
    3      A,NatVeg,Steep         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    3         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
```

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```
    3         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    3         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    3              0       3.5     0.045        75      0.15       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    3              0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    3              0       0.6      0.04         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
    3       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
    3       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    3              0         0      0.01         0       0.4      0.01         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    2      IMPERVIOUS-MOD         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    1
```

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```
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >       IWATER input info: Part 2          ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            100       0.1     0.011      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >       IWATER input info: Part 3          ***
    # -  # ***PETMAX    PETMIN
    2              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK    ***
<Name>   #                  <-factor->     <Name>   #   Tbl#    ***
Basin  1***
PERLND   3                        0.5     RCHRES   1      2
PERLND   3                        0.5     RCHRES   1      3
IMPLND   2                        0.5     RCHRES   1      5

******Routing******
PERLND   3                        0.5     COPY     1     12
IMPLND   2                        0.5     COPY     1     15
PERLND   3                        0.5     COPY     1     13
RCHRES   1                          1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                        in  out                             ***
    1     Tank  1                 2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
```

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```
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1       0  1  0  0    4  5  0  0  0       0  0  0  0  0        2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.03       0.0      90.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.000000  0.000000  0.000000  0.000000
  0.041667  0.004944  0.000138  0.000000  0.007976
  0.083333  0.006952  0.000388  0.000000  0.011216
  0.125000  0.008466  0.000710  0.000000  0.013658
  0.166667  0.009719  0.001090  0.000000  0.015680
  0.208333  0.010803  0.001518  0.000000  0.017429
  0.250000  0.011764  0.001988  0.000000  0.018980
  0.291667  0.012631  0.002497  0.000000  0.020378
  0.333333  0.013422  0.003040  0.000000  0.021654
  0.375000  0.014149  0.003615  0.000000  0.022827
  0.416667  0.014822  0.004218  0.000000  0.023912
  0.458333  0.015448  0.004849  0.000000  0.024922
  0.500000  0.016032  0.005505  0.000000  0.025865
  0.541667  0.016580  0.006185  0.000000  0.026748
  0.583333  0.017093  0.006886  0.000000  0.027577
  0.625000  0.017576  0.007609  0.000000  0.028357
  0.666667  0.018031  0.008351  0.000000  0.029091
  0.708333  0.018460  0.009111  0.000000  0.029783
  0.750000  0.018865  0.009889  0.000000  0.030436
  0.791667  0.019247  0.010683  0.000000  0.031052
  0.833333  0.019607  0.011492  0.000000  0.031633
  0.875000  0.019948  0.012316  0.000000  0.032182
  0.916667  0.020268  0.013154  0.000000  0.032700
  0.958333  0.020571  0.014005  0.000000  0.033188
  1.000000  0.020856  0.014868  0.000000  0.033648
  1.041667  0.021124  0.015743  0.000000  0.034080
  1.083333  0.021376  0.016628  0.000000  0.034487
  1.125000  0.021613  0.017524  0.000000  0.034868
  1.166667  0.021834  0.018429  0.000000  0.035225
  1.208333  0.022040  0.019343  0.000000  0.035558
  1.250000  0.022233  0.020266  0.000000  0.035869
  1.291667  0.022411  0.021196  0.000000  0.036156
  1.333333  0.022576  0.022133  0.000000  0.036422
  1.375000  0.022727  0.023077  0.000000  0.036667
  1.416667  0.022866  0.024027  0.000000  0.036890
  1.458333  0.022992  0.024982  0.000000  0.037093
  1.500000  0.023105  0.025943  0.000000  0.037276
  1.541667  0.023206  0.026907  0.000000  0.037438
  1.583333  0.023294  0.027876  0.000000  0.037581
  1.625000  0.023371  0.028848  0.000000  0.037705
  1.666667  0.023435  0.029824  0.000000  0.037809
  1.708333  0.023488  0.030801  0.159277  0.037894
```

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```
  1.750000  0.023529  0.031781  0.479800  0.037960
  1.791667  0.023558  0.032762  0.898932  0.038007
  1.833333  0.023575  0.033744  1.395808  0.038035
  1.875000  0.023581  0.034726  1.957056  0.038035
  1.916667  0.023575  0.035709  2.571872  0.038035
  1.958333  0.023558  0.036691  3.230328  0.038035
  2.000000  0.023529  0.037672  3.922657  0.038035
  2.041667  0.023488  0.038651  4.638961  0.038035
  2.083333  0.023435  0.039629  5.369132  0.038035
  2.125000  0.023371  0.040604  6.102898  0.038035
  2.166667  0.023294  0.041576  6.829962  0.038035
  2.208333  0.023206  0.042545  7.540200  0.038035
  2.250000  0.023105  0.043510  8.223910  0.038035
  2.291667  0.022992  0.044470  8.872106  0.038035
  2.333333  0.022866  0.045426  9.476839  0.038035
  2.375000  0.022727  0.046376  10.03156  0.038035
  2.416667  0.022576  0.047320  10.53149  0.038035
  2.458333  0.022411  0.048257  10.97406  0.038035
  2.500000  0.022233  0.049187  11.35931  0.038035
  2.541667  0.022040  0.050109  11.69038  0.038035
  2.583333  0.021834  0.051023  11.97396  0.038035
  2.625000  0.021613  0.051929  12.22081  0.038035
  2.666667  0.021376  0.052824  12.44626  0.038035
  2.708333  0.021124  0.053710  12.83772  0.038035
  2.750000  0.020856  0.054584  13.09277  0.038035
  2.791667  0.020571  0.055447  13.34294  0.038035
  2.833333  0.020268  0.056298  13.58850  0.038035
  2.875000  0.019948  0.057136  13.82971  0.038035
  2.916667  0.019607  0.057960  14.06678  0.038035
  2.958333  0.019247  0.058770  14.29992  0.038035
  3.000000  0.018865  0.059564  14.52932  0.038035
  3.041667  0.018460  0.060342  14.75516  0.038035
  3.083333  0.018031  0.061102  14.97759  0.038035
  3.125000  0.017576  0.061844  15.19676  0.038035
  3.166667  0.017093  0.062566  15.41282  0.038035
  3.208333  0.016580  0.063268  15.62589  0.038035
  3.250000  0.016032  0.063948  15.83609  0.038035
  3.291667  0.015448  0.064603  16.04354  0.038035
  3.333333  0.014822  0.065234  16.24835  0.038035
  3.375000  0.014149  0.065838  16.45060  0.038035
  3.416667  0.013422  0.066413  16.65040  0.038035
  3.458333  0.012631  0.066956  16.84782  0.038035
  3.500000  0.011764  0.067464  17.04296  0.038035
  3.541667  0.010803  0.067935  17.23589  0.038035
  3.583333  0.009719  0.068363  17.42669  0.038035
  3.625000  0.008466  0.068742  17.61542  0.038035
  3.666667  0.006952  0.069065  17.80214  0.038035
  3.708333  0.004944  0.069315  17.98693  0.038035
  3.750000  0.000000  0.069453  18.16984  0.038035
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1             PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1             IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1             PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1             IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     12.1      WDM    701 FLOW     ENGL      REPL
```

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```
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

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Disclaimer

Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages. Software Copyright © by : Clear Creek Solutions, Inc. 2005-2018; All Rights Reserved.

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ATTACHMENT 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	**Contents**	**Checklist**
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☒ Included See Structural BMP Maintenance Information Checklist on the back of this Attachment cover sheet.
Attachment 3b	Draft Maintenance Agreement (when applicable)	☐ Included ☐ 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.

☐ **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)
- ☐ 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 shall include a draft maintenance agreement in the local jurisdiction's standard format (PDP applicant to contact the City Engineer to obtain the current maintenance agreement forms).

Filterra® Maintenance Steps



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. Clean area around Filterra



6. Complete paperwork and record plant height and width

For additional information please contact your local Filterra sales representative.
Eastern Zone: 866-349-3458, Western Zone: 877-345-1450.

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ATTACHMENT 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

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 4 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. Photocopies of general brochures are not acceptable.
☐ A single plan BMP sheet for each construction drawing highlighting only those BMPs included in the referenced construction drawing. (See Section 5.5.2 of the City's JRMP for further detail.)

Operation & Maintenance (OM) Manual v01

filterra®

Bioretention Systems

CONTECH®

ENGINEERED SOLUTIONS

filterra®
Bioretention Systems

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- Design

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- Maintenance Overview
  - » Why Maintain?
  - » When to Maintain?
- Exclusion of Services
- Maintenance Visit Summary
- Maintenance Tools, Safety Equipment and Supplies
- Maintenance Visit Procedure
- Maintenance Checklist

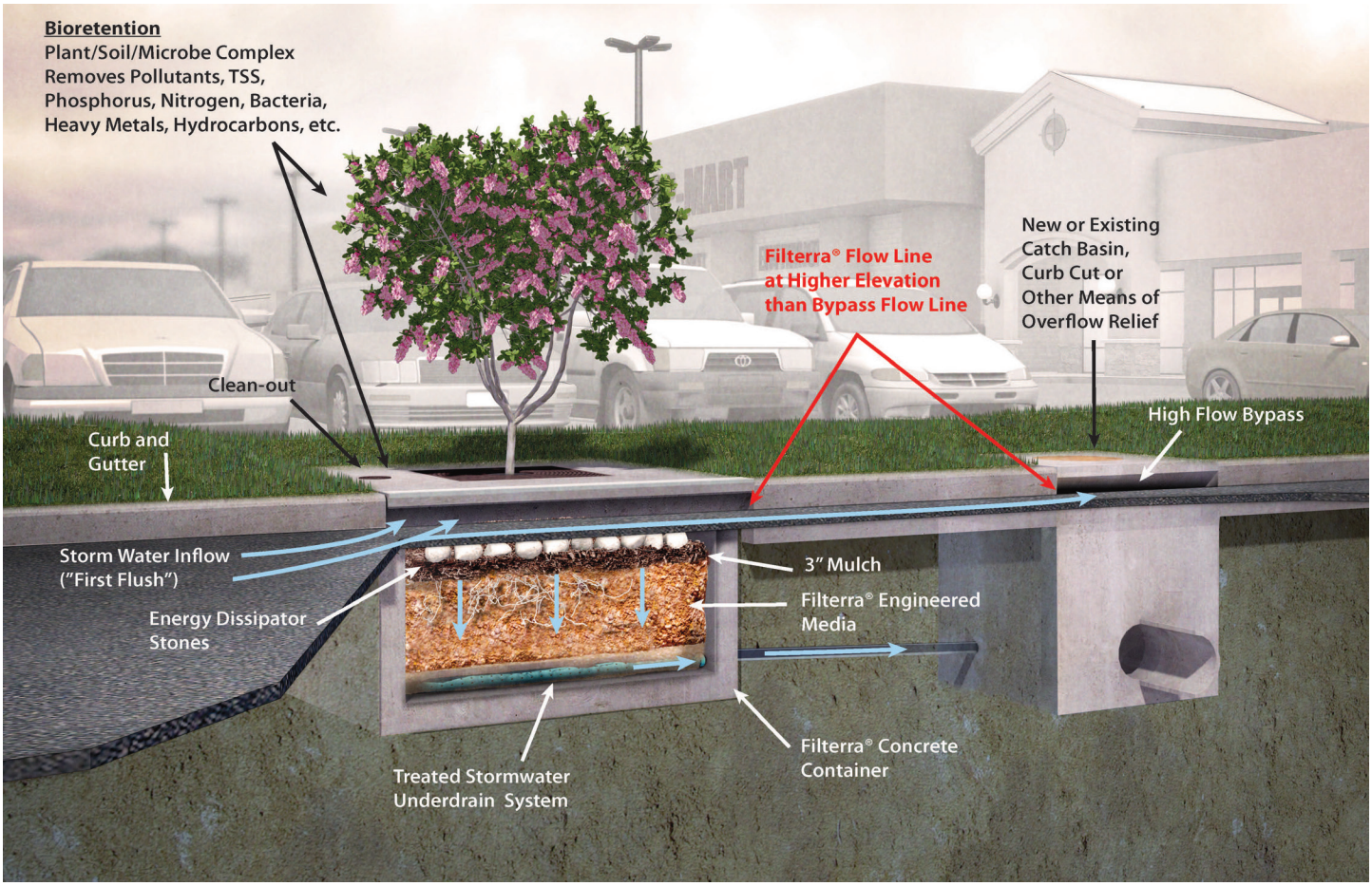
Resources

- *Example Filterra Project Maintenance Report Sheet*
- *Example Filterra Structure Maintenance Report Sheet*
- Filterra® Warranty
- *Drawing FTST-2: Filterra Standard Configuration Detail*
- *Drawing FTNL-3: Filterra Narrow Length Configuration Detail*
- *Drawing FTNW-3: Filterra Narrow Width Configuration Detail*

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General Description

The following general specifications describe the general operations and maintenance requirements for the Contech Engineered Solutions LLC 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, Contech 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 www.conteches.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?

Contech 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 while the fall visit helps the system by removing excessive leaf litter.

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 may 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 minor trash removal and a full replacement of mulch. See below for actual number of bagged mulch that is required in each unit size. Mulch should be a double shredded, hardwood variety; do not use colored or dyed mulch. Some visits may require additional Filterra® engineered soil media available from the Supplier.

Box Length	Box Width	Filter Surface Area (ft^2)	Volume at 3″ (ft^3)	# of 2 ft^3 Mulch Bags
4	4	4	4	2
6	4	6	6	3
8	4	8	8	4
6	6	9	9	5
8	6	12	12	6
10	6	15	15	8
12	6	18	18	9
13	7	23	23	12

Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.



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 cast iron 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 of Bottom of Top Slab (inches)	_____
# of Buckets of Media Added	_____



4. Mulch replacement

- Please see mulch specifications.
- 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 Contech 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	Condition 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 1/2 inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.
Maintenance is ideally to be performed twice annually.				

CONTECH®
ENGINEERED SOLUTIONS

ADVANCED DRAINAGE SYSTEMS, INC.

IDA AVE APARTMENTS

SOLANA BEACH

STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500 OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MADE FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm) MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING..
10. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

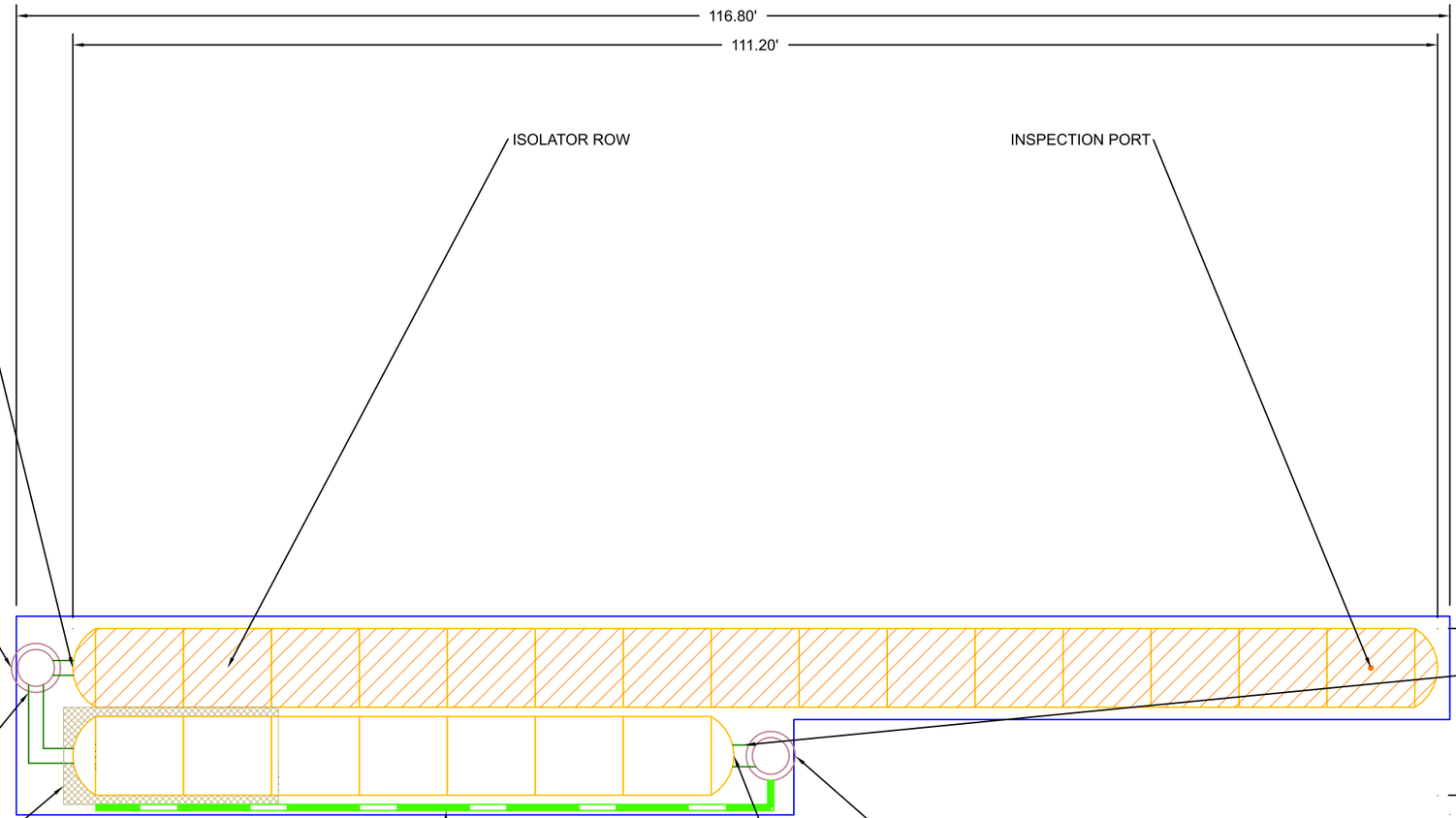
CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

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CONCEPTUAL LAYOUT

(22) STORMTECH MC-3500 CHAMBERS
(4) STORMTECH MC-3500 END CAPS
INSTALLED WITH 12 " COVER STONE, 9 " BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 4732 CF
AREA OF SYSTEM: 1475 **FT²**
PERIMETER OF SYSTEM: 266 **FT**

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION



IDA AVE APARTMENTS
SOLANA BEACH

DATE: 02/06/2018 | DRAWN: DM | CHECKED: ---
PROJECT #: Tool

REV	DRW	CHK	DESCRIPTION

THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS UNDER THE DIRECTION OF THE SITE DESIGN ENGINEER OR OTHER PROJECT REPRESENTATIVE. THE SITE DESIGN ENGINEER SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE SITE DESIGN ENGINEER TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.

StormTech®
Detention- Retention- Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
860-529-8188 |888-892-2694 | WWW.STORMTECH.COM

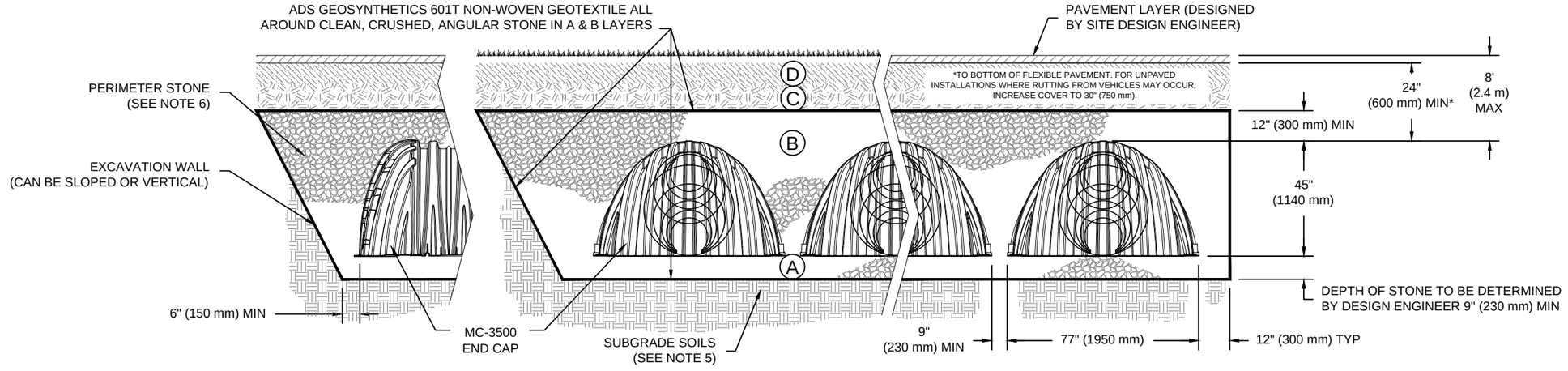
ADS®
ADVANCED DRAINAGE SYSTEMS, INC.
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

NOT TO SCALE

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2] [3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. MC-3500 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

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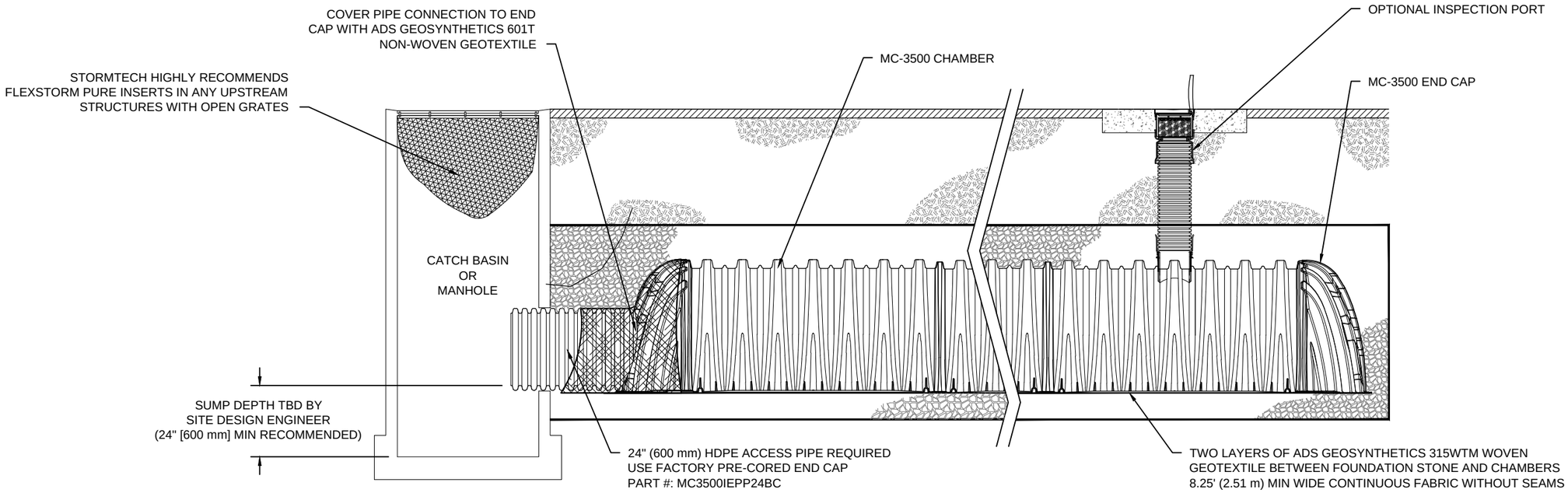
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REV	DESCRIPTION	CHK	DRW	DFT

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MC-3500 ISOLATOR ROW DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

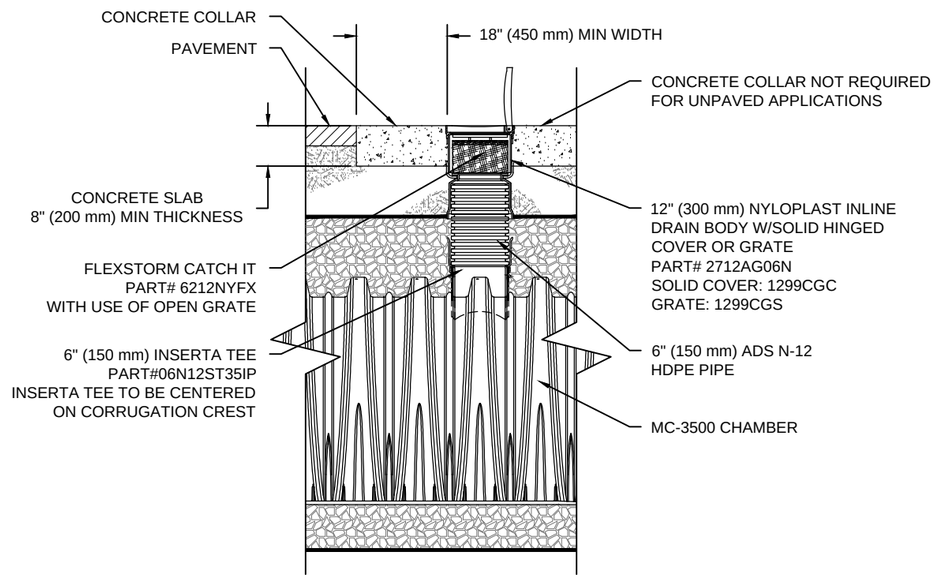
STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



MC-3500 6" INSPECTION PORT DETAIL
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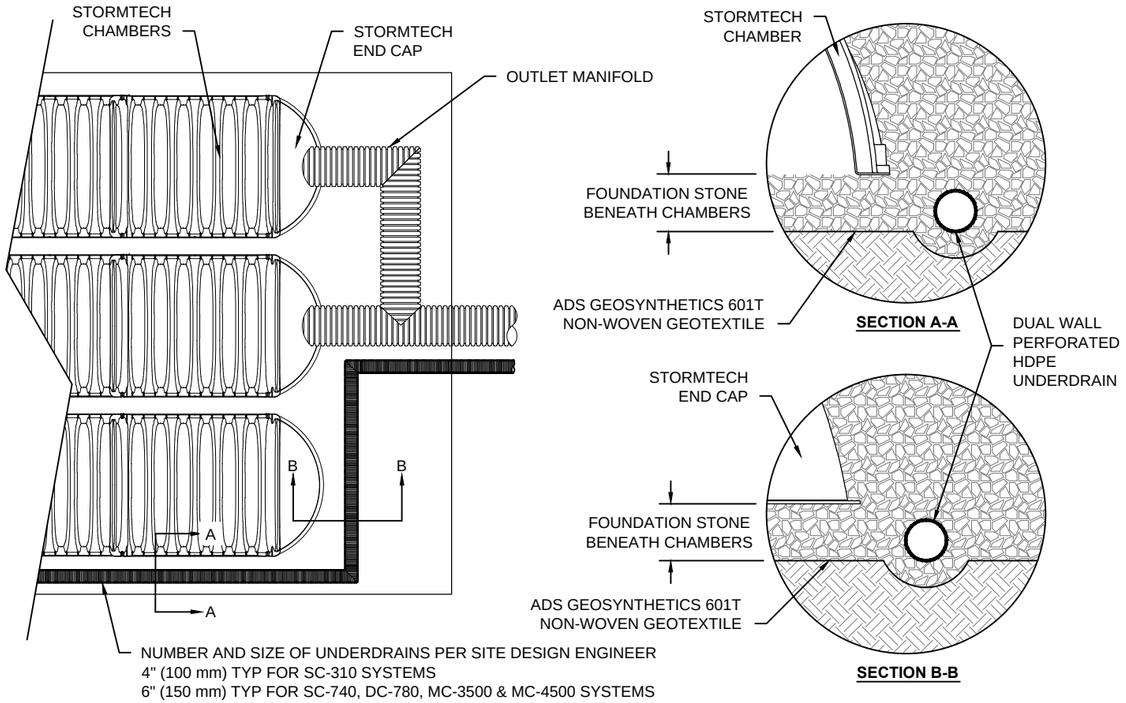
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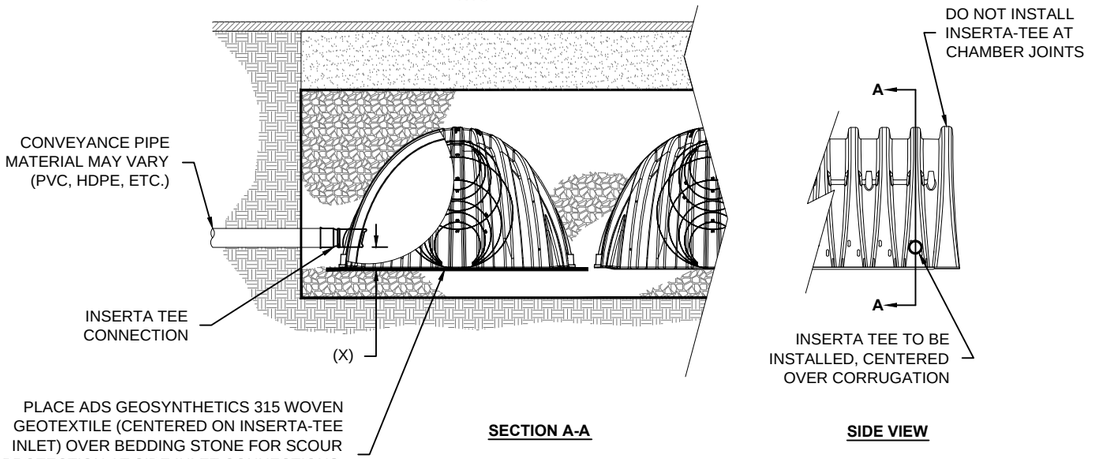
UNDERDRAIN DETAIL

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INSERTA TEE DETAIL

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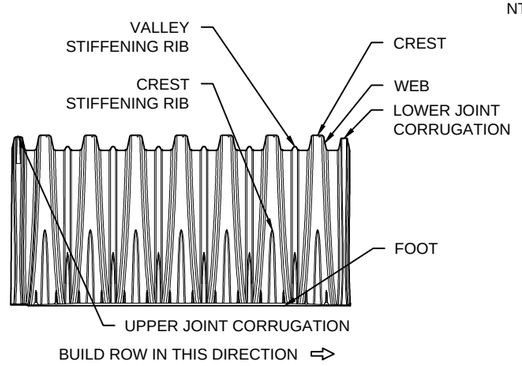


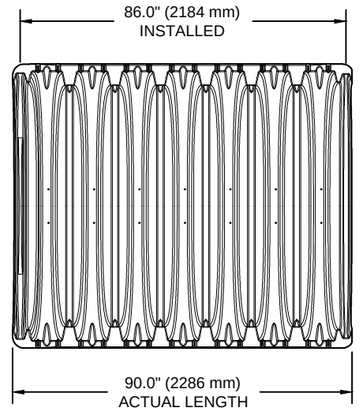
NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

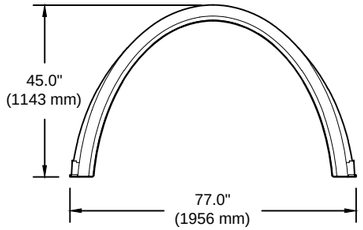
CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

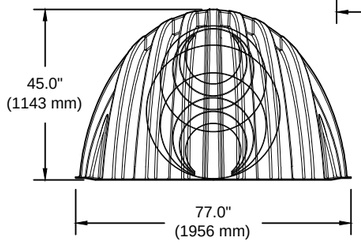
MC-3500 TECHNICAL SPECIFICATION

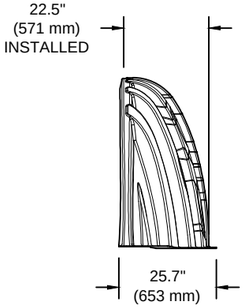
NTS











NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	178.9 CUBIC FEET	(5.06 m³)
WEIGHT	135.0 lbs.	(61.2 kg)

NOMINAL END CAP SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 22.5"	(1956 mm X 1143 mm X 571 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	46.0 CUBIC FEET	(1.30 m³)
WEIGHT	50.0 lbs.	(22.7 kg)

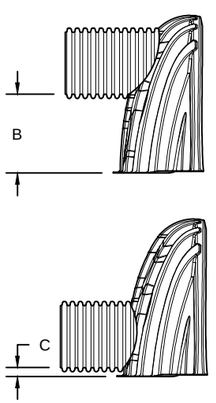
*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP30BC	30" (750 mm)	---	

NOTE: ALL DIMENSIONS ARE NOMINAL

CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS.
CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm)
THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHTEST POSSIBLE FOR THE PIPE SIZE.



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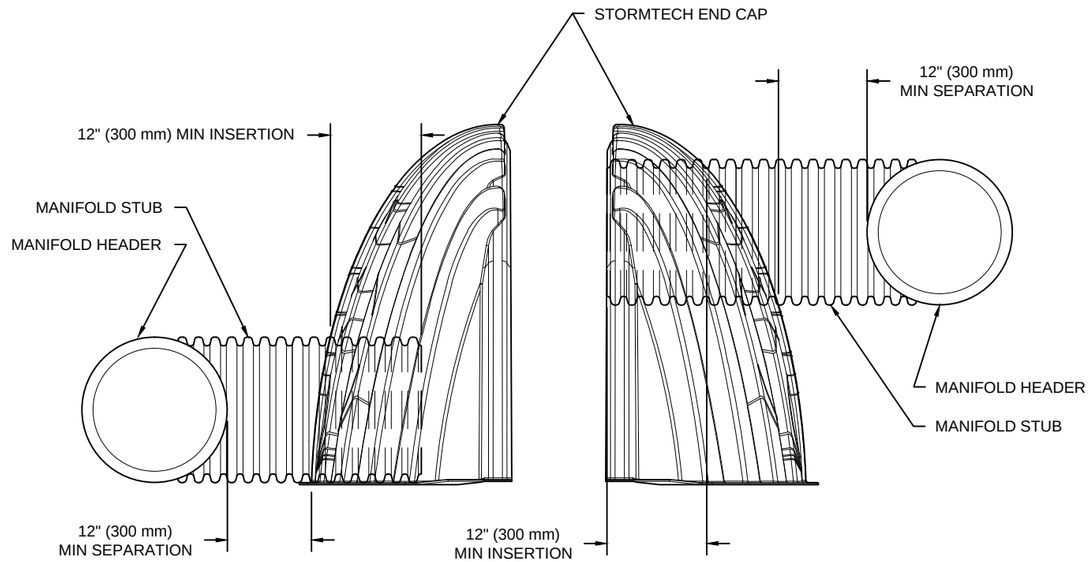
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MC-SERIES END CAP INSERTION DETAIL

NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL
FOR A PROPER FIT IN END CAP OPENING.

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Isolator® Row O&M Manual







THE MOST ADVANCED NAME IN WATER MANAGEMENT SOLUTIONS™

ADS®

THE ISOLATOR® ROW

INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

THE ISOLATOR ROW

The Isolator Row is a row of StormTech chambers, either SC-160LP, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the SC-160LP, DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

The Isolator Row is typically designed to capture the “first flush” and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

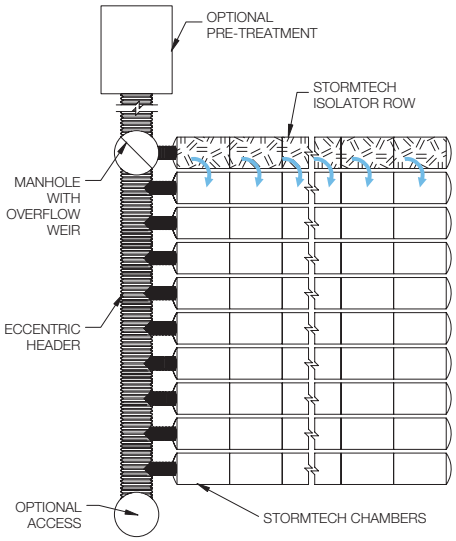
Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.



Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.



StormTech Isolator Row with Overflow Spillway (not to scale)





ISOLATOR ROW INSPECTION/MAINTENANCE

INSPECTION

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

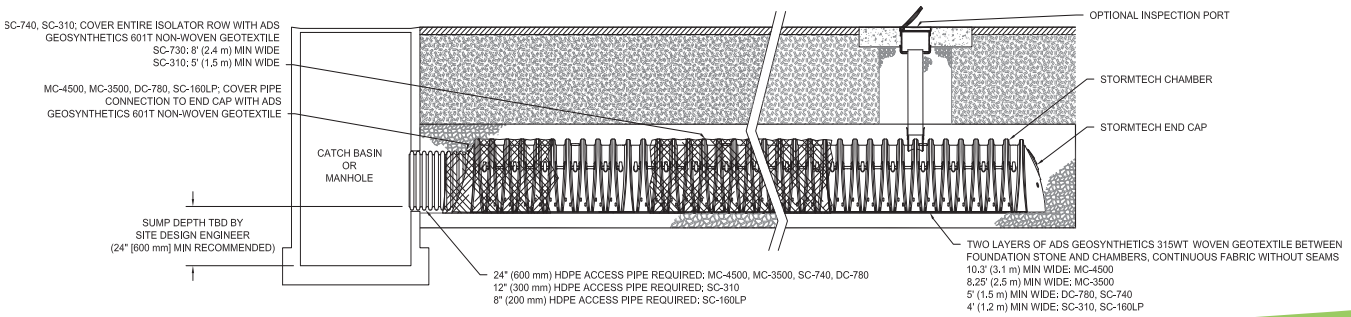
MAINTENANCE

The Isolator Row was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)

Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-4500 chamber models and is not required over the entire Isolator Row.



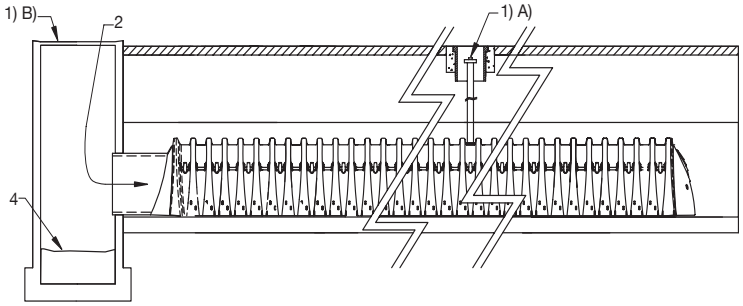
ISOLATOR ROW STEP BY STEP MAINTENANCE PROCEDURES

STEP 1
Inspect Isolator Row for sediment.
- A) Inspection ports (if present)
  - i. Remove lid from floor box frame
  - ii. Remove cap from inspection riser
  - iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
  - iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.
- B) All Isolator Rows
  - i. Remove cover from manhole at upstream end of Isolator Row
  - ii. Using a flashlight, inspect down Isolator Row through outlet pipe
    1. Mirrors on poles or cameras may be used to avoid a confined space entry
    2. Follow OSHA regulations for confined space entry if entering manhole
  - iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

STEP 2
Clean out Isolator Row using the JetVac process.
- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

STEP 3
Replace all caps, lids and covers, record observations and actions.

STEP 4
Inspect & clean catch basins and manholes upstream of the StormTech system.



SAMPLE MAINTENANCE LOG

Date	Stadia Rod Readings		Sediment Depth (1)–(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

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StormTech® Detention • Retention • Water Quality
A division of ADS

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

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 behind this cover sheet:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☒ Included See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet.
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 .	☒ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☒ Not performed ☐ Included ☐ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required) See Chapter 6 and Appendix G of the BMP Design Manual	☒ Included ☐ Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐ Included ☒ 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 behind this cover sheet:

Attachment Sequence	**Contents**	**Checklist**
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☒ Included See Structural BMP Maintenance Information Checklist on the back of this Attachment cover sheet.
Attachment 3b	Draft Maintenance Agreement (when applicable)	☐ Included ☐ 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.

☐ **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)
- ☐ 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 shall include a draft maintenance agreement in the local jurisdiction's standard format (PDP applicant to contact the City Engineer to obtain the current maintenance agreement forms).

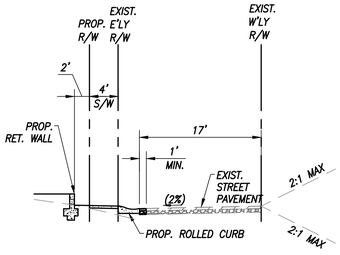
ATTACHMENT 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

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

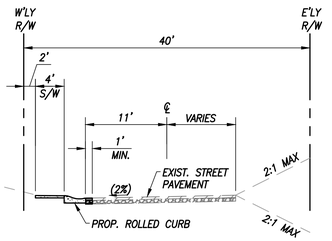
The plans must identify:

☒ Structural BMP(s) with ID numbers matching Form 4 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. Photocopies of general brochures are not acceptable.
☐ A single plan BMP sheet for each construction drawing highlighting only those BMPs included in the referenced construction drawing. (See Section 5.5.2 of the City's JRMP for further detail.)



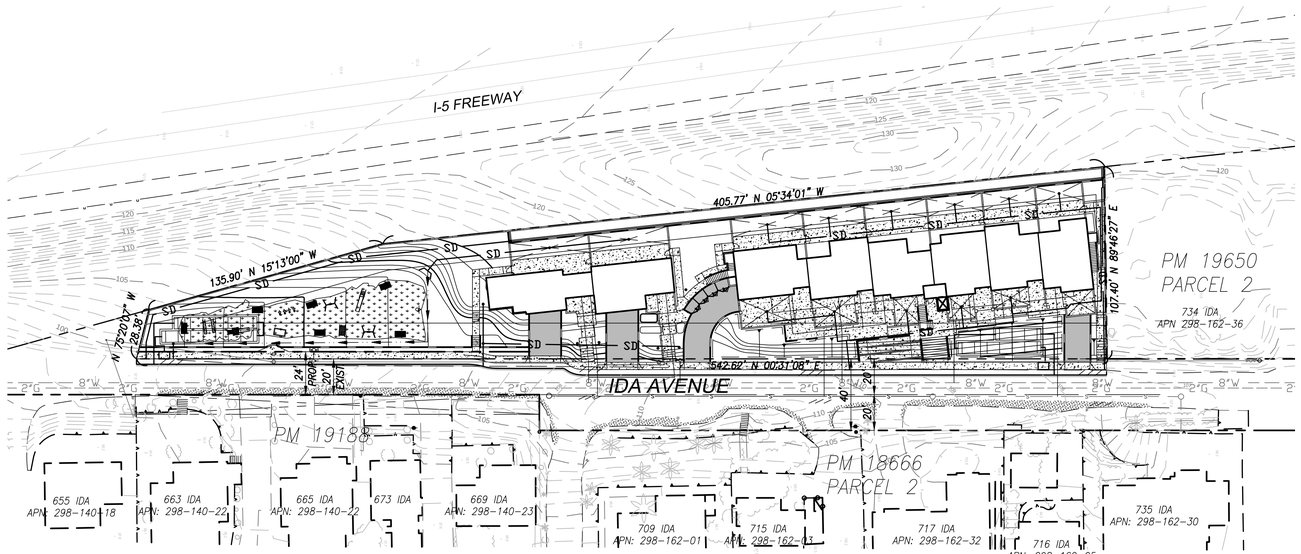
IDA AVE
STREET SECTION
(NORTH OF UNIT 7)

NTS



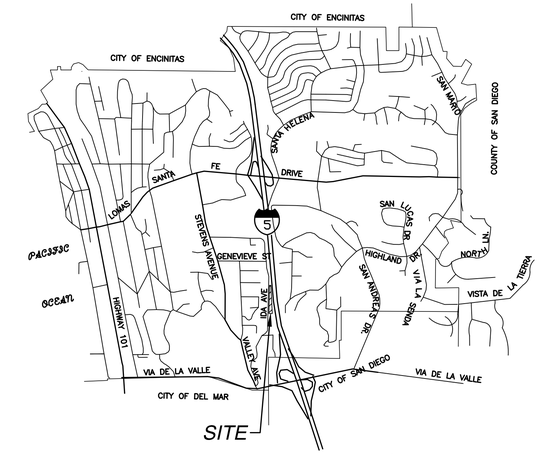
IDA AVE
STREET SECTION
(UNITS 1-7)

NTS



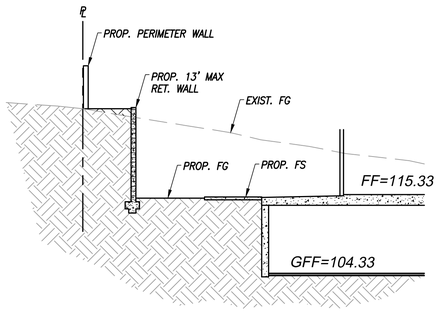
INDEX MAP

SCALE 1:40



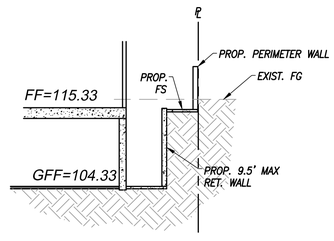
VICINITY MAP

NTS



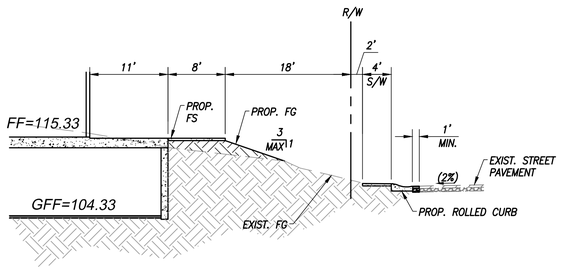
SECTION A-A

NTS



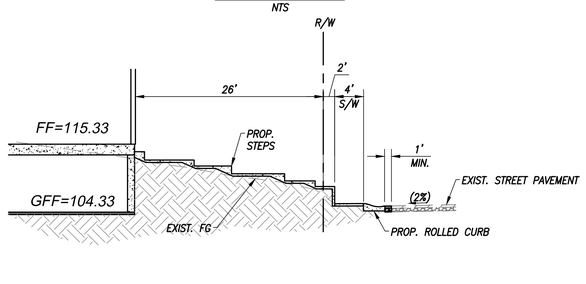
SECTION B-B

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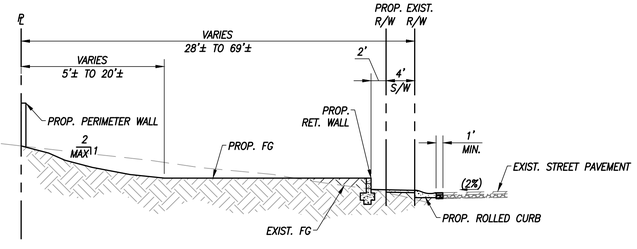
SECTION C-C

NTS



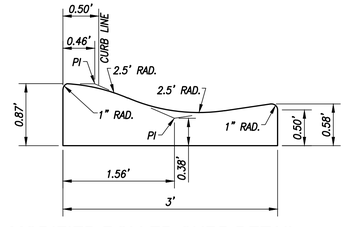
SECTION D-D

NTS



SECTION E-E

NTS



MODIFIED ROLLED CURB DETAIL

NTS

LEGEND

- PROP. AC
- PROP. PCC
- PROP. LDSCP
- R/W
- ℄
- AC JOIN LINE
- (100) EXIST. CONTOUR
- W EXIST. WATER (SIZE PER PLAN)
- S EXIST. SEWER (SIZE PER PLAN)
- G EXIST. GAS (SIZE PER PLAN)
- EXIST. GUTTER
- EXIST. CURB
- 100 PROP. INDEX CONTOUR
- PROP. INTERMEDIATE CONTOUR
- PROP. CURB
- PROP. GUTTER
- PROP. RET. WALL
- PROP. PERIMETER WALL
- FS FINISH SURFACE
- FS FINISH GRADE
- TS TOP OF STEP
- TW TOP OF WALL
- BSL BUILDING SETBACK LINE
- TOP OF SLOPE / PROP. / EXIST. / TOE OF SLOPE

OWNERS:

SHANTU PATEL
C/O KNN MANAGEMENT LLC
1280 HOOVER STREET
CARLSBAD, CALIFORNIA 92008
PHONE: (790) 214-8558
shantumd@gmail.com

ENGINEER:

ARMSTRONG & BROOKS CONSULTING ENGINEERS
1350 CHASE DRIVE CORONA, CA. 92881
PH. (951) 372-8400
FAX (951) 372-8430

ZONING

MHRd

ASSESSOR'S PARCEL NOS.

298-162-37

SITE ACREAGE

GROSS ACREAGE:	0.94 AC
NET ACREAGE:	0.94 AC

EARTHWORK (RAW QTYS)

RAW CUT	8,945	CU YD
RAW FILL	235	CU YD
TOTAL:	8,610	CU YD

LEGAL DESCRIPTION

PARCEL 3 OF PM 19650, IN THE CITY OF SOLANA BEACH, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, FEBRUARY 4, 2005

BASIS OF BEARING

THE BASIS OF BEARING FOR THIS MAP IS NAD 83, ZONE 6 GRID BEARING BETWEEN MONUMENT NO. 2005 (N 1,940,417.755 E 6,251,714.612) AND NO. 2007 (N 1,937,541.494, E 6,253,036.581) PER RECORD OR SURVEY NO. 18971.
BEARING: S 24°41'03" E

BENCHMARK

THE BASIS OF ELEVATION FOR THIS SURVEY IS A FOUND 2.5" CITY OF SOLANA BEACH BRASS DISC ON CONCRETE DRAINAGE INLET AT THE EAST END OF FRESCA COURT.
INDEX #2005 NAME: SOLB-5
ELEVATION = 104.952

SHEET INDEX

TITLE SHEET 1
CONCEPTUAL GRADING PLAN 2
COMPOSITE UTILITY PLAN 3

PREPARED BY:

ARMSTRONG & BROOKS CONSULTING ENGINEERS
PLANNING - INFRASTRUCTURE - SITE DEVELOPMENT - WATER RESOURCES
1350 E. CHASE DRIVE - CORONA - CA - 92881
P: 951 - 372 - 8400 F: 951 - 372 - 8430

REGISTERED PROFESSIONAL ENGINEER
DENNIS C. ARMSTRONG
No.C48758
Exp. 9/30/18
CIVIL
STATE OF CALIFORNIA

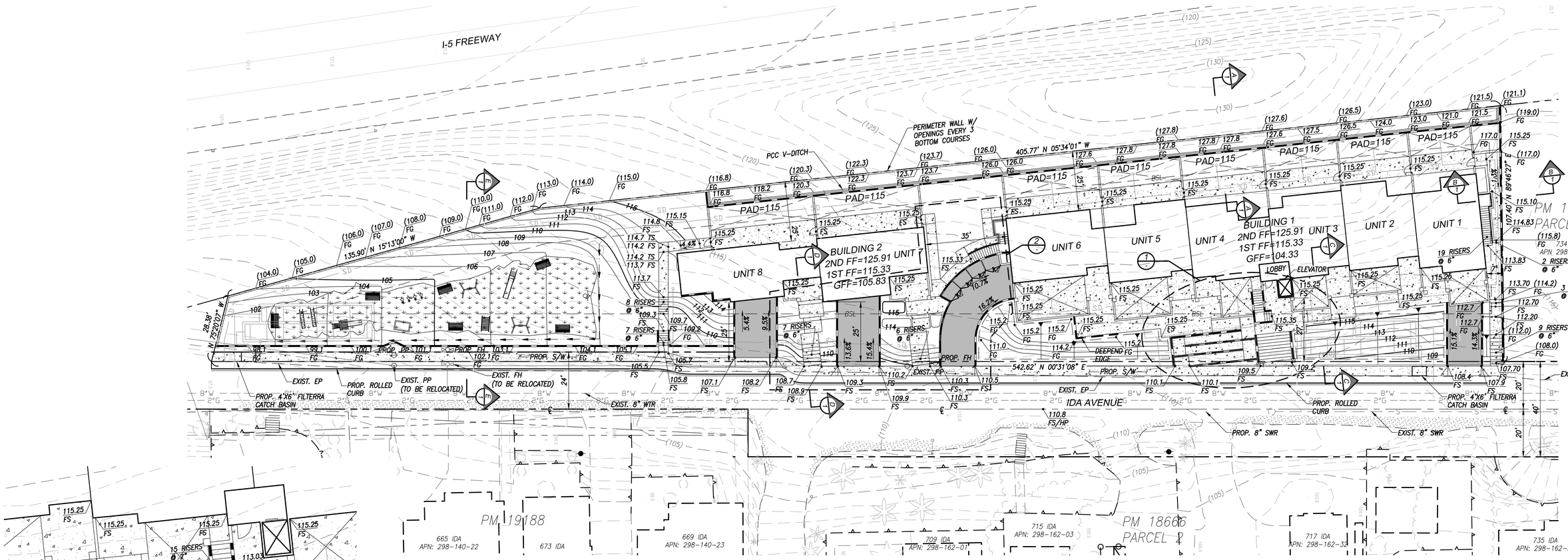
CITY OF SOLANA BEACH

CONCEPTUAL GRADING PLAN

TITLE SHEET

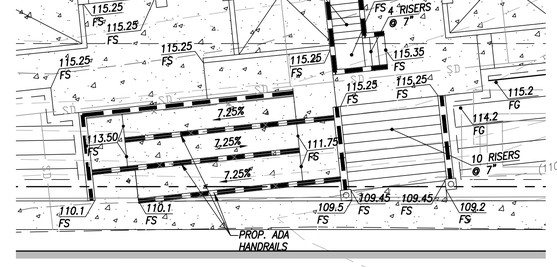
SHEET 1
OF 3

\\DOS01\IT\SHARE\PROJECTS\SOLANA BEACH\DWG\19\CGP-01.DWG 2/9/18



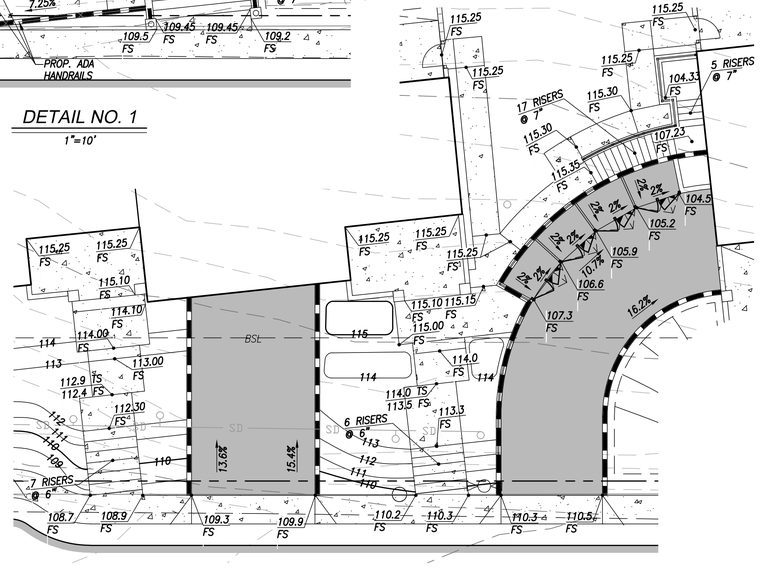
1ST FLOOR LEVEL

1"=20'



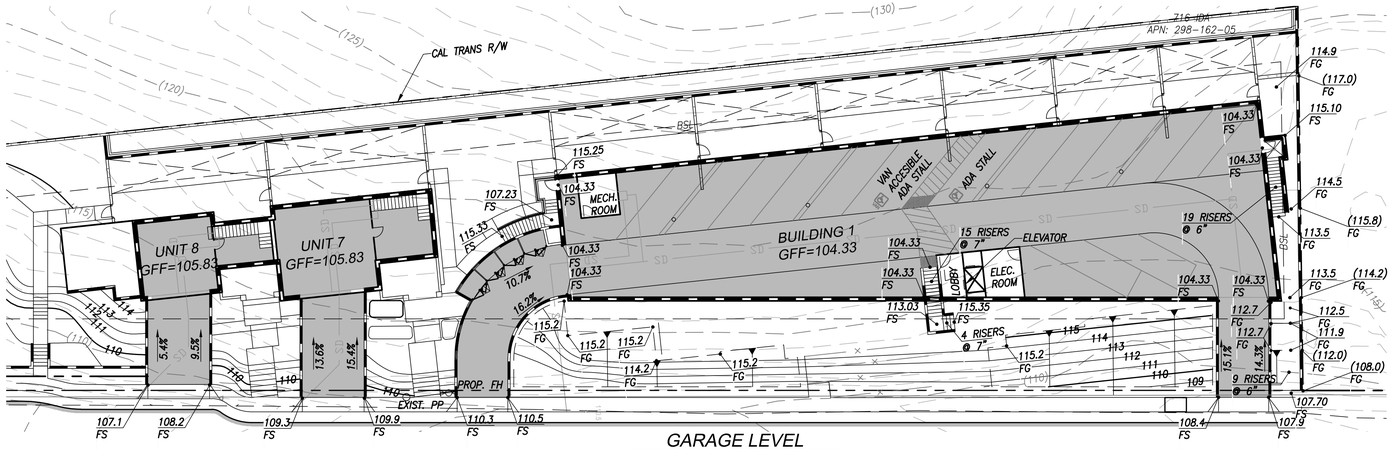
DETAIL NO. 1

1"=10'



DETAIL NO. 2

1"=10'



GARAGE LEVEL

1"=20'

20 0 20 40

SCALE 1" = 20'

PREPARED BY:

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1350 E. CHASE DRIVE - CORONA - CA - 92881
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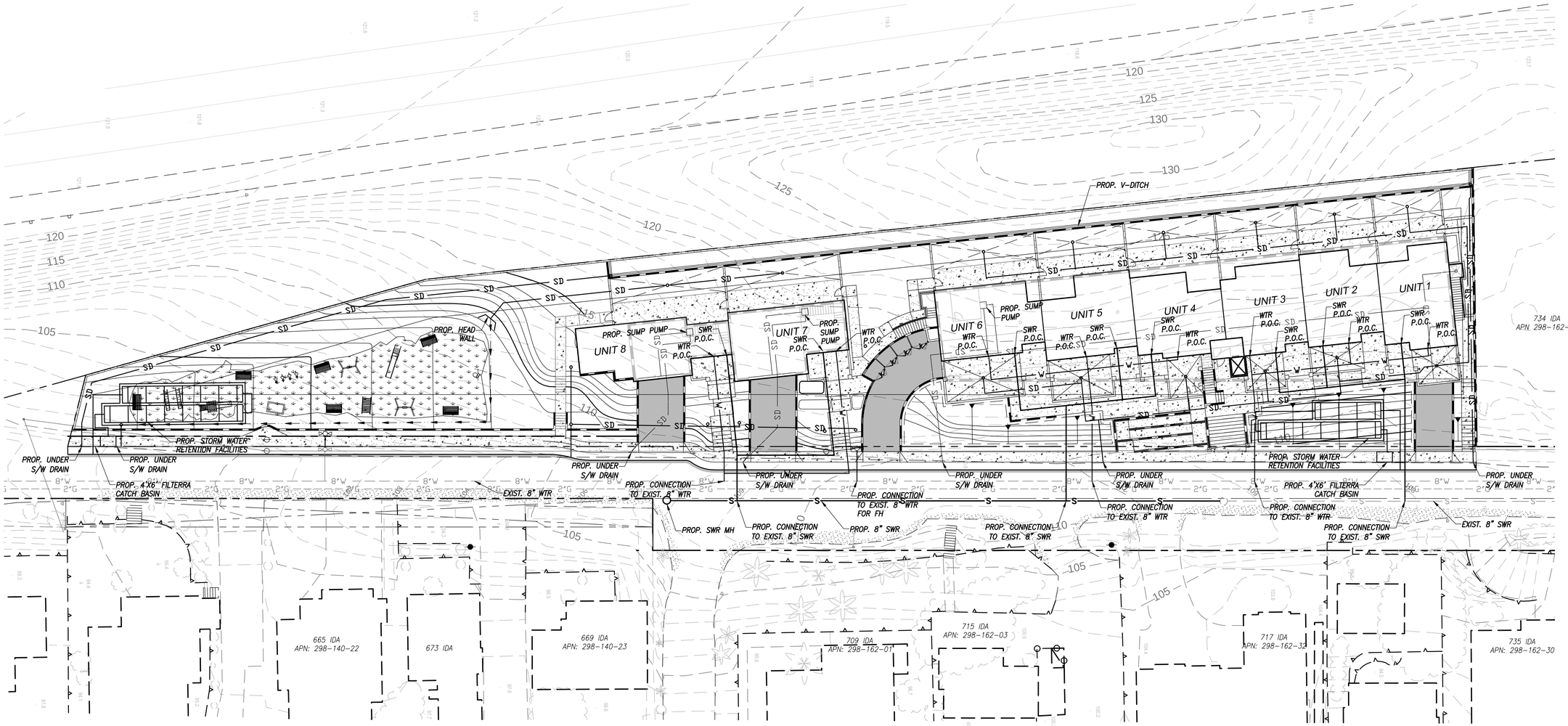
CITY OF SOLANA BEACH

CONCEPTUAL GRADING PLAN

GRADING PLAN

SHEET 2
OF 3

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STATE OF CALIFORNIA

CITY OF SOLANA BEACH

CONCEPTUAL GRADING PLAN

UTILITY PLAN

SHEET 3
OF 3

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