Preliminary Water Quality Management Plan

(PWQMP)

Project Name:

BAKE PARKWAY / JERONIMO ROAD INTERSECTION IMPROVEMENT
CITY OF IRVINE AND CITY OF LAKE FOREST
CIP No. 314210
Project No.: 00912566-PAA

Project Location:
Intersection of Bake Parkway and Jeronimo Road

Prepared for:

City of Irvine

1 Civic Center Plaza

Irvine, CA 92623-9575

(949) 724-7325

Prepared by:

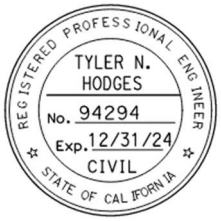
Mark Thomas

2121 Alton Parkway Suite 210

Irvine, CA 92606

(949)477-9000

Engineer: Tyler Hodges



November 21, 2023

Preliminary Water Quality Management Plan (PWQMP)

CIP 314210

Project No.: 00912566-PAA

This Preliminary Water Quality Management Plan (PWQMP) for CIP No. 314210 has been prepared for the City of Irvine by Mark Thomas. The PWQMP is intended to comply with the requirements of the local NPDES Stormwater Program requiring the preparation of the plan.

This project is a street improvement of 5,000 square feet or more of paved surface.

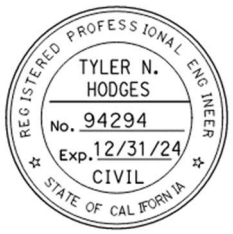
The City of Irvine is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Public Agency Responsible Manager:			
Name/ Title	Lincoln Lo, Deputy Director of Project Delivery/City Engineer		
Address	1 Civic Center Plaza Irvine, CA 92623-9575		
Email	Llo@cityofirvine.org		
Telephone #	949-724-7325		
I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein. This responsibility extends within City of Irvine's jurisdiction.			
Signature		Date	11/14/23

Public Agency Responsible Manager:			
Name/ Title	Thomas E. Wheeler, Director of Public Works/City Engineer		
Address	100 Civic Center Drive Lake Forest, CA 92630		
Email	twheeler@lakeforestca.gov		
Telephone #	949-461-3481		
I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein. This responsibility extends within City of Lake Forest's jurisdiction.			
Signature	Tom Wheeler	Date	11/28/2023

Preparer (Engineer): Tyler Hodges			
Title	Design Engineer	PE Registration #	94294
Company	Mark Thomas		
Address	2121 Alton Parkway Suite 210 Irvine, CA 92606		
Email	thodges@markthomas.com		
Telephone #	(949)477-9000		

I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R8-2009-0030/NPDES No. CAS618030, of the Santa Ana Regional Water Quality Control Board.

Preparer Signature		Date	11/17/23
Place Stamp Here			

Contents

Page No.

Attachments

Section I Discretionary Permit(s) and Water Quality Conditions

Provide discretionary permit and water quality information. *Refer to Section 2.1 in the Technical Guidance Document (TGD) available from the Orange County Stormwater Program (ocwatersheds.com).*

Project Infomation	
CIP /Project No.	City of Irvine CIP 314210
Additional Information/ Comments:	Intersection of Bake Parkway and Jeronimo Road within the cities of Irvine and Lake Forest.
Water Quality Conditions	
Water Quality Conditions (list verbatim)	N/A
Watershed-Based Plan Conditions	
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	N/A

Section II Project Description

II.1 Project Description

Description of Proposed Project	
Development Category (Verbatim from WQMP):	Category 7: Streets, roads, highways, and freeways. This category includes any paved surface that is 5,000 square feet or greater used for the transportation of automobiles, trucks, motorcycles, and other vehicles.
Project Area (ac): 1.67	SIC Code: N/A
Narrative Project Description:	The Bake Parkway / Jeronimo Road Intersection Improvements Project is located at the intersection of Bake Parkway and Jeronimo Road in the City of Lake Forest and City of Irvine. The westerly leg of the intersection presides within the City of Irvine, and the remaining legs of the intersection preside within the City of Lake Forest. The Proposed Project is a joint effort between both cities. The proposed improvements consists of: • One (1) additional northbound left turn lane on Bake Parkway to add additional storage for left turn traffic • One (1) additional westbound left turn lane on Jeronimo Road to add additional storage for left turn traffic storage • Provide on-street Class II bike lanes for all legs of this intersection The land adjacent to the right of ways is privately owned by multiple property owners including Southern California Regional Rail Authority to the south, business centers west of Bake Parkway, and residential buildings east of Bake Parkway. The land cover within the project intersection is predominantly asphalt and concrete with moderate landscaping. Adjacent landscaped slopes of various greenery and parkway landscaping is maintained by the City of Lake Forest. Proposed improvements will replant disturbed pervious areas as necessary. Landscape treatments for areas in front of the existing residential areas will need to be coordinated between City of Lake Forest and the adjacent homeowners associations and incorporate into a final design level of the project WQMP during the final design phase of the project.

Along Bake Parkway, the north leg of the intersection will provide a 6-lane facility, a 9′ chevron striped buffer zone in the southbound direction, one southbound 10′ left turn lane, and two 8′ bikes lanes (one in each direction). The south leg of the intersection provides a 6-lane facility, two 8′ bike lanes (one in each direction), two northbound 10′ left turn lanes, and a 4′ raised median. The westerly widening requires a retaining wall to prevent any impacts to the existing OCFCD channel. There are four existing SCE wooden poles along the westerly sidewalk that will require relocation due to the proposed widening.

Jeronimo Road will provide a 4-lane facility, two 10′ left turn lanes, one 13′ right turn lane in the eastbound direction and extension of the bike lanes to the intersection. The northerly sidewalk will be widened to accommodate for the additional westbound left turn lane and 8′ bike lanes in the westbound direction. The east leg of the intersection provides retaining walls at the back of walk to mitigate the sloped parkway and prevent any impacts to the residential property wall. Additional right-of-way is required to accommodate for the proposed improvements.

Since this project is a street/ roadway project. BMP selection and sizing has been designed in accordance with Section 2.7 of the TGD incorporating United States Environmental Protection Agency (USEPA) "Managing Wet Weather with Green Infrastructure: Green Streets" for the Maximum Extent Practicable (MEP). This allows treatment of comingled off-site runoff to offset the inability to treat areas within the project where it is not feasible due to right-of-way and utility constraints to provide treatment.

Due to project constraints and using the MEP standard, a volume based BMP was determined to be infeasible due to infiltration constraints and right-of-way constraints. A flow-based BMP will be used to treat the Water Quality Design Flow (WQDF) equivalent to the Design Capture Volume (DCV) as defined as the 85th percentile, 24-hour storm event from the disturbed project area.

Runoff will be collected and treated at the northeast corner of the project intersection. An 8′ x 10′ Filterra unit will be installed upstream of the relocated catch basin #1 (DMA 1) to provide LID treatment to the maximum extent practicable.

<table>
<tr><td></td><td colspan="4">The location of the Filterra unit was chosen to ensure that the tributary drainage area generates enough runoff to satisfy the WQDF.
Three separate catch basins receive flows from the disturbed project area. Existing catch basin #2 (DMA 2) is within the limits of the intersection project, however providing treatment at this location was deemed not feasible due to limited right-of-way and existing utilities conflicts. Existing catch basins #3 (DMA 3) and #4 (DMA 4) lie outside of the project impact limits. Providing treatment at these locations is not feasible due to limited city right-of-way and would require additional right-of-way acquisition from the adjacent property owners. Therefore per the USEPA Green Streets criteria, one Filterra Unit (FTBSV0810) will be incorporated to treat the required WQDF of 0.32 cfs from the entire disturbed project area. Refer to the Site Plan WQMP exhibit for the BMP location.</td></tr>
<tr><td rowspan="2">Project Area</td><td colspan="2">Pervious</td><td colspan="2">Impervious</td></tr>
<tr><td>Area
(acres or sq ft)</td><td>Percentage</td><td>Area
(acres or sq ft)</td><td>Percentage</td></tr>
<tr><td>Pre-Project Conditions</td><td>0.41</td><td>24.4%</td><td>1.26</td><td>75.6%</td></tr>
<tr><td>Post-Project Conditions</td><td>0.10</td><td>5.9%</td><td>1.57</td><td>94.1%</td></tr>
<tr><td>Drainage Patterns/Connections</td><td colspan="4">The project area existing drainage pattern consists of runoff that flows east to west along Jeronimo Road and is in sag condition along Bake Parkway. Bake Parkway flows are separated by a highpoint approximately 850 feet south of the intersection at the bridge above the OCTA Metrolink railroad, and a highpoint approximately 1,100 feet north of the intersection.

Flows east of Bake Parkway are intercepted by inlets at the northeast corner and southeast corner of the project intersection. West of Bake Parkway, flows travel westward along Jeronimo Road and are collected in catch basins outside of the project scope.

Street surface runoff and adjacent landscaping runoff is collected by the two street catch basins and is conveyed into the existing storm drain system. The proposed drainage improvements will maintain the existing drainage patterns and treat additional runoff to the maximum extent practical. See Section II.4 for post development drainage characteristics.</td></tr>
</table>

II.2 Potential Stormwater Pollutants

Determine and list expected stormwater pollutants based on land uses and site activities. *Refer to Section 2.2.2 and Table 2.1 in the TGD for guidance.*

Pollutants of Concern			
Pollutant	Circle One: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E ☒	N ☐	Expected to be of concern due to public use of the project area as a public roadway.
Nutrients	E ☒	N ☐	Expected to be of concern due to public use of the project area as a public roadway, and proximity to landscaped areas.
Heavy Metals	E ☒	N ☐	Expected to be of concern due to public use of project area as a public roadway.
Pathogens (Bacteria/Virus)	E ☒	N ☐	Expected to be of concern due to public use of project area as a public roadway, and proximity to landscaped areas.
Pesticides	E ☒	N ☐	Expected to be of concern due to proximity to landscaped areas.
Oil and Grease	E ☒	N ☐	Expected to be of concern due to public use of project area as a public roadway.
Toxic Organic Compounds	E ☒	N ☐	Expected to be of concern due to proximity to landscaped areas.
Trash and Debris	E ☒	N ☐	Expected to be of concern due to public use of project area as a public roadway.

- **Suspended Solids / Sediment:** consist of soils or other surficial materials that are eroded and then transported or deposited by wind, water, or gravity. Excessive sedimentation can increase turbidity, clog fish gills, reduce spawning habitat, lower young aquatic organisms survival rates, smother bottom dwelling organisms, and suppress aquatic vegetation growth. Sediments in runoff also transport other pollutants that adhere to them, including trace metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs),

and phosphorus. The largest source of suspended solids / sediment is typically erosion from disturbed soils.

- **Nutrients:** includes the macro-nutrients nitrogen and phosphorus. They commonly exist in the form of mineral salts dissolved or suspended in water and as particulate organic matter transported by storm water. Excessive discharge of nutrients to water bodies and streams can cause eutrophication, including excessive aquatic algae and plant growth, loss of dissolved oxygen, release of toxins in sediment, and significant swings in hydrogen ion concentration (pH). Primary sources of nutrients in urban runoff are fertilizers, trash and debris, and eroded soils. Urban areas with improperly managed landscapes can be substantial sources.

- **Metals:** includes certain metals that can be toxic to aquatic life if concentrations become high enough to stress natural processes. Metals of concern include cadmium, chromium, copper, lead, mercury, and zinc. Lead and chromium have been used as corrosion inhibitors in primer coatings and are also raw material components in non-metal products such as fuels, adhesives, paints, and other coatings. Copper and zinc are typically associated with building materials, including galvanized metal and ornamental copper, and automotive products, including tires and brake pads. Humans can be impacted from contaminated groundwater resources, and bioaccumulation of metals in fish and shellfish. Environmental concerns regarding the potential for release of metals to the environment have already led to restricted metal usage in certain applications, for example lead additives in gasoline. The primary source of metals in urban storm water is typically commercially available metal products and automobiles.

- **Microbial Pathogens (Bacteria and Viruses):** include bacteria and viruses, which are ubiquitous microorganisms that thrive under a range of environmental conditions. Water containing excessive pathogenic bacteria and viruses can create a harmful environment for humans and aquatic life. The source of pathogenic bacteria and viruses is typically the transport of animal or human fecal wastes from the watershed, but pathogenic organisms do occur in the natural environment.

- **Oil and Grease:** are characterized as high-molecular weight organic compounds. Elevated oil and grease content can decrease the aesthetic value of the water body, as well as the water quality. Introduction of these pollutants to water bodies may occur due to the wide uses and applications of some of these products in municipal, residential, commercial, industrial, and construction areas. Primary sources of oil and grease are petroleum hydrocarbon products, motor products from leaking vehicles, esters, oils, fats, waxes, and high molecular-weight fatty acids.

- **Toxic Organic Compounds:** include organic compounds (pesticides, solvents, hydrocarbons) which at toxic concentrations constitute a hazard to humans and aquatic organisms. Storm water coming into contact with organic compounds can transport excessive levels organics to receiving waters. Dirt, grease, and grime retained in cleaning fluid or rinse water may also adsorb levels of organic compounds that are harmful or hazardous to aquatic life. Sources of organic compounds include landscape maintenance areas, vehicle maintenance areas, waste handling areas, and potentially most other urban areas.

- **Trash and Debris:** includes trash, such as paper, plastic, and various waste materials, that can typically be found throughout the urban landscape, and debris which includes waste products of natural origin which are not naturally discharged to water bodies such as landscaping waste, woody debris, etc. The presence of trash and debris may have a significant impact on the recreational value of a water body and upon the health of aquatic habitat.

II.3 Hydrologic Conditions of Concern

Determine if streams located downstream from the project area are determined to be potentially susceptible to hydromodification impacts. *Refer to Section 2.2.3.1 in the TGD.*

☐ No – Show map

☒ Yes – Describe applicable hydrologic conditions of concern below. *Refer to Section 2.2.3 in the TGD.*

Newport Bay watershed is susceptible to hydromodification and therefore HCOC's must be considered. A project does not have an HCOC if either of the following conditions is met per OC TGD Section 2.2.3.1:

- Post-development runoff volume for the two-year frequency, twenty-four hour storm does not exceed that of the pre-development condition by more than five percent, or
- Time of concentration of post-development runoff for the two-year, twenty-four hour storm event is not less than that for the pre-development condition by more than five percent

Section 2.7.3 indicates that if sizing criteria cannot be achieved, the constraints must be documented and the largest portion of the sizing criteria that can be reasonably provided given the constraints must be used.

The project is located within the Orange County Water District Groundwater Basin Protection Boundary and contains underlying soils within hydrologic soil group D, making infiltration infeasible, refer to Figure XVI-2b and XVI-2d in Attachment D. The lack of pervious area and landscaping in the project also makes harvest and use BMPs infeasible. Due to these constraints, runoff volume cannot be mitigated to meet the hydromodification requirements.

It is possible to mitigate changes in the time of concentration with the use of a detention BMP. However, due to the nature of the project, a roadway improvement located in a developed area with many utilities and limited right-of-way, incorporating a detention system into the storm drain system is not feasible.

The disturbed project area is 1.67 acres and is shown per drainage management area below. The project area is less than 5 acres; therefore the runoff volumes and peak flow rates were calculated using the simple method runoff coefficient per the OC TGD.

Simple Method Runoff Coefficient for Volume
Runoff Volume (V) = C * d * A * 43560 sf/ac * 1/12 in/ft
C = Runoff Coefficient (0.75 * Impervious Ratio + 0.15)
d = Storm Depth = 2.05 in
Storm Depth (d) per OC TGD Section IV.1.1 for Non-mountainous Areas
A = Tributary Area (acres)

Simple Method Runoff Coefficient for Flow
Runoff Rate (Q) = C * i * A
C = Runoff Coefficient (0.75 * Impervious Ratio + 0.15)
I = Design Intensity (inch/hour) = 1.52 in/hr
Design Intensity (I) per OC Hydrology Manual Figure B-3 for 10-minute time of concentration and 2-year design storm. Refer to Attachment C for Nomographs.
A = Tributary Area (acres)

Existing Condition:

Subarea No.	Total Area (sf)	Volume (cf)	Flow (cfs)
1	20,489	1,782	0.36
2	12,575	1,830	0.37
3	19,546	2,564	0.52
4	19,984	2,720	0.56
	Total	8,896	1.82

Proposed Condition:

Subarea No.	Total Area (sf)	Volume (cf)	Flow (cfs)
1	20,489	2,597	0.53
2	12,575	1,933	0.40
3	19,546	3,005	0.61
4	19,984	3,073	0.63
	Total	10,609	2.17

An increase in 1,712 cubic feet of volume is seen when comparing the existing and proposed project conditions. Post-construction flow rates exceed the pre-construction flow rate by 0.35 cfs. Both volume and flows are increased by 19.3% over the project site which is greater than the five percent criteria.

Due to the nature of the project, existing catch basins will be relocated to the proposed adjacent curb line. The line and grade are slightly altered; however, the drainage patterns remain unchanged. Therefore, it is assumed the post-construction time of concentration will remain consistent with the existing condition.

HCOC is present due to the increase in volume and peak flows, therefore hydromodification BMPs must be implemented to the Maximum Extent Practical (MEP).

Incorporation of hydromodification management BMPs are not necessary for a project with such a small impact on the watershed and are not practicable for a project of this type. Multiple constraints such as limited right-of-way and hydrologic group D soils create challenges to implement hydromodification BMPs. Per Section 5.3.1 of the North OC TGD and application of the Green Streets Standard, the project will not include a hydromodification management BMP.

II.4 Post Development Drainage Characteristics

Post development drainage patterns will mimic the existing drainage pattern. Refer to Section II for existing drainage patterns. Street flows will be collected by the proposed catch basins that have been relocated to the new curb line and conveyed into the existing storm drain system. The existing storm drain system collects flow from the Lake Forest Keys property, northeast of the proposed project and are directed through drainage easements to the northeast corner of the project intersection. Flows captured at the northeast corner and southeast corners of the intersection are conveyed through a 24-inch diameter storm drain along Annette Avenue before it is routed under the Southern California Regional Rail Authority tracks and discharges to a ditch adjacent to a Southern California Edison easement. Post development flows will then discharge into San Diego Creek Reach 2 confluence within San Diego Creek Reach 1, then the Newport Bay Upper before reaching Newport Bay Lower and ultimately discharging into the Pacific Ocean.

II.5 Property Ownership/Management

Describe property ownership/management. Refer to Section 2.2.5 in the Technical Guidance Document (TGD).

The project site is located within the City of Irvine and the City of Lake Forest. Roadway ownership belongs to the two cities the project is located within. The proposed BMP will be owned and maintained by the City of Lake Forest.

Section III Site Description

III.1 Physical Setting

Planning Area/ Community Name	City of Irvine: PA 35 Irvine Spectrum 2 City of Lake Forest: Lake Forest Keys and Lake Forest West
Location/Address	Intersection of Jeronimo Road and Bake Parkway
Land Use	Roadway / Public Facility
Zoning	The project area is roadway with no zoning. City of Irvine adjacent properties zoning: 5.4-General Industrial City of Lake Forest adjacent properties zoning: Low Density Residential, Low-Medium Density Residential, Lake and Transportation Corridor
Acreage	Disturbed project area is 1.67 acres. Net 0.31 acre of new impervious area is added to the project.
Predominant Soil Type	D

III.2 Site Characteristics

Precipitation Zone	The project site location resides within the 0.85" Design Capture Storm. Refer to Figure XVI-1 in Attachment D.
Ownership of Land Adjacent to Right of Ways	The land adjacent to the right of ways is privately owned by multiple property owners including Southern California Regional Rail Authority to the south, business centers west of Bake Parkway, and residential buildings east of Bake Parkway. Additionally west of the intersection is Serrano Creek, maintained by Orange County Flood Control District.
Topography/Longitudinal Slope	The project site has longitudinal slopes averaging between 2% and 5%.
Grade differential between road surface and storm drain system.	There is 2' minimum cover between the road surface and storm drain system and averages 5' depth.
Soil Type, Geology, and Infiltration Properties	The project site location resides within the dominant hydrology soil group D, but group C soils are also present. Group C soils are typically sandy clay loams. They have low infiltration rates when thoroughly wetted, consist chiefly of soils with a layer that impedes downward movement of water, and/or have moderately fine to fine soil structure. Group D soils are typically clay loams, silty clay loams, sandy clays, silty clays, or clays. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with high swelling potential, permanent high water table, claypan or clay layer at or near the surface, and/or shallow soils over nearly impervious material. Refer to Attachment D, Figure XVI-2a for soil map information.

Site Characteristics (continued)	
Hydrogeologic (Groundwater) Conditions	This project is located within the Orange County Water District Groundwater Basin Protection Boundary. Groundwater has not been encountered at the project location. Refer to Figure XVI-2d in Attachment D.
Geotechnical Conditions (relevant to infiltration)	The project has soil type C per the OC Stormwater Land Development Tool and soil type D per the OC TGD. Infiltration is deemed infeasible due to the OC Infiltration Study showing the project location containing hydrologic soil group D. Refer to Figure XVI-2b and the NRCS Soil Map in Attachment D.
Maintenance Access Considerations	Curbside access to proposed BMP is readily available through existing public roadway. Maintenance will be routinely performed on the street or as necessary by the City of Lake Forest.
Utility and Infrastructure Information	Improvements to the existing utilities and infrastructure will be implemented because of this project. Catch basins will be relocated to accommodate changes to the curb. Third party utility coordination will be required to relocate existing utilities as needed to accommodate proposed improvements.

III.3 Watershed Description

Receiving Waters	This project drains into San Diego Creek Reach 2, San Diego Creek Reach 1, Upper and Lower Newport Bay prior to discharging into the Pacific Ocean. Refer to Attachment E.
303(d) Listed Impairments	**San Diego Creek Reach 2:** Sedimentation/Siltation, Nutrients, Indicator Bacteria, Benthic Community Effects, Toxicity **San Diego Creek Reach 1:** Nutrients, Sedimentation/Siltation, Selenium, Toxaphene, Toxicity, Indicator Bacteria, Benthic Community Effects, DDT, Malathion **Newport Bay, Upper:** Sedimentation/Siltation, Nutrients, PCBs, Toxicity, Indicator Bacteria, Chlordane, Copper, DDT, Malathion **Newport Bay, Lower:** Chlordane, Copper, DDT, Indicator Bacteria, Nutrients, PCBs, Toxicity
Applicable TMDLs	**San Diego Creek Reach 2:** Sedimentation/Siltation, Nutrients, Unknown Toxicity **San Diego Creek Reach 1:** Nutrients, Sedimentation/Siltation, Toxaphene, DDT **Newport Bay, Upper:** Nutrients, Sedimentation/Siltation, PCBs, Indicator Bacteria, Chlordane, DDT **Newport Bay, Lower:** Nutrients, PCBs, Indicator Bacteria, Chlordane, DDT
Pollutants of Concern for the Project	Suspended Solid/ Sediments, Nutrients, Heavy Metals, Pathogens (Bacteria/ Virus), Pesticides, Oil and Grease, Toxic Organic Compounds, Trash and Debris
Environmentally Sensitive and Special Biological Significant Areas	The project is not located within 200 feet or adjacent to an Environmentally Sensitive Area (ESA). Also, there is no Area of Special Biological Significance (ASBS) in the City of Irvine. Per the OC TGD Section 2.3.3.4, "*discharge from an urban area that comingles with downstream flows prior to an ESA is not subject to this requirement.*" Refer to 303(d) impaired waters map in Attachment E.

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

The Project will incorporate United States Environmental Protection Agency (USEPA) guidance, "Managing Wet Weather with Green Infrastructure: Green Streets" as described in the **Model WQMP Appendix B,** in a manner consistent with the maximum extent practicable (MEP) standard. This approach includes:

- Selecting LID BMPs that integrate with both the opportunities and constraints of the project site and to attempt to address pollutants of concern and HCOCs,
- Developing innovative stormwater management configurations integrating "green" with "grey" infrastructure,
- Sizing BMPs opportunistically to provide stormwater pollution reduction to the MEP, accounting for the many competing considerations in right of ways.

Project Performance Criteria (continued)	
If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)	This project is considered to be a Green Streets project and according to Section 2.7 of the TGD states: *"Applicable Green Streets projects should select BMPs consistent with the Green Streets guidance. The performance criteria for applicable Green Streets projects do not require retention BMPs to be considered to the MEP before considering biotreatment and treatment control BMPs. A formal process of BMP prioritization and selection is not required for applicable Green Streets projects, however infiltration infeasibility criteria still apply; only feasible BMPs may be selected."* Infiltration is not feasible at this project location due to its underlying hydrologic soil being in group D. Refer to Figure XVI-2b in Attachment D. Additional treatment and volume reduction is infeasible due to right-of-way constraints adjacent to the project limits.
Calculate target LID design storm capture volume for Project (Section 7.II-2.4.3 from MWQMP).	The LID performance criteria include the following from the Model WQMP: The Design Capture Storm Depth is the 85th percentile, 24-hour storm depth that, when applied to the project site results in the Design Capture Volume (DCV). The table in Section IV.2 summarizes the DCV and water quality flow for each drainage management area.

	The DCV and water quality flows were calculated using a design storm depth of 0.85″ and intensity of 0.226 in/hr respectively. Refer to Capture Efficiency Nomograph in Attachment C. Biofiltration is implemented through the use of a Filterra unit to meet the LID requirements.

IV.2. Site Design And Drainage Plan

This project is located within the Newport Bay Watershed in the Santa Ana Regional Watershed Boundary. Refer to Attachment B for WQMP Exhibits.

Describe site design and drainage plan including

- A narrative of site design practices utilized or rationale for not using practices.
- A narrative of how site is designed to allow BMPs to be incorporated to the MEP.
- A table of DMA characteristics and list of LID BMPs proposed in each DMA.
- Reference to the PWQMP plot plan.
- A listing of GIS coordinates for LID BMPs (unless not required by local jurisdiction).

Refer to Section 2.4.2 in the TGD.

This project qualifies as an applicable USEPA "Green Streets Project" and will implement LID BMPs and WQMP requirements according to MEP standards. This allows treatment of comingled off-site runoff to compensate for the infeasibility and impracticability of treatment of all areas within the project.

Onsite retention system was ruled out due the infeasibility to infiltrate, and the insufficient water demand for potential harvest-and-use alternatives. Therefore, flow-based BMPs (Proprietary Biotreatment) was utilized to fit the site constraints. Roadway runoff would be directed to a Filterra unit upstream of the local storm drain catch basin, such that bypass from larger storm events will drain into the storm drain system without causing flooding.

The project area consists of 4 subareas that total 1.67 acres of disturbed project area. The subarea boundaries can be found on the WQMP Exhibit included in Attachment B. The subareas were divided to reflect the disturbed area within project limits respective to catch basin locations.

To calculate the DCV and treatment flow values, the post-construction disturbed area was analyzed for each subarea. The design flow rate calculation was completed following the Capture Efficiency Method outlined in Section III.3.3 of the OC TGD, refer to Attachment C. The tables below provide a summary of the design flow calculations which utilize 80% capture efficiency and a time of concentration of 10 minutes. Time of concentration per the longest flow path to the BMP was determined using the OC Hydrology Manual Nomograph in Attachment C.

Simple Method Runoff Coefficient for Flow
Runoff Rate (Q) = C * i * A
C = Runoff Coefficient (0.75 * Impervious Ratio + 0.15)
I = Design Intensity (inch/hour) = 0.226 in/hr
A = Tributary Area (acres)

Simple Method Runoff Coefficient for Volume
Runoff Volume (V) = C * d * A * 43560 sf/ac * 1/12 in/ft
C = Runoff Coefficient (0.75 * Impervious Ratio + 0.15)
d = Storm Depth = 0.85 in
A = Tributary Area (acres)

The Design Capture Volume (DCV) and Water Quality Design Flows (WQDF) were calculated using a design storm depth of 0.85" and intensity of 0.226 in/hr respectively.

Existing Condition

DMA ID	Area (sf)	Area (ac)	Imperviousness Ratio	Runoff Coefficient	DCV (ft^3)	Q80% (cfs)
1	20,489	0.47	0.48	0.51	739	0.054
2	12,575	0.29	0.94	0.85	759	0.056
3	19,546	0.45	0.82	0.77	1,063	0.078
4	19,984	0.46	0.86	0.80	1,128	0.083
Total	72,594	1.67			3,689	0.270

The required design capture volume in the existing condition is 3,689 ft^3 and the 80% capture efficiency flow rate is 0.270 cfs.

Proposed Condition

DMA ID	Area (sf)	Area (ac)	Imperviousness Ratio	Runoff Coefficient	DCV (ft^3)	Q80% (cfs)
1	20,489	0.47	0.79	0.74	1,077	0.079
2	12,575	0.29	1.00	0.90	802	0.059
3	19,546	0.45	1.00	0.90	1,246	0.091
4	19,984	0.46	1.00	0.90	1,274	0.093
Total	72,594	1.67			4,399	0.322

The required design capture volume in the proposed condition 4,399 ft^3 and the 80% capture efficiency flow rate is 0.322 cfs.

The project incorporates one proposed proprietary biotreatment Filterra unit (FTBSV0810), by Contech Engineered Solutions, to treat the entire disturbed project area. The proposed system is an offline flow-based system that provides water quality treatment by filtering runoff through the engineered soil media which removes pollutants before entering the public storm drain system. The system is designed such that larger design storm flows will bypass the proposed BMP and be captured in the downstream storm drain. Tributary to the BMP, the upstream drainage area is large enough to generate runoff equivalent to the WQDF for the disturbed project area.

Site constraints including limited right-of-way and existing utilities, reduce possible locations to provide BMPs as mentioned in Section II.1. Alternative BMPs that adhere to Green Streets projects were reviewed and determined infeasible. The placement of street trees would require additional right-of-way and excessive grading with possible retaining walls in areas to allow for ADA compliant sidewalks. Vegetated swales and curb extensions required similar right-of-way acquisition and introduced significant grading which was not originally identified in the site design for the project.

As stated above infiltration is infeasible due to HSG D soils, therefore bioretention and infiltration trenches could not be utilized. The underlying soils within the project area have low infiltration properties and within the roadway the soils will be compacted between 90% to 95% relative compaction. The combination of poor infiltration properties and underlying soil compaction provided rationale to not proceed with infiltration BMPs.

BMP TYPE	BMP LOCATION	BMP SIZE	TREATMENT Q_{DESIGN} (cfs)	TRIBUTARY TREATMENT Q (cfs) ROADWAY	FILTERRA TREATMENT $Q_{CAPACITY}$ (cfs) ROADWAY	TRIBUTARY AREA TO BMP (acres) ROADWAY
BMP-A Filterra FTBSV 0810	NORTHEAST CORNER OF INTERSECTION @ JERONIMO ROAD N:2181437.28 E:6117118.00	8' x 10'	0.32	0.79	0.32	3.53
		TOTAL	**0.32**	**0.79**	**0.32**	**3.53**

A Filterra unit, is proposed adjacent to the catch basin located at the northeast corner of the project intersection. This catch basin has a tributary drainage area of 3.53 ac, which exceeds the project area.

IV.3 Lid Bmp Selection And Project Conformance Analysis

IV.3.1 Green Street / Linear Project BMPs

Name	Included?
Street trees (canopy interception)	☐
Stormwater Curb Extensions / Stormwater Planters	☐
Bioretention Areas	☐
Permeable Pavement	☐
Permeable Friction Course Overlays	☐
Vegetated Swales (compost amended were possible)	☐
Filter strips (amended road shoulder)	☐
Proprietary Biotreatment	☒
Infiltration Trench	☐
Cartridge Media Filters	☐
WSDOT Media Filter Drains	☐
Other: United Stormwater Connector Pipe Screen (Certified Full Trash Capture Device)	☒
Other:	☐
Other:	☐

The performance criteria for applicable Green Streets projects do not require retention BMPs to be considered to the MEP before considering biotreatment and treatment control BMPs. A formal process of BMP prioritization and selection is not required for applicable Green Streets projects. All BMPs were considered per Table 2.8 (Applicable BMPs for Green Streets projects) of the OC TGD.

The project site has limited right-of-way which prohibits the installation of street trees, the use of curb extensions, planters, bioretention areas, swales, filter strips, and infiltration trenches. Permeable pavement and permeable friction course overlays in areas of high traffic and loading fall outside of its recommended use and is deemed infeasible for the project location. Flow-based proprietary biofiltration devices will treat the water quality flow per the requirements set in the 2013 OC TGD.

This project will incorporate BMPs sized to treat the water quality flow as determined with an intensity of 0.226 in/hr using an 80% average annual capture efficiency and a conservative time of concentration of 10 minutes. The water quality flow was calculated to be 0.32 cfs. Refer to Section IV.2 for calculations.

The Filterra unit was sized using the sizing tool provided by Contech Engineered Solutions and is shown the standard detail in Attachment C. The Filterra unit will be treating flow from the project area as well as offset area. The offset area consists of asphalt paving and patches of landscaping and the total acreage is listed in Section IV.2. Drainage areas that do not have a respective BMP for its inlet will equivalently treated by the Filterra provided.

United Stormwater Connector Pipe Screen (Certified Full Trash Capture Device) will be added to onsite catch basins to satisfy the trash amendment requirements.

IV.3.3 Non-structural Source Control BMPs

Non-Structural Source Control BMPs

Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N3	Right-of-Way Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N11	Right-of-Way Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N14	Right-of-Way Catch Basin Inspection	☒	☐	
N15	Street Sweeping	☒	☐	

Non-Structural BMPs

Right-of-Way Landscape Management

City of Lake Forest will perform monthly and as needed maintenance that will be consistent with the County Water Conservation Resolution or the City of Lake Forest equivalent, and fertilizer and pesticide usage will be consistent with County Management Guidelines for Use of Fertilizers (DAMP Section 5.5). See also, efficient irrigation systems under structural controls.

BMP Maintenance

City of Lake Forest will be responsible for all BMPs.

Right-of-Way Litter Control

City of Lake Forest will conduct litter control on a weekly basis.

Employee Training
Environmental awareness education materials will be provided to the employees of the City of Lake Forest. Training courses on storm water pollution will be given to employees annually.

Right-of-Way Catch Basin Inspection

City of Lake Forest will conduct inspections and clean out catch basins annually, and as needed.

Street Sweeping

City of Lake Forest will street sweep and maintain streets to be free of debris monthly, and as needed.

IV.3.4 Structural Source Control BMPs

Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**If not applicable, state brief reason**
		Included	**Not Applicable**	
S1	Provide storm drain system stenciling and signage	☒	☐	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	

Storm Drain Stenciling and Signage

The phrase "No Dumping – Drains to Ocean" shall be stenciled on catch basins in maintenance areas to alert the public and employees of the City of Lake Forest to the destination of pollutants discharged into the storm drain system. The locations of these catch basins are shown on the attached Site Plan (Attachment B) located in Section VI of this PWQMP. Inspection of stencil legibility will be performed annually, and as needed. Re-stenciling will be performed as necessary, but no less than once every 5 years.

Efficient Irrigation Systems & Landscape Design, Water Conservation, Smart Controller and Source Control

Irrigation systems shall be installed and programmed to apply proper volume of water and avoid excess runoff. A landscape plan shall be implemented to verify the following at a minimum:

- Water sensors are functioning properly (make adjustments as necessary)
- Irrigation heads are adjusted properly to eliminate over-spray of hardscape areas;
- Irrigation timing and cycle lengths are adjusted in accordance with water demands, time of year, weather and day or nighttime temperatures; and
- Plants with similar water requirements are grouped together.

The timing and application methods of irrigation water in common areas will minimize the runoff of excess irrigation water into the storm water conveyance system. Inspections, replacements, repairs, and adjustments will be performed bi-weekly by the City of Lake Forest.

IV.3.5 Treatment Control BMPs

Trash Full Capture Systems

The State Water Resources Control Board adopted statewide Trash Provisions to address impact trash has on beneficial uses of surface waters. The Trash Provisions establish a statewide water quality objective for trash and the prohibition of trash discharge to surface waters of the State. Throughout the state, trash is generated on land and transported to surface water through municipal storm drain systems. Local discharges from municipal storm drain systems are regulated through the Orange County MS4 Permit through the Santa Ana Regional Water Quality Control Board. The Trash Provisions apply to all Phase 1 and Phase II permittees under the NPDES MS4 permit.

Connector Pipe Screen Units

A connector pipe screen unit shall be installed to prevent trash from entering the storm drain system and discharged to surface waters of the State. The unit is composed of a metal screen assembly that is installed inside of a catch basin, in front the outlet pipe. The location of the catch basin with these units are shown on the attached PWQMP Site Plan located in Attachment B of this PWQMP.

IV.4 Alternative Compliance Plan (Not Applicable)

Per the OC TGD Section 2.7.4, "*Applicable Green Streets projects are not required to meet alternative compliance options if stormwater management controls described in this section, or equivalent, are installed in a manner consistent with the MEP standard.*
Alternative compliance programs should be considered for applicable Green Streets projects if on-site green infrastructure approaches cannot practicably treat the design volume. The primary alternative compliance option for applicable Green Streets projects is the completion of off-site mitigation projects. The proponent would implement a project to reduce stormwater pollution for other portions of roadway or similar land uses to the project in the same hydrologic unit, ideally as close to the project as possible and discharging to the same outfall."

Section V Inspection/Maintenance Responsibility for BMPs

Refer to Attachment F for Operations and Maintenance Plan.

BMP Inspection/Maintenance			
BMP	**Reponsible Department / Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
Filterra Biofiltration System	City of Lake Forest	Inspect and clean out filtration system. Remove any debris and trash and replace mulch before the start of the rainy season. Verify infiltration rate of biofiltration media and amend/replace soil material as necessary.	Annually/Ongoing
Right-of-Way Litter Control	City of Lake Forest	Inspection and Control Litter.	Weekly
Employee Training	City of Lake Forest	Training courses for new employees on storm water pollution.	Annually, and with new hire trainings
Common Area Catch Basin Inspection	City of Lake Forest	Inspection and cleaning of drainage facilities.	Annually, and as needed

BMP Inspection/Maintenance			
BMP	**Reponsible Department/ Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
Street Sweeping	City of Lake Forest	Sweep streets and maintain free of debris.	Monthly, and as needed
Catch Basin Stencilling and Signage	City of Lake Forest	Inspect legibility of markers and stencils for fading and vandalism. Re-stencil as necessary, but no less than once every 5 years.	Annually, and as needed
Efficient Irrigation & Landscape Design	City of Lake Forest	Inspection of sprinkler heads and irrigation timing cycle, and replacing, repairing, or adjusting as necessary.	Bi-weekly
Right-of-Way Landscape Management	City of Lake Forest	Maintain Right-of-Way Landscape.	Monthly, and as needed
United Stormwater Connector Pipe Screen (Certified Full Trash Capture Device)	City of Lake Forest	Clear screen and remove accumulated trash, sediment, and debris.	Monthly, and as needed

Section VI Site Plan and Drainage Plan

VI.1 Site Plan And Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural BMP locations
- Drainage delineations and flow information
- Drainage connections
- BMP details

VI.2 Submittal and Recordation of Water Quality Management Plan

Following approval of the Final Project-Specific WQMP, three copies of the approved WQMP (including BMP Exhibit, Operations and Maintenance (O&M) Plan, and Appendices) shall be submitted. In addition, these documents shall be submitted in a PDF format.

Section VII Educational Materials

Education Materials			
Residential Material (http://www.ocwatersheds.com)	**Check If Applicable**	**Business Material (http://www.ocwatersheds.com)**	**Check If Applicable**
The Ocean Begins at Your Front Door	☐	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☐	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☐	Proper Maintenance Practices for Your Business	☐
Household Tips	☐	**Other Material**	**Check If Attached**
Proper Disposal of Household Hazardous Waste	☐		
Recycle at Your Local Used Oil Collection Center (Central County)	☐	SD-13 Storm Drain Signage	☒
Recycle at Your Local Used Oil Collection Center (South County)	☐	SC-70 Road and Street Maintenance	☒
Tips for Maintaining a Septic Tank System	☐	SC-74 Drainage System Maintenance	☒
Responsible Pest Control	☐		☐
Sewer Spill	☐		☐
Tips for the Home Improvement Projects	☐		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☐		☐
Tips for Pet Care	☐		☐
Tips for Pool Maintenance	☐		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☐		☐
Tips for Projects Using Paint	☐		☐

ATTACHMENT A

Educational Materials

Storm Drain Signage SD-13

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ✓ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

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

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING –

CASQA California Stormwater Quality Association

DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Road and Street Maintenance SC-70

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Description

Streets, roads, and highways are significant sources of pollutants in stormwater discharges, and operation and maintenance (O&M) practices, if not conducted properly, can contribute to the problem. Stormwater pollution from roadway and bridge maintenance should be addressed on a site-specific basis. Use of the procedures outlined below, that address street sweeping and repair, bridge and structure maintenance, and unpaved roads will reduce pollutants in stormwater.

Approach

Pollution Prevention

- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal)
- Recycle paint and other materials whenever possible.
- Enlist the help of citizens to keep yard waste, used oil, and other wastes out of the gutter.

Suggested Protocols

Street Sweeping and Cleaning

- Maintain a consistent sweeping schedule. Provide minimum monthly sweeping of curbed streets.
- Perform street cleaning during dry weather if possible.

- Avoid wet cleaning or flushing of street, and utilize dry methods where possible.
- Consider increasing sweeping frequency based on factors such as traffic volume, land use, field observations of sediment and trash accumulation, proximity to water courses, etc. For example:
  - Increase the sweeping frequency for streets with high pollutant loadings, especially in high traffic and industrial areas.
  - Increase the sweeping frequency just before the wet season to remove sediments accumulated during the summer.
  - Increase the sweeping frequency for streets in special problem areas such as special events, high litter or erosion zones.
- Maintain cleaning equipment in good working condition and purchase replacement equipment as needed. Old sweepers should be replaced with new technologically advanced sweepers (preferably regenerative air sweepers) that maximize pollutant removal.
- Operate sweepers at manufacturer requested optimal speed levels to increase effectiveness.
- To increase sweeping effectiveness consider the following:
  - Institute a parking policy to restrict parking in problematic areas during periods of street sweeping.
  - Post permanent street sweeping signs in problematic areas; use temporary signs if installation of permanent signs is not possible.
  - Develop and distribute flyers notifying residents of street sweeping schedules.
- Regularly inspect vehicles and equipment for leaks, and repair immediately.
- If available use vacuum or regenerative air sweepers in the high sediment and trash areas (typically industrial/commercial).
- Keep accurate logs of the number of curb-miles swept and the amount of waste collected.
- Dispose of street sweeping debris and dirt at a landfill.
- Do not store swept material along the side of the street or near a storm drain inlet.
- Keep debris storage to a minimum during the wet season or make sure debris piles are contained (e.g. by berming the area) or covered (e.g. with tarps or permanent covers).

Street Repair and Maintenance

Pavement marking

- Schedule pavement marking activities for dry weather.

- Develop paint handling procedures for proper use, storage, and disposal of paints.
- Transfer and load paint and hot thermoplastic away from storm drain inlets.
- Provide drop cloths and drip pans in paint mixing areas.
- Properly maintain application equipment.
- Street sweep thermoplastic grindings. Yellow thermoplastic grindings may require special handling as they may contain lead.
- Paints containing lead or tributyltin are considered a hazardous waste and must be disposed of properly.
- Use water based paints whenever possible. If using water based paints, clean the application equipment in a sink that is connected to the sanitary sewer.
- Properly store leftover paints if they are to be kept for the next job, or dispose of properly.

Concrete installation and repair

- Schedule asphalt and concrete activities for dry weather.
- Take measures to protect any nearby storm drain inlets and adjacent watercourses, prior to breaking up asphalt or concrete (e.g. place san bags around inlets or work areas).
- Limit the amount of fresh concrete or cement mortar mixed, mix only what is needed for the job.
- Store concrete materials under cover, away from drainage areas. Secure bags of cement after they are open. Be sure to keep wind-blown cement powder away from streets, gutters, storm drains, rainfall, and runoff.
- Return leftover materials to the transit mixer. Dispose of small amounts of hardened excess concrete, grout, and mortar in the trash.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- When making saw cuts in pavement, use as little water as possible and perform during dry weather. Cover each storm drain inlet completely with filter fabric or plastic during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains or evaporates, shovel or vacuum the slurry residue from the pavement or gutter and remove from site. Alternatively, a small onsite vacuum may be used to pick up the slurry as this will prohibit slurry from reaching storm drain inlets.
- Wash concrete trucks off site or in designated areas on site designed to preclude discharge of wash water to drainage system.

Patching, resurfacing, and surface sealing

- Schedule patching, resurfacing and surface sealing for dry weather.
- Stockpile materials away from streets, gutter areas, storm drain inlets or watercourses. During wet weather, cover stockpiles with plastic tarps or berm around them if necessary to prevent transport of materials in runoff.
- Pre-heat, transfer or load hot bituminous material away from drainage systems or watercourses.
- Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and maintenance holes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from covered maintenance holes and storm drain inlets when the job is complete.
- Prevent excess material from exposed aggregate concrete or similar treatments from entering streets or storm drain inlets. Designate an area for clean up and proper disposal of excess materials.
- Use only as much water as necessary for dust control, to avoid runoff.
- Sweep, never hose down streets to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Equipment cleaning maintenance and storage

- Inspect equipment daily and repair any leaks. Place drip pans or absorbent materials under heavy equipment when not in use.
- Perform major equipment repairs at the corporation yard, when practical.
- If refueling or repairing vehicles and equipment must be done onsite, use a location away from storm drain inlets and watercourses.
- Clean equipment including sprayers, sprayer paint supply lines, patch and paving equipment, and mud jacking equipment at the end of each day. Clean in a sink or other area (e.g. vehicle wash area) that is connected to the sanitary sewer.

Bridge and Structure Maintenance

Paint and Paint Removal

- Transport paint and materials to and from job sites in containers with secure lids and tied down to the transport vehicle.
- Do not transfer or load paint near storm drain inlets or watercourses.

- Test and inspect spray equipment prior to starting to paint. Tighten all hoses and connections and do not overfill paint container.
- Plug nearby storm drain inlets prior to starting painting where there is significant risk of a spill reaching storm drains. Remove plugs when job is completed.
- If sand blasting is used to remove paint, cover nearby storm drain inlets prior to starting work.
- Perform work on a maintenance traveler or platform, or use suspended netting or tarps to capture paint, rust, paint removing agents, or other materials, to prevent discharge of materials to surface waters if the bridge crosses a watercourse. If sanding, use a sander with a vacuum filter bag.
- Capture all clean-up water, and dispose of properly.
- Recycle paint when possible (e.g. paint may be used for graffiti removal activities). Dispose of unused paint at an appropriate household hazardous waste facility.

Graffiti Removal

- Schedule graffiti removal activities for dry weather.
- Protect nearby storm drain inlets prior to removing graffiti from walls, signs, sidewalks, or other structures needing graffiti abatement. Clean up afterwards by sweeping or vacuuming thoroughly, and/or by using absorbent and properly disposing of the absorbent.
- When graffiti is removed by painting over, implement the procedures under Painting and Paint Removal above.
- Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a landscaped or dirt area. If such an area is not available, filter runoff through an appropriate filtering device (e.g. filter fabric) to keep sand, particles, and debris out of storm drains.
- If a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound), plug nearby storm drains and vacuum/pump wash water to the sanitary sewer.
- Consider using a waterless and non-toxic chemical cleaning method for graffiti removal (e.g. gels or spray compounds).

Repair Work

- Prevent concrete, steel, wood, metal parts, tools, or other work materials from entering storm drains or watercourses.
- Thoroughly clean up the job site when the repair work is completed.
- When cleaning guardrails or fences follow the appropriate surface cleaning methods (depending on the type of surface) outlined in SC-71 Plaza & Sidewalk Cleaning fact sheet.

- If painting is conducted, follow the painting and paint removal procedures above.
- If graffiti removal is conducted, follow the graffiti removal procedures above.
- If construction takes place, see the Construction Activity BMP Handbook.
- Recycle materials whenever possible.

Unpaved Roads and Trails

- Stabilize exposed soil areas to prevent soil from eroding during rain events. This is particularly important on steep slopes.
- For roadside areas with exposed soils, the most cost-effective choice is to vegetate the area, preferably with a mulch or binder that will hold the soils in place while the vegetation is establishing. Native vegetation should be used if possible.
- If vegetation cannot be established immediately, apply temporary erosion control mats/blankets; a comma straw, or gravel as appropriate.
- If sediment is already eroded and mobilized in roadside areas, temporary controls should be installed. These may include: sediment control fences, fabric-covered triangular dikes, gravel-filled burlap bags, biobags, or hay bales staked in place.

Non-Stormwater Discharges

Field crews should be aware of non-stormwater discharges as part of their ongoing street maintenance efforts.

- Refer to SC-10 Non-Stormwater Discharges
- Identify location, time and estimated quantity of discharges.
- Notify appropriate personnel.

Training

- Train employees regarding proper street sweeping operation and street repair and maintenance.
- Instruct employees and subcontractors to ensure that measures to reduce the stormwater impacts of roadway/bridge maintenance are being followed.
- Require engineering staff and/or consulting A/E firms to address stormwater quality in new bridge designs or existing bridge retrofits.
- Use a training log or similar method to document training.
- Train employees on proper spill containment and clean up, and in identifying non-stormwater discharges.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Densely populated areas or heavily used streets may require parking regulations to clear streets for cleaning.
- No currently available conventional sweeper is effective at removing oil and grease. Mechanical sweepers are not effective at removing finer sediments.
- Limitations may arise in the location of new bridges. The availability and cost of land and other economic and political factors may dictate where the placement of a new bridge will occur. Better design of the bridge to control runoff is required if it is being placed near sensitive waters.

Requirements

Costs

- The maintenance of local roads and bridges is already a consideration of most community public works or transportation departments. Therefore, the cost of pollutant reducing management practices will involve the training and equipment required to implement these new practices.
- The largest expenditures for street sweeping programs are in staffing and equipment. The capital cost for a conventional street sweeper is between $60,000 and $120,000. Newer technologies might have prices approaching $180,000. The average useful life of a conventional sweeper is about four years, and programs must budget for equipment replacement. Sweeping frequencies will determine equipment life, so programs that sweep more often should expect to have a higher cost of replacement.
- A street sweeping program may require the following.
  - Sweeper operators, maintenance, supervisory, and administrative personnel are required.
  - Traffic control officers may be required to enforce parking restrictions.
  - Skillful design of cleaning routes is required for program to be productive.
  - Arrangements must be made for disposal of collected wastes.

- If investing in newer technologies, training for operators must be included in operation and maintenance budgets. Costs for public education are small, and mostly deal with the need to obey parking restrictions and litter control. Parking tickets are an effective reminder to obey parking rules, as well as being a source of revenue.

Maintenance

- Not applicable

Supplemental Information

Further Detail of the BMP

Street sweeping

There are advantages and disadvantages to the two common types of sweepers. The best choice depends on your specific conditions. Many communities find it useful to have a compliment of both types in their fleet.

Mechanical Broom Sweepers - More effective at picking up large debris and cleaning wet streets. Less costly to purchase and operate. Create more airborne dust.

Vacuum Sweepers - More effective at removing fine particles and associated heavy metals. Ineffective at cleaning wet streets. Noisier than mechanical broom sweepers which may restrict areas or times of operation. May require an advance vehicle to remove large debris.

Street Flushers - Not affected by biggest interference to cleaning, parked cars. May remove finer sediments, moving them toward the gutter and stormwater inlets. For this reason, flushing fell out of favor and is now used primarily after sweeping. Flushing may be effective for combined sewer systems. Presently street flushing is not allowed under most NPDES permits.

Cross-Media Transfer of Pollutants

The California Air Resources Board (ARB) has established state ambient air quality standards including a standard for respirable particulate matter (less than or equal to 10 microns in diameter, symbolized as PM10). In the effort to sweep up finer sediments to remove attached heavy metals, municipalities should be aware that fine dust, that cannot be captured by the sweeping equipment and becomes airborne, could lead to issues of worker and public safety.

Bridges

Bridges that carry vehicular traffic generate some of the more direct discharges of runoff to surface waters. Bridge scupper drains cause a direct discharge of stormwater into receiving waters and have been shown to carry relatively high concentrations of pollutants. Bridge maintenance also generates wastes that may be either directly deposited to the water below or carried to the receiving water by stormwater. The following steps will help reduce the stormwater impacts of bridge maintenance:

- Site new bridges so that significant adverse impacts to wetlands, sensitive areas, critical habitat, and riparian vegetation are minimized.

- Design new bridges to avoid the use of scupper drains and route runoff to land for treatment control. Existing scupper drains should be cleaned on a regular basis to avoid sediment/debris accumulation.
- Reduce the discharge of pollutants to surface waters during maintenance by using suspended traps, vacuums, or booms in the water to capture paint, rust, and paint removing agents. Many of these wastes may be hazardous. Properly dispose of this waste by referring to CA21 (Hazardous Waste Management) in the Construction Handbook.
- Train employees and subcontractors to reduce the discharge of wastes during bridge maintenance.

De-icing

- Do not over-apply deicing salt and sand, and routinely calibrate spreaders.
- Near reservoirs, restrict the application of deicing salt and redirect any runoff away from reservoirs.
- Consider using alternative deicing agents (less toxic, biodegradable, etc.).

References and Resources

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Orange County Stormwater Program
http://www.ocwatersheds.com/stormwater/swp_introduction.asp

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 2001. Fresh Concrete and Mortar Application Best Management Practices for the Construction Industry. June.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 2001. Roadwork and Paving Best Management Practices for the Construction Industry. June.

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Roadway and Bridge Maintenance. On-line
http://www.epa.gov/npdes/menuofbmps/poll_13.htm

Drainage System Maintenance SC-74

Photo Credit: Geoff Brosseau

Objectives

- Contain
- Educate
- Reduce/Minimize

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff that may contain certain pollutants. Maintaining catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis will remove pollutants, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Approach

Suggested Protocols

Catch Basins/Inlet Structures

- Municipal staff should regularly inspect facilities to ensure the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC-75 Waste Handling and Disposal).
- Clean catch basins, storm drain inlets, and other conveyance structures in high pollutant load areas just before the wet season to remove sediments and debris accumulated during the summer.

- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Record the amount of waste collected.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed of. Do not dewater near a storm drain or stream.
- Except for small communities with relatively few catch basins that may be cleaned manually, most municipalities will require mechanical cleaners such as eductors, vacuums, or bucket loaders.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect flushed effluent and pump to the sanitary sewer for treatment.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge from cleaning a storm drain pump station or other facility to reach the storm drain system.
- Conduct quarterly routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.
- Sample collected sediments to determine if landfill disposal is possible, or illegal discharges in the watershed are occurring.

Open Channel

- Consider modification of storm channel characteristics to improve channel hydraulics, to increase pollutant removals, and to enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies

(SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS

Illicit Connections and Discharges

- During routine maintenance of conveyance system and drainage structures field staff should look for evidence of illegal discharges or illicit connections:
  - Is there evidence of spills such as paints, discoloring, etc.
  - Are there any odors associated with the drainage system
  - Record locations of apparent illegal discharges/illicit connections
  - Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of up gradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
  - Once the origin of flow is established, require illicit discharger to eliminate the discharge.
- Stencil storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

- The State Department of Fish and Game has a hotline for reporting violations called Cal TIP (1-800-952-5400). The phone number may be used to report any violation of a Fish and Game code (illegal dumping, poaching, etc.).
- The California Department of Toxic Substances Control's Waste Alert Hotline, 1-800-69TOXIC, can be used to report hazardous waste violations.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Only properly trained individuals are allowed to handle hazardous materials/wastes.
- Train municipal employees from all departments (public works, utilities, street cleaning, parks and recreation, industrial waste inspection, hazardous waste inspection, sewer maintenance) to recognize and report illegal dumping.
- Train municipal employees and educate businesses, contractors, and the general public in proper and consistent methods for disposal.
- Train municipal staff regarding non-stormwater discharges (See SC-10 Non-Stormwater Discharges).

Spill Response and Prevention

- Refer to SC-11, Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Cleanup activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.
- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and disposal of flushed effluent to sanitary sewer may be prohibited in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Municipal codes should include sections prohibiting the discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.
- Private property access rights may be needed to track illegal discharges up gradient.

- Requirements of municipal ordinance authority for suspected source verification testing for illicit connections necessary for guaranteed rights of entry.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget. A careful study of cleaning effectiveness should be undertaken before increased cleaning is implemented. Catch basin cleaning costs are less expensive if vacuum street sweepers are available; cleaning catch basins manually can cost approximately twice as much as cleaning the basins with a vacuum attached to a sweeper.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary. Encouraging reporting of illicit discharges by employees can offset costs by saving expense on inspectors and directing resources more efficiently. Some programs have used funds available from "environmental fees" or special assessment districts to fund their illicit connection elimination programs.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.

- Identifying illicit discharges requires teams of at least two people (volunteers can be used), plus administrative personnel, depending on the complexity of the storm sewer system.

- Arrangements must be made for proper disposal of collected wastes.

- Requires technical staff to detect and investigate illegal dumping violations, and to coordinate public education.

Supplemental Information

Further Detail of the BMP

Storm Drain flushing

Sanitary sewer flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in sanitary sewer systems. The same principles that make sanitary sewer flushing effective can be used to flush storm drains. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as to an open channel, to another point where flushing will be initiated, or over to the sanitary sewer and on to the treatment facilities, thus preventing re-suspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. The deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to

cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce the impacts of stormwater pollution, a second inflatable device, placed well downstream, may be used to re-collect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to re-collect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75 percent for organics and 55-65 percent for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm drain flushing.

Flow Management

Flow management has been one of the principal motivations for designing urban stream corridors in the past. Such needs may or may not be compatible with the stormwater quality goals in the stream corridor.

Downstream flood peaks can be suppressed by reducing through flow velocity. This can be accomplished by reducing gradient with grade control structures or increasing roughness with boulders, dense vegetation, or complex banks forms. Reducing velocity correspondingly increases flood height, so all such measures have a natural association with floodplain open space. Flood elevations laterally adjacent to the stream can be lowered by increasing through flow velocity.

However, increasing velocity increases flooding downstream and inherently conflicts with channel stability and human safety. Where topography permits, another way to lower flood elevation is to lower the level of the floodway with drop structures into a large but subtly excavated bowl where flood flows we allowed to spread out.

Stream Corridor Planning

Urban streams receive and convey stormwater flows from developed or developing watersheds. Planning of stream corridors thus interacts with urban stormwater management programs. If local programs are intended to control or protect downstream environments by managing flows delivered to the channels, then it is logical that such programs should be supplemented by management of the materials, forms, and uses of the downstream riparian corridor. Any proposal for steam alteration or management should be investigated for its potential flow and stability effects on upstream, downstream, and laterally adjacent areas. The timing and rate of flow from various tributaries can combine in complex ways to alter flood hazards. Each section of channel is unique, influenced by its own distribution of roughness elements, management activities, and stream responses.

Flexibility to adapt to stream features and behaviors as they evolve must be included in stream reclamation planning. The amenity and ecology of streams may be enhanced through the landscape design options of 1) corridor reservation, 2) bank treatment, 3) geomorphic restoration, and 4) grade control.

Corridor reservation - Reserving stream corridors and valleys to accommodate natural stream meandering, aggradation, degradation, and over bank flows allows streams to find their own form and generate less ongoing erosion. In California, open stream corridors in recent urban developments have produced recreational open space, irrigation of streamside plantings, and the aesthetic amenity of flowing water.

Bank treatment - The use of armoring, vegetative cover, and flow deflection may be used to influence a channel's form, stability, and biotic habitat. To prevent bank erosion, armoring can be done with rigid construction materials, such as concrete, masonry, wood planks and logs, riprap, and gabions. Concrete linings have been criticized because of their lack of provision of biotic habitat. In contrast, riprap and gabions make relatively porous and flexible linings. Boulders, placed in the bed reduce velocity and erosive power.

Riparian vegetation can stabilize the banks of streams that are at or near a condition of equilibrium. Binding networks of roots increase bank shear strength. During flood flows, resilient vegetation is forced into erosion-inhibiting mats. The roughness of vegetation leads to lower velocity, further reducing erosive effects. Structural flow deflection can protect banks from erosion or alter fish habitat. By concentrating flow, a deflector causes a pool to be scoured in the bed.

Geomorphic restoration – Restoration refers to alteration of disturbed streams so their form and behavior emulate those of undisturbed streams. Natural meanders are retained, with grading to gentle slopes on the inside of curves to allow point bars and riffle-pool sequences to develop. Trees are retained to provide scenic quality, biotic productivity, and roots for bank stabilization, supplemented by plantings where necessary.

A restorative approach can be successful where the stream is already approaching equilibrium. However, if upstream urbanization continues new flow regimes will be generated that could disrupt the equilibrium of the treated system.

Grade Control - A grade control structure is a level shelf of a permanent material, such as stone, masonry, or concrete, over which stream water flows. A grade control structure is called a sill, weir, or drop structure, depending on the relation of its invert elevation to upstream and downstream channels.

A sill is installed at the preexisting channel bed elevation to prevent upstream migration of nick points. It establishes a firm base level below which the upstream channel can not erode.

A weir or check dam is installed with invert above the preexisting bed elevation. A weir raises the local base level of the stream and causes aggradation upstream. The gradient, velocity, and erosive potential of the stream channel are reduced. A drop structure lowers the downstream invert below its preexisting elevation, reducing downstream gradient and velocity. Weirs and drop structure control erosion by dissipating energy and reducing slope velocity.

When carefully applied, grade control structures can be highly versatile in establishing human and environmental benefits in stabilized channels. To be successful, application of grade control structures should be guided by analysis of the stream system both upstream and downstream from the area to he reclaimed.

Examples

The California Department of Water Resources began the Urban Stream Restoration Program in 1985. The program provides grant funds to municipalities and community groups to implement stream restoration projects. The projects reduce damages from streambank aid watershed instability arid floods while restoring streams' aesthetic, recreational, and fish and wildlife values.

In Buena Vista Park, upper floodway slopes are gentle and grassed to achieve continuity of usable park land across the channel of small boulders at the base of the slopes.

The San Diego River is a large, vegetative lined channel, which was planted in a variety of species to support riparian wildlife while stabilizing the steep banks of the floodway.

References and Resources

Ferguson, B.K. 1991. Urban Stream Reclamation, p. 324-322, Journal of Soil and Water Conservation.

Los Angeles County Stormwater Quality. Public Agency Activities Model Program. On-line: http://ladpw.org/wmd/npdes/public_TC.cfm

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Orange County Stormwater Program
http://www.ocwatersheds.com/StormWater/swp_introduction.asp

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP) Municipal Activities Model Program Guidance. 2001. Project Clean Water. November.

United States Environmental Protection Agency (USEPA). 1999. Stormwater Management Fact Sheet Non-stormwater Discharges to Storm Sewers. EPA 832-F-99-022. Office of Water, Washington, D.C. September.

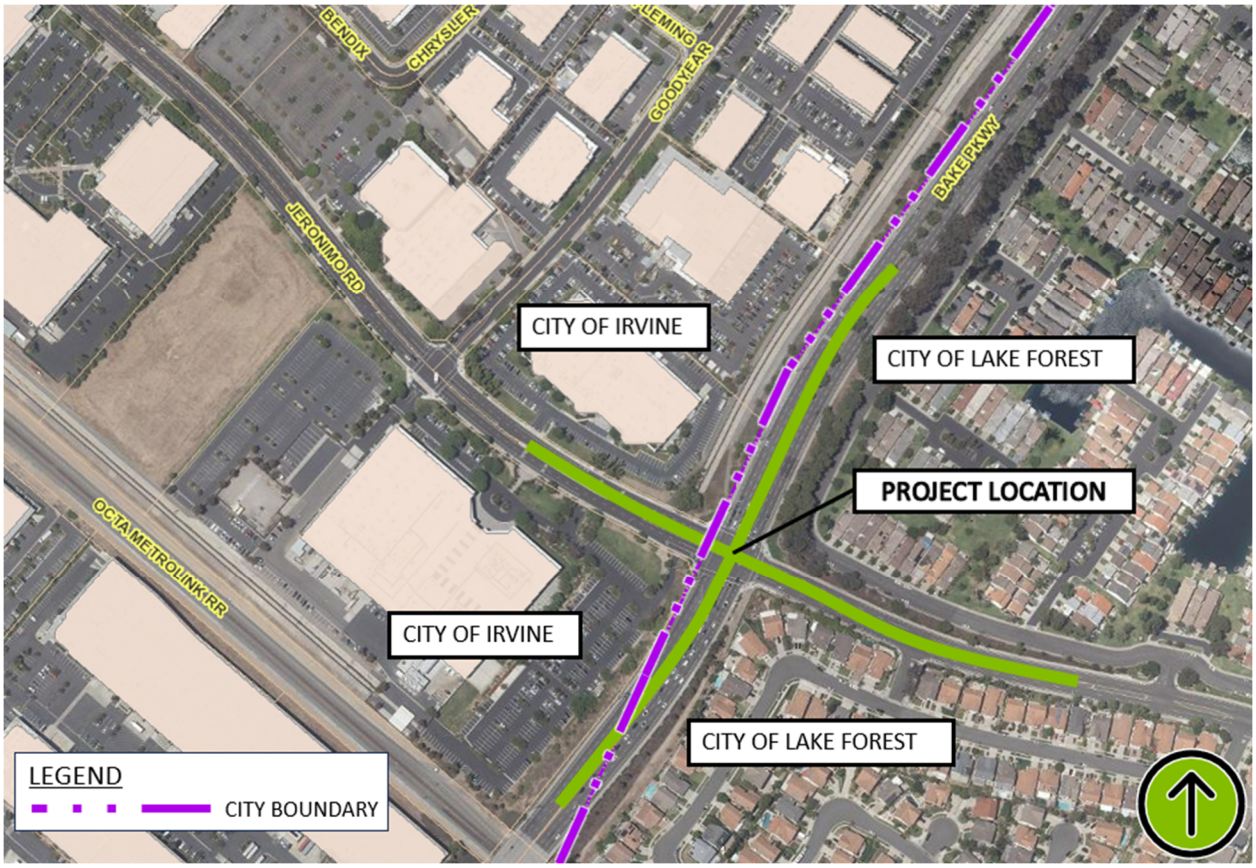
United States Environmental Protection Agency (USEPA). 1999. Stormwater O&M Fact Sheet Catch Basin Cleaning. EPA 832-F-99-011. Office of Water, Washington, D.C. September.

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Illegal Dumping Control. On line: http://www.epa.gov/npdes/menuofbmps/poll_7.htm

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line: http://www.epa.gov/npdes/menuofbmps/poll_16.htm

ATTACHMENT B

Vicinity Map, WQMP Exhibits, Street Improvement Plans



Project Vicinity Map

LEGEND

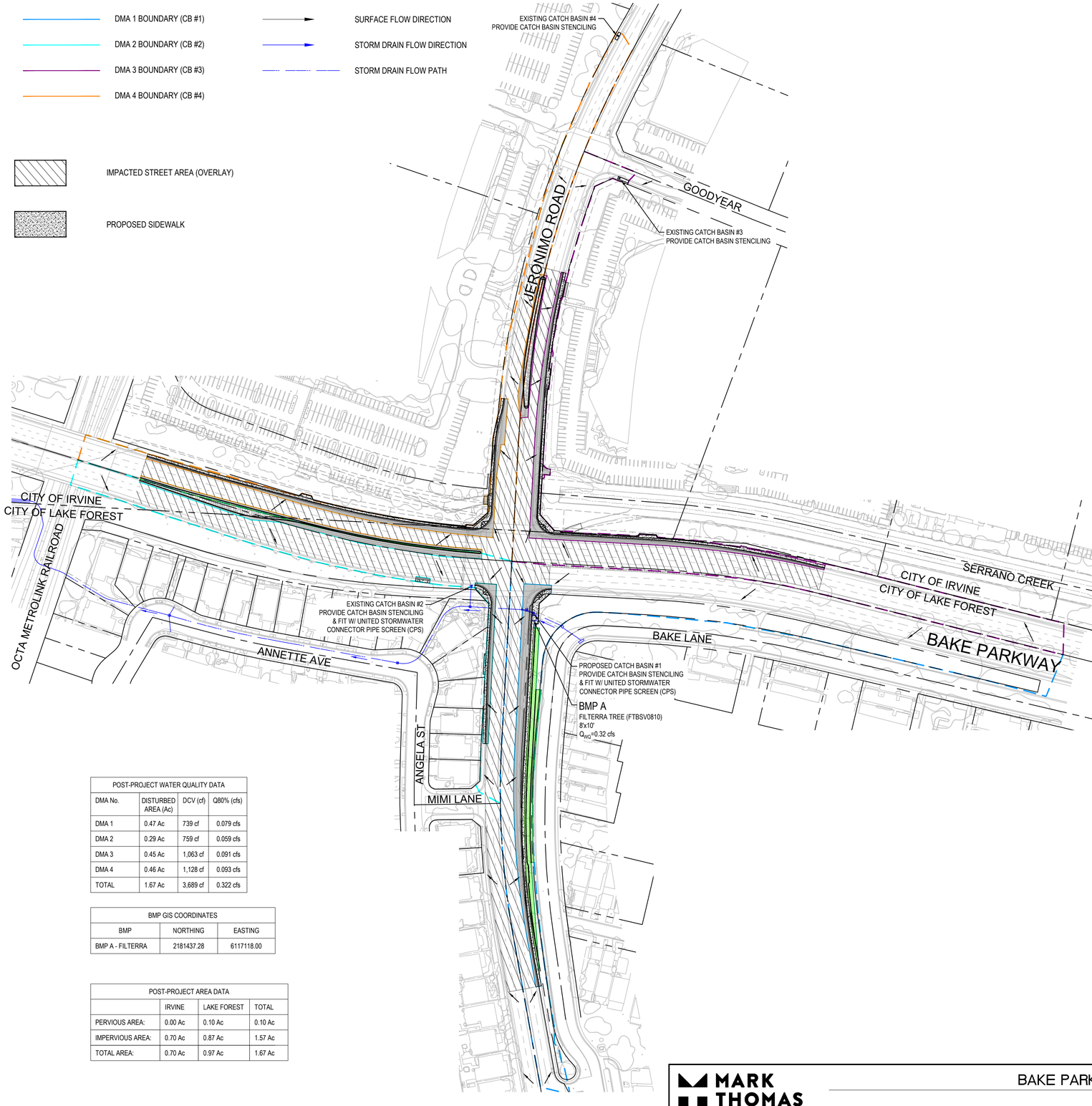
- SUBAREA 1 DRAINAGE BOUNDARY
- SUBAREA 2 DRAINAGE BOUNDARY
- SUBAREA 3 DRAINAGE BOUNDARY
- SUBAREA 4 DRAINAGE BOUNDARY

- DMA 1 BOUNDARY (CB #1)
- DMA 2 BOUNDARY (CB #2)
- DMA 3 BOUNDARY (CB #3)
- DMA 4 BOUNDARY (CB #4)

- SURFACE FLOW DIRECTION
- STORM DRAIN FLOW DIRECTION
- STORM DRAIN FLOW PATH

NOTE: DMA BOUNDARY REPRESENTS DISTURBED PROJECT AREA WITHIN ITS RESPECTIVE SUBAREA BOUNDARY. SUBAREA BOUNDARY REPRESENTS DRAINAGE TRIBUTARY AREA.

- PROPOSED LANDSCAPE AREA
- PROPOSED PAVEMENT
- PROPOSED MEDIAN
- IMPACTED STREET AREA (OVERLAY)
- PROPOSED SIDEWALK



POST-PROJECT WATER QUALITY DATA			
DMA No.	DISTURBED AREA (Ac)	DCV (cf)	Q80% (cfs)
DMA 1	0.47 Ac	739 cf	0.079 cfs
DMA 2	0.29 Ac	759 cf	0.059 cfs
DMA 3	0.45 Ac	1,063 cf	0.091 cfs
DMA 4	0.46 Ac	1,128 cf	0.093 cfs
TOTAL	1.67 Ac	3,689 cf	0.322 cfs

BMP GIS COORDINATES		
BMP	NORTHING	EASTING
BMP A - FILTERRA	2181437.28	6117118.00

POST-PROJECT AREA DATA			
	IRVINE	LAKE FOREST	TOTAL
PERVIOUS AREA:	0.00 Ac	0.10 Ac	0.10 Ac
IMPERVIOUS AREA:	0.70 Ac	0.87 Ac	1.57 Ac
TOTAL AREA:	0.70 Ac	0.97 Ac	1.67 Ac

0 50 100 200 400

25 75 150 300

GRAPHIC SCALE
1" = 100'

DATE: 11/21/23

MARK THOMAS

BAKE PARKWAY /JERONIMO ROAD INTERSECTION IMPROVEMENTS

SITE PLAN WQMP EXHIBIT - CIP 314210

J:\Irvine-21-00266-PR-ED Bake Pkwy-Jeronimo Rd\Reports\WQMP\CAD\BakePRED_SitePlan_Exhibit.dwg

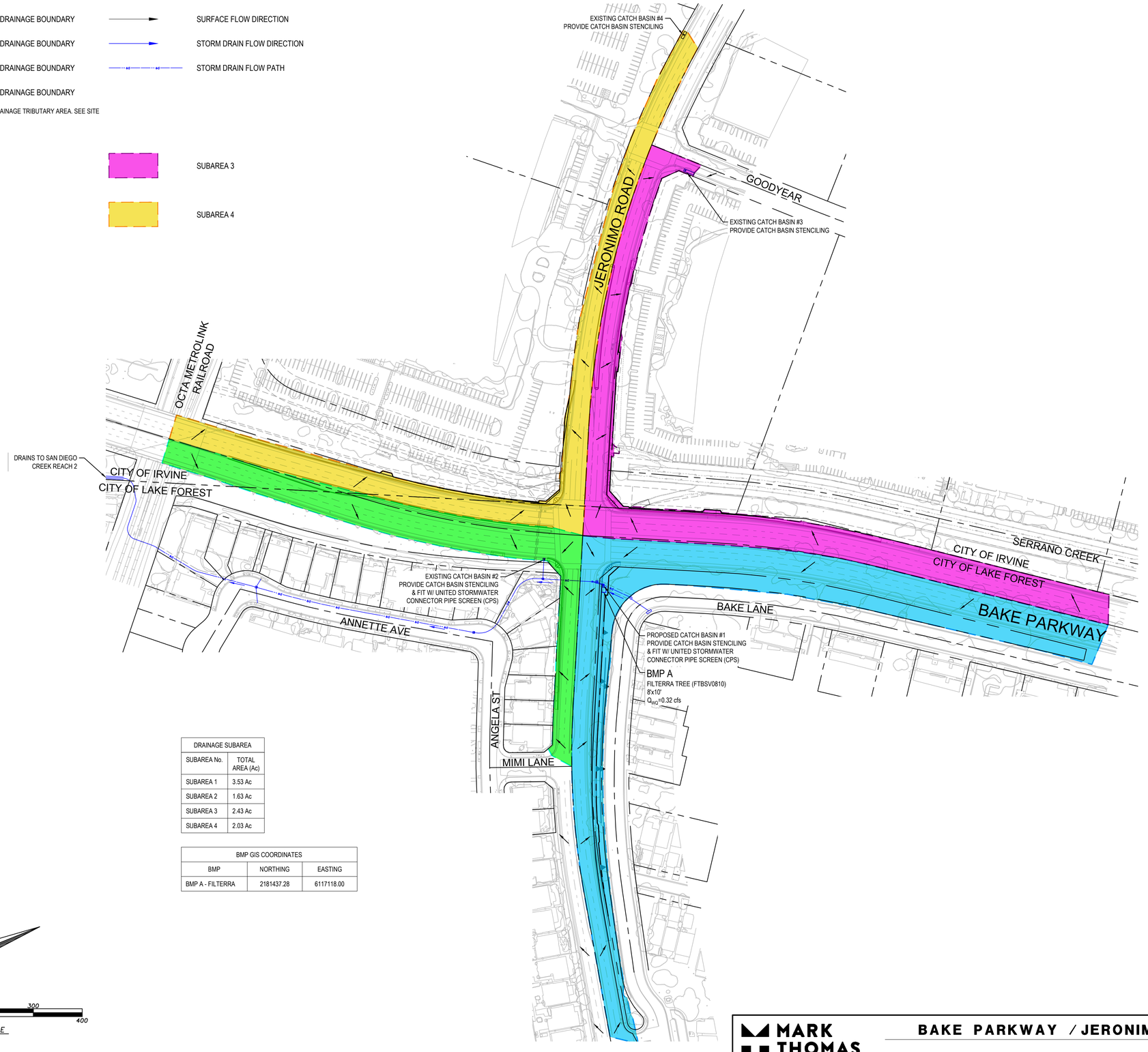
LEGEND

- SUBAREA 1 DRAINAGE BOUNDARY
- SUBAREA 2 DRAINAGE BOUNDARY
- SUBAREA 3 DRAINAGE BOUNDARY
- SUBAREA 4 DRAINAGE BOUNDARY

NOTE: SUBAREA BOUNDARY REPRESENTS DRAINAGE TRIBUTARY AREA. SEE SITE PLAN WQMP EXHIBIT FOR DMA BOUNDARY.

- SURFACE FLOW DIRECTION
- STORM DRAIN FLOW DIRECTION
- STORM DRAIN FLOW PATH

- SUBAREA 1
- SUBAREA 2
- SUBAREA 3
- SUBAREA 4



DRAINAGE SUBAREA	
SUBAREA No.	TOTAL AREA (Ac)
SUBAREA 1	3.53 Ac
SUBAREA 2	1.63 Ac
SUBAREA 3	2.43 Ac
SUBAREA 4	2.03 Ac

BMP GIS COORDINATES		
BMP	NORTHING	EASTING
BMP A - FILTERRA	2181437.28	6117118.00

0 25 50 75 100 150 200 300 400

GRAPHIC SCALE
1" = 100'

DATE: 11/17/23

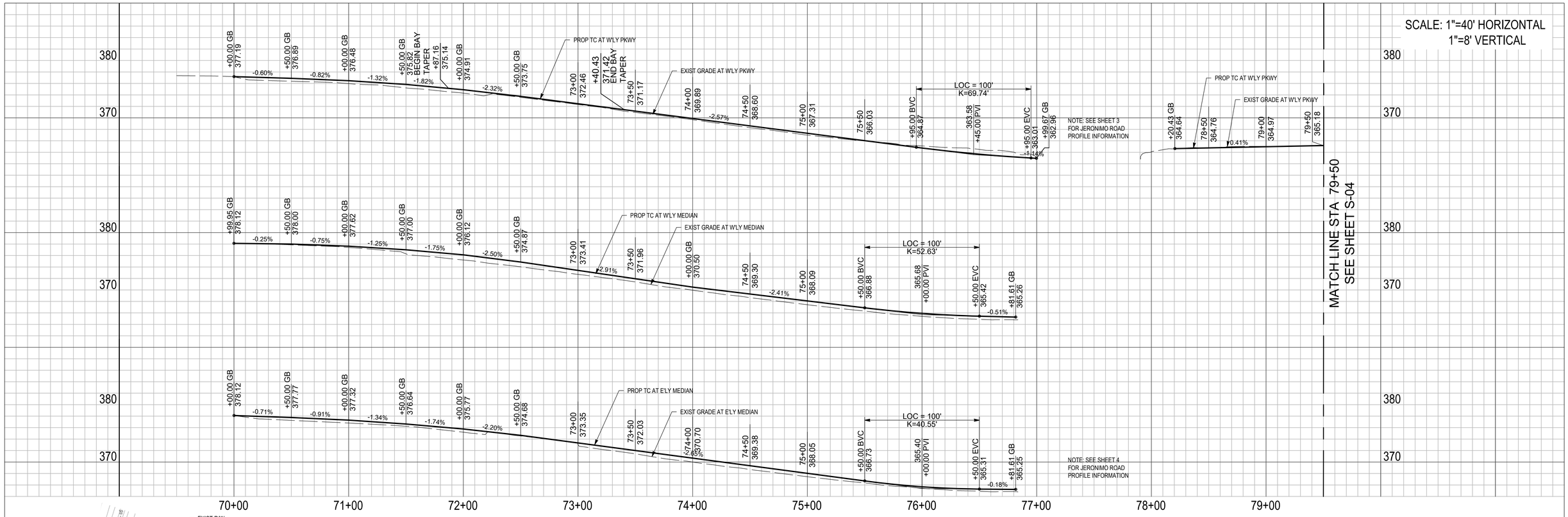
MARK THOMAS

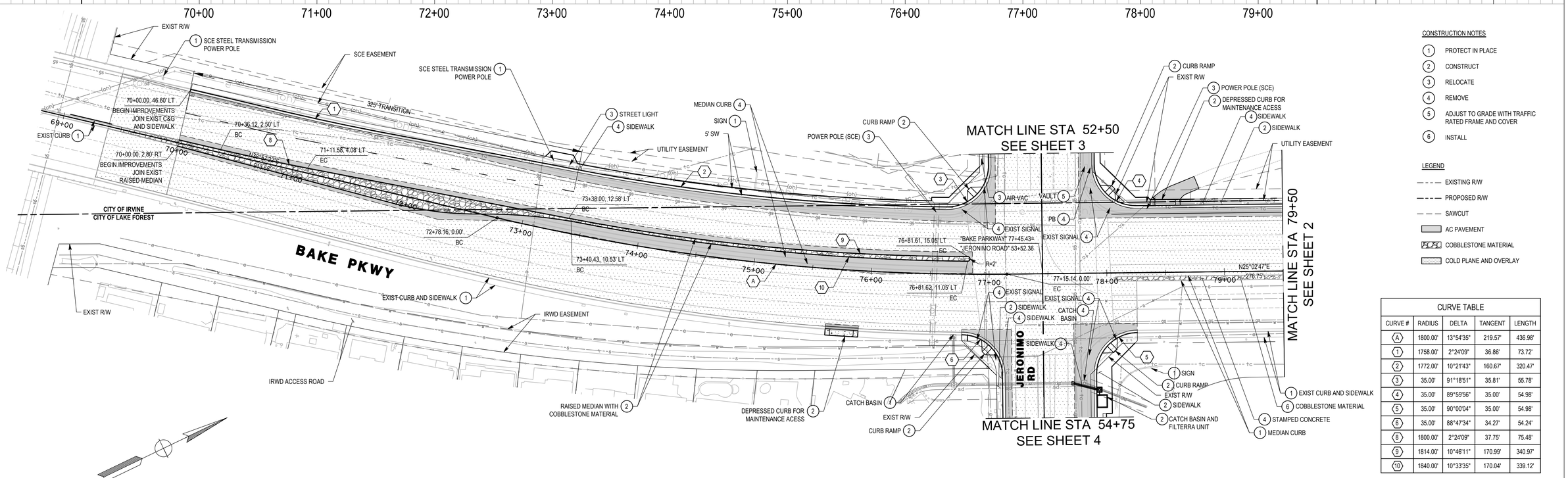
BAKE PARKWAY / JERONIMO ROAD INTERSECTION IMPROVEMENTS

DRAINAGE SUBAREA EXHIBIT - CIP 314210

J:\Irvine-21-00266-PR-ED Bake Pkwy-Jeronimo Rd\Reports\WQMP\CAD\BakePRED_SitePlan_Exhibit.dwg

SCALE: 1"=40' HORIZONTAL
1"=8' VERTICAL





CONSTRUCTION NOTES

1. PROTECT IN PLACE
2. CONSTRUCT
3. RELOCATE
4. REMOVE
5. ADJUST TO GRADE WITH TRAFFIC RATED FRAME AND COVER
6. INSTALL

LEGEND

- EXISTING R/W
- PROPOSED R/W
- SAWCUT
- AC PAVEMENT
- COBBLESTONE MATERIAL
- COLD PLANE AND OVERLAY

CURVE TABLE				
CURVE #	RADIUS	DELTA	TANGENT	LENGTH
A	1800.00'	13°54'35"	219.57'	436.98'
1	1758.00'	2°24'09"	36.86'	73.72'
2	1772.00'	10°21'43"	160.67'	320.47'
3	35.00'	91°18'51"	35.81'	55.78'
4	35.00'	89°59'56"	35.00'	54.98'
5	35.00'	90°00'04"	35.00'	54.98'
6	35.00'	88°47'34"	34.27'	54.24'
8	1800.00'	2°24'09"	37.75'	75.48'
9	1814.00'	10°46'11"	170.99'	340.97'
10	1840.00'	10°33'35"	170.04'	339.12'

10 30 60 120
0 20 40 80 160
GRAPHIC SCALE
1" = 40'

NO.	DATE	REVISIONS	ENGR.	APPROV.	DATE
7					
6					
5					
4					
3					
2					
1					

DRAWN BY: DATE
DESIGNED BY: DATE
CHECKED BY: DATE

PLAN PREPARED BY:
MARK THOMAS
MARK THOMAS & COMPANY
2121 ALTON PARKWAY, SUITE 210
IRVINE, CA 92606

DESIGN ENGINEER R.C.E. No. DATE

BAKE PARKWAY/JERONIMO ROAD INTERSECTION IMPROVEMENTS
STREET IMPROVEMENT PLAN AND PROFILE

CITY OF IRVINE
PUBLIC WORKS DEPARTMENT

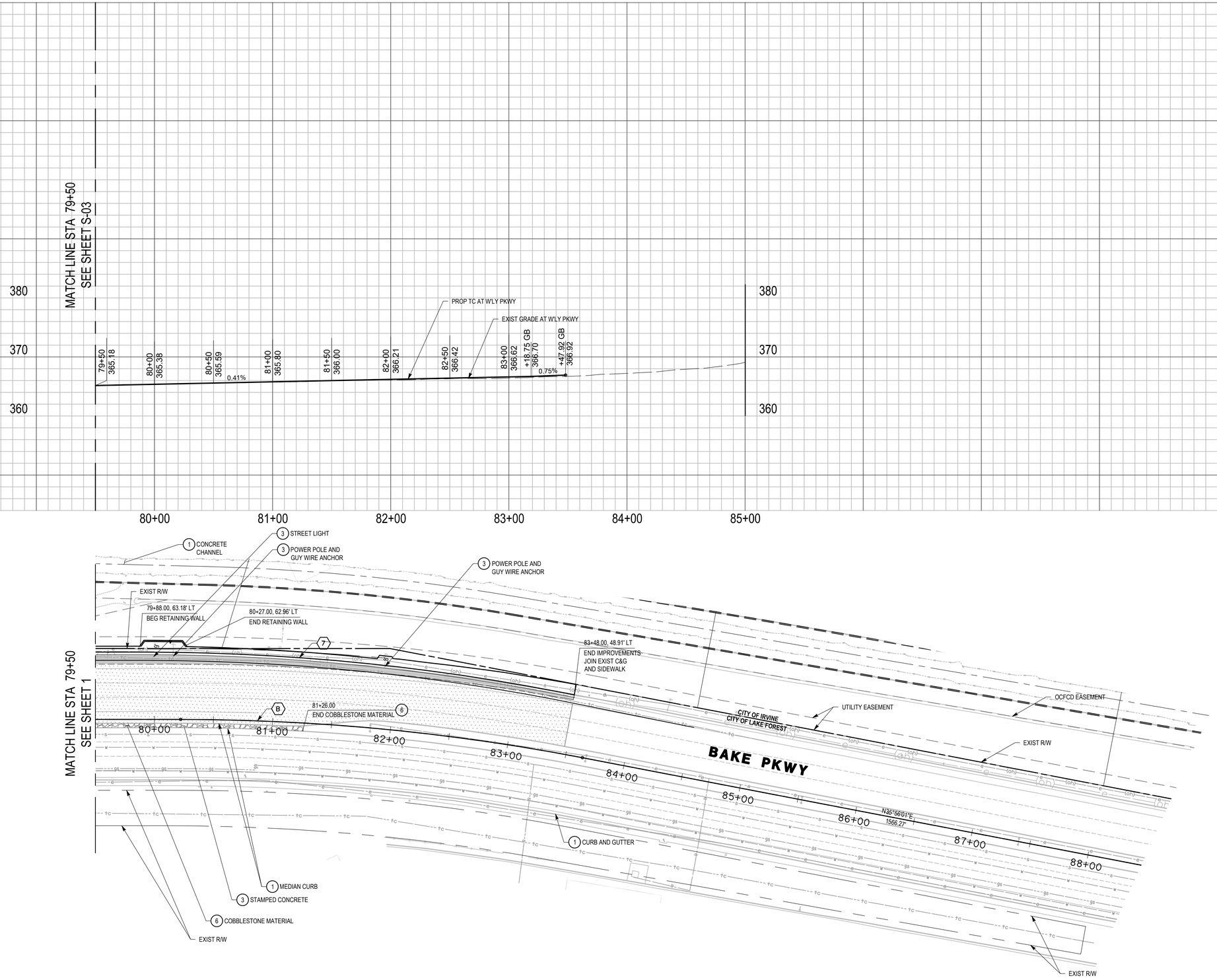
CIP NO.

SHEET 1 OF 4

J:\Irvine-21-00266-PR-ED Bake Pkwy-Jeronimo Rd\CADD\Sheets\CIP ST-01.dwg

SHEET REVISED: 8/15/07

SCALE: 1"=40' HORIZONTAL
1"=8' VERTICAL



CONSTRUCTION NOTES

1. PROTECT IN PLACE
2. CONSTRUCT
3. RELOCATE
4. REMOVE
5. ADJUST TO GRADE WITH TRAFFIC RATED FRAME AND COVER
6. INSTALL

LEGEND

- EXISTING R/W
- PROPOSED R/W
- SAWCUT
- AC PAVEMENT
- COBBLESTONE MATERIAL
- COLD PLANE AND OVERLAY

CURVE TABLE				
CURVE #	RADIUS	DELTA	TANGENT	LENGTH
B	1800.00'	10°53'14"	171.53'	342.03'
7	1850.00'	10°53'14"	176.30'	351.53'

0 10 20 30 40 60 80 120 160
GRAPHIC SCALE
1" = 40'

NO.	DATE	REVISIONS	ENGR.	APPROV.	DATE
7					
6					
5					
4					
3					
2					
1					

DRAWN BY: DATE
DESIGNED BY: DATE
CHECKED BY: DATE

PLAN PREPARED BY:
MARK THOMAS
MARK THOMAS & COMPANY
2121 ALTON PARKWAY, SUITE 210
IRVINE, CA 92606
DESIGN ENGINEER R.C.E. No. DATE

BAKE PARKWAY/JERONIMO ROAD INTERSECTION IMPROVEMENTS
STREET IMPROVEMENT PLAN AND PROFILE

CITY OF IRVINE
PUBLIC WORKS DEPARTMENT

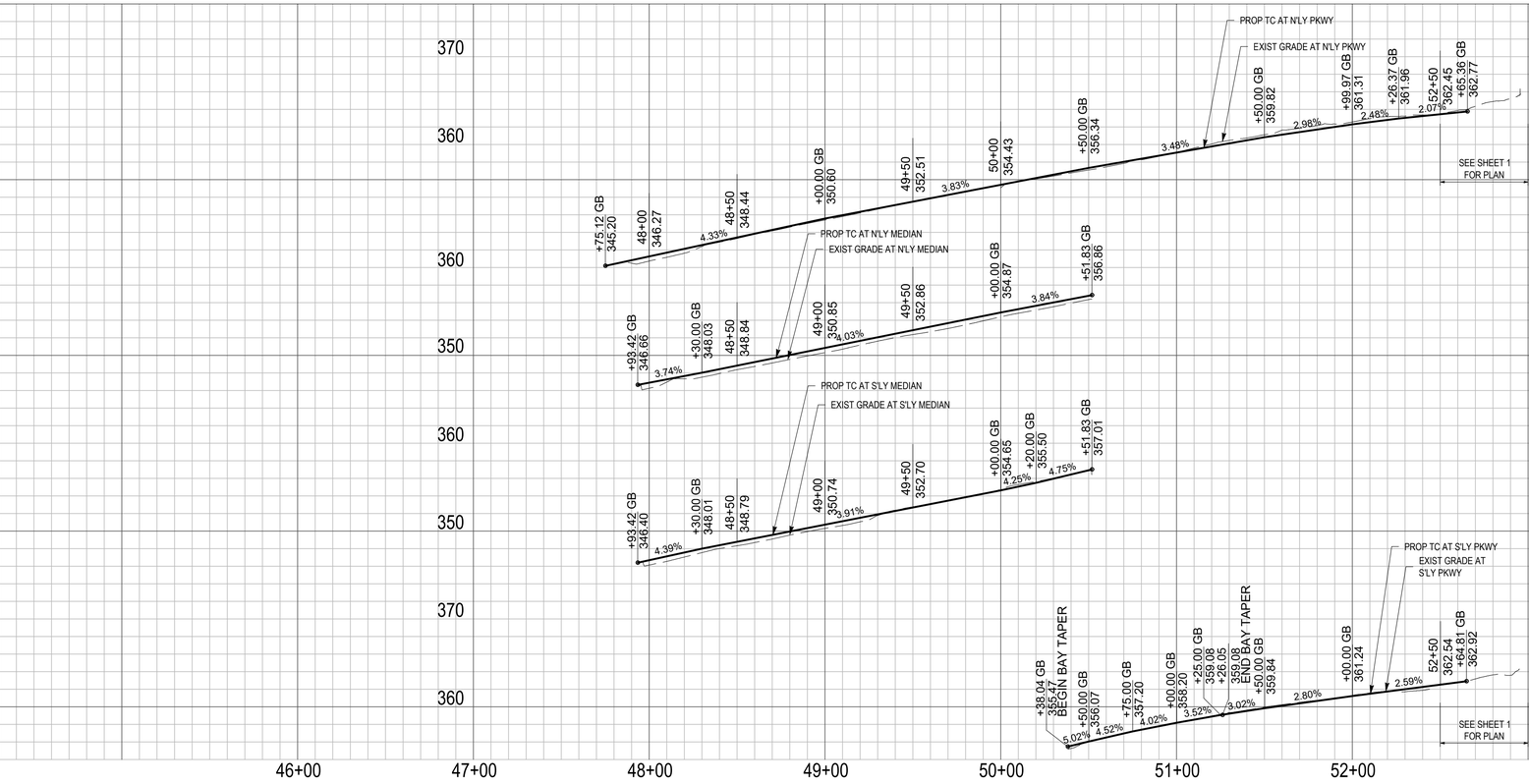
CIP NO.

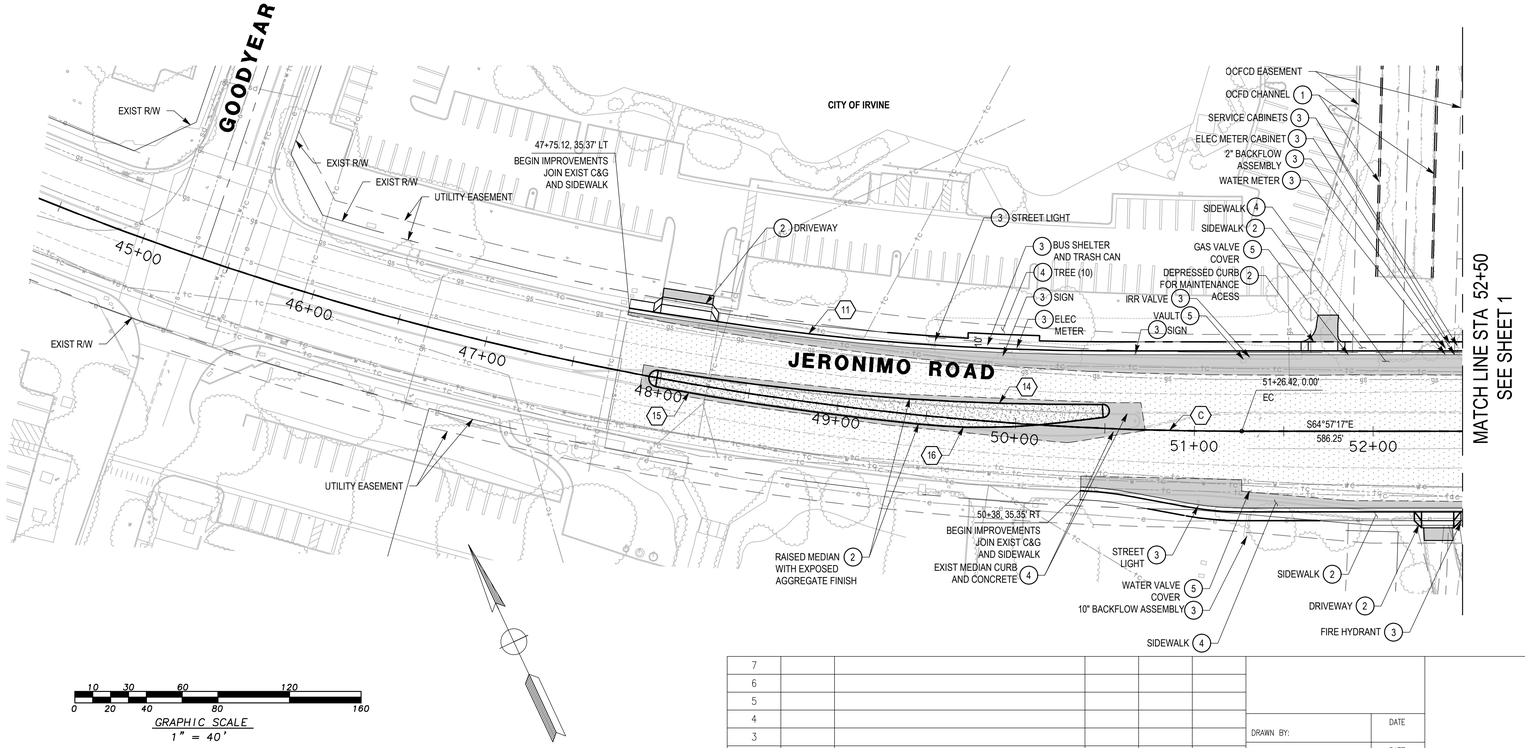
SHEET 2 OF 4

J:\Irvine-21-00266-PR-ED Bake Pkwy-Jeronimo Rd\CAD\Sheets\CIP ST-02.dwg

SHEET REVISED: 8/15/07

SCALE: 1"=40' HORIZONTAL
1"=8' VERTICAL





10 30 60 120
0 20 40 80 160
GRAPHIC SCALE
1" = 40'

CONSTRUCTION NOTES

1. PROTECT IN PLACE
2. CONSTRUCT
3. RELOCATE
4. REMOVE
5. ADJUST TO GRADE WITH TRAFFIC RATED FRAME AND COVER
6. INSTALL

LEGEND

- EXISTING R/W
- PROPOSED R/W
- SAWCUT
- AC PAVEMENT
- COBBLESTONE MATERIAL
- COLD PLANE AND OVERLAY
- EXPOSED AGGREGATE FINISH

CURVE TABLE

CURVE #	RADIUS	DELTA	TANGENT	LENGTH
C	1800.00'	26°06'40"	417.40'	820.30'
11	1470.00'	8°38'55"	111.16'	221.89'
14	1500.00'	9°30'57"	124.85'	249.12'
15	1805.00'	4°42'54"	74.31'	148.54'
16	360.00'	12°34'55"	39.69'	79.05'

NO.	DATE	REVISIONS	ENGR.	APPROV.	DATE
7					
6					
5					
4					
3					
2					
1					

DRAWN BY: DATE
DESIGNED BY: DATE
CHECKED BY: DATE

PLAN PREPARED BY:
MARK THOMAS
MARK THOMAS & COMPANY
2121 ALTON PARKWAY, SUITE 210
IRVINE, CA 92606

DESIGN ENGINEER R.C.E. No. DATE

BAKE PARKWAY/JERONIMO ROAD INTERSECTION IMPROVEMENTS
STREET IMPROVEMENT PLAN AND PROFILE

CITY OF IRVINE
PUBLIC WORKS DEPARTMENT

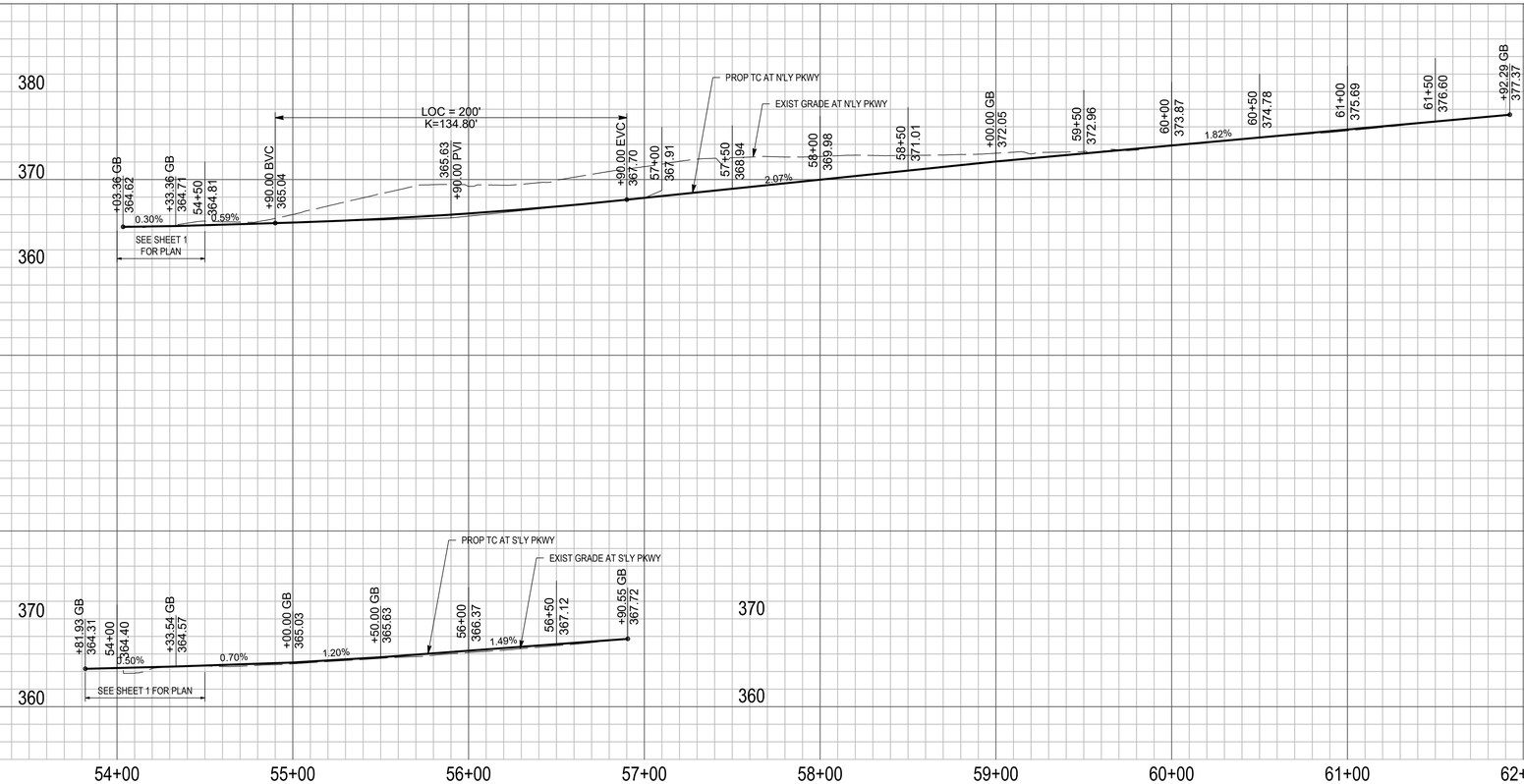
CIP NO.

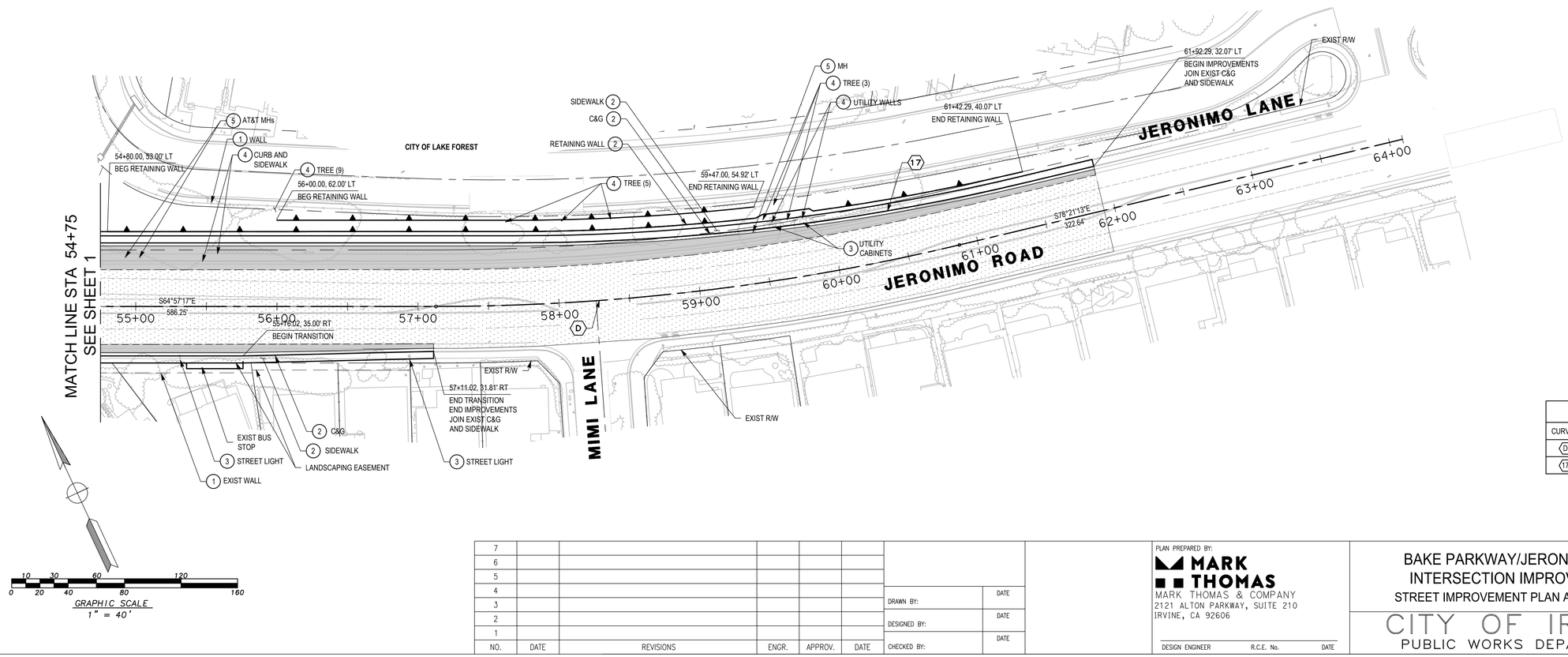
SHEET 3 OF 4

J:\Irvine-21-00266-PR-ED Bake Pkwy-Jeronimo Rd\CADD\Sheets\CIP ST-03.dwg

SHEET REVISED: 8/15/07

SCALE: 1"=40' HORIZONTAL
1"=8' VERTICAL





CONSTRUCTION NOTES

1. PROTECT IN PLACE
2. CONSTRUCT
3. RELOCATE
4. REMOVE
5. ADJUST TO GRADE WITH TRAFFIC RATED FRAME AND COVER
6. INSTALL

LEGEND

- EXISTING R/W
- PROPOSED R/W
- SAWCUT
- AC PAVEMENT
- COBBLESTONE MATERIAL
- COLD PLANE AND OVERLAY

CURVE TABLE				
CURVE #	RADIUS	DELTA	TANGENT	LENGTH
(D)	1600.00'	13°23'56"	187.94'	374.17'
(17)	1565.00'	13°23'56"	183.83'	365.98'

GRAPHIC SCALE
1" = 40'

NO.	DATE	REVISIONS	ENGR.	APPROV.	DATE
7					
6					
5					
4					
3					
2					
1					

DRAWN BY: DATE
DESIGNED BY: DATE
CHECKED BY: DATE

PLAN PREPARED BY:
MARK THOMAS
MARK THOMAS & COMPANY
2121 ALTON PARKWAY, SUITE 210
IRVINE, CA 92606

DESIGN ENGINEER R.C.E. No. DATE

BAKE PARKWAY/JERONIMO ROAD INTERSECTION IMPROVEMENTS

STREET IMPROVEMENT PLAN AND PROFILE

CITY OF IRVINE
PUBLIC WORKS DEPARTMENT

CIP NO.

SHEET 4 OF 4

J:\Irvine-21-00266-PR-ED Bake Pkwy-Jeronimo Rd\CADD\Sheets\CIP ST-04.dwg

SHEET REVISED: 8/15/07

ATTACHMENT C

BMP Design Calculations, BMP Fact Sheet

Existing Condition

	Limits of Disturbance								10	0.226	
SUBAREA No.	**Area (sf)**	**Area (ac)**	**Impervious Area (sf)**	**Pervious Area (sf)**	**Storm Depth (in)**	**Imperviousness**	**Runoff Coefficient**	**DCV (ft^3)**	**Time of Concentration (min)**	**Intensity (in/hr)**	**Q80% (cfs)**
1	20489	0.47	9813	10676	0.85	0.48	0.51	739	10	0.226	0.054
2	12575	0.29	11771	804	0.85	0.94	0.85	759	10	0.226	0.056
3	19546	0.45	16099	3447	0.85	0.82	0.77	1063	10	0.226	0.078
4	19984	0.46	17232	2752	0.85	0.86	0.80	1128	10	0.226	0.083
TOTAL AREA	**72594**	**1.67**	**54915**	**17679**		0.78	**TOTAL DCV**	**3689**			0.270

Rainfall Depth (in)	2-Year Storm Intensity (in/hr)
2.05	1.52
Hydromod Volume (ft^3)	**Q 2-YR (cfs)**
1782	0.36
1830	0.37
2564	0.52
2720	0.56
8896	1.82

Proposed Condition

	Limits of Disturbance								10	0.226	
SUBAREA No.	**Area (sf)**	**Area (ac)**	**Impervious Area (sf)**	**Pervious Area (sf)**	**Storm Depth (in)**	**Imperviousness**	**Runoff Coefficient**	**DCV (ft^3)**	**Time of Concentration (min)**	**Intensity (in/hr)**	**Q80% (cfs)**
1	20489	0.47	16175	4314	0.85	0.79	0.74	1077	10	0.226	0.079
2	12575	0.29	12575	0	0.85	1.00	0.90	802	10	0.226	0.059
3	19546	0.45	19546	0	0.85	1.00	0.90	1246	10	0.226	0.091
4	19984	0.46	19984	0	0.85	1.00	0.90	1274	10	0.226	0.093
TOTAL AREA	**72594**	**1.67**	**68280**	**4314**		0.95	**TOTAL DCV**	**4399**			0.322

Rainfall Depth (in)	2-Year Storm Intensity (in/hr)
2.05	1.52
Hydromod Volume (ft^3)	**Q 2-YR (cfs)**
2597	0.53
1933	0.40
3005	0.61
3073	0.63
10609	2.17

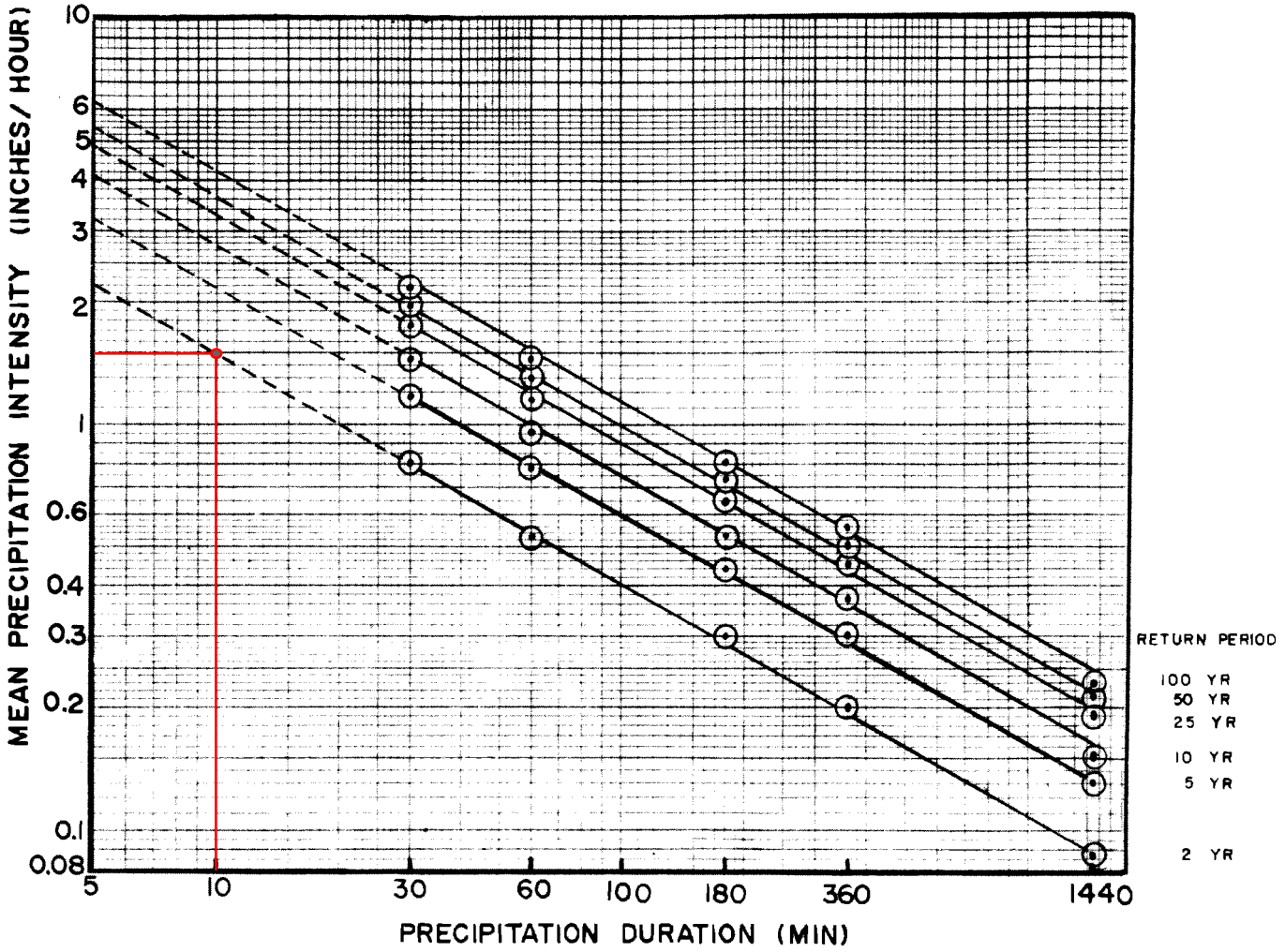
WATER QUALITY TREATMENT SUMMARY TABLE						
DMA	**Area (sf)**	**Area (ac)**	**Impervious Area (sf)**	**Pervious Area (sf)**	**Imperviousness**	**Q TREATMENT REQ. (CFS)**
1	20489	0.47	16175	4314	0.79	0.08
2	12575	0.29	12575	0	1.00	0.06
3	19546	0.45	19546	0	1.00	0.09
4	19984	0.46	19984	0	1.00	0.09
TOTAL PROJECT WATER QUALITY TREATMENT SUMMARY TABLE						
TOTAL	72594	1.67	68280	4314	0.95	0.322

Regression Equations: $I(t) = at^b$

(I= Intensity in inches/hour, t= duration in minutes)

Return Frequency (years)	a	b
2	5.702	-0.574
5	7.870	-0.562
10	10.209	-0.573
25	11.995	-0.566
50	13.521	-0.566
100	15.560	-0.573

I(10) = 5.702 * (10^-0.574)
I(10) = 1.52 in/hr

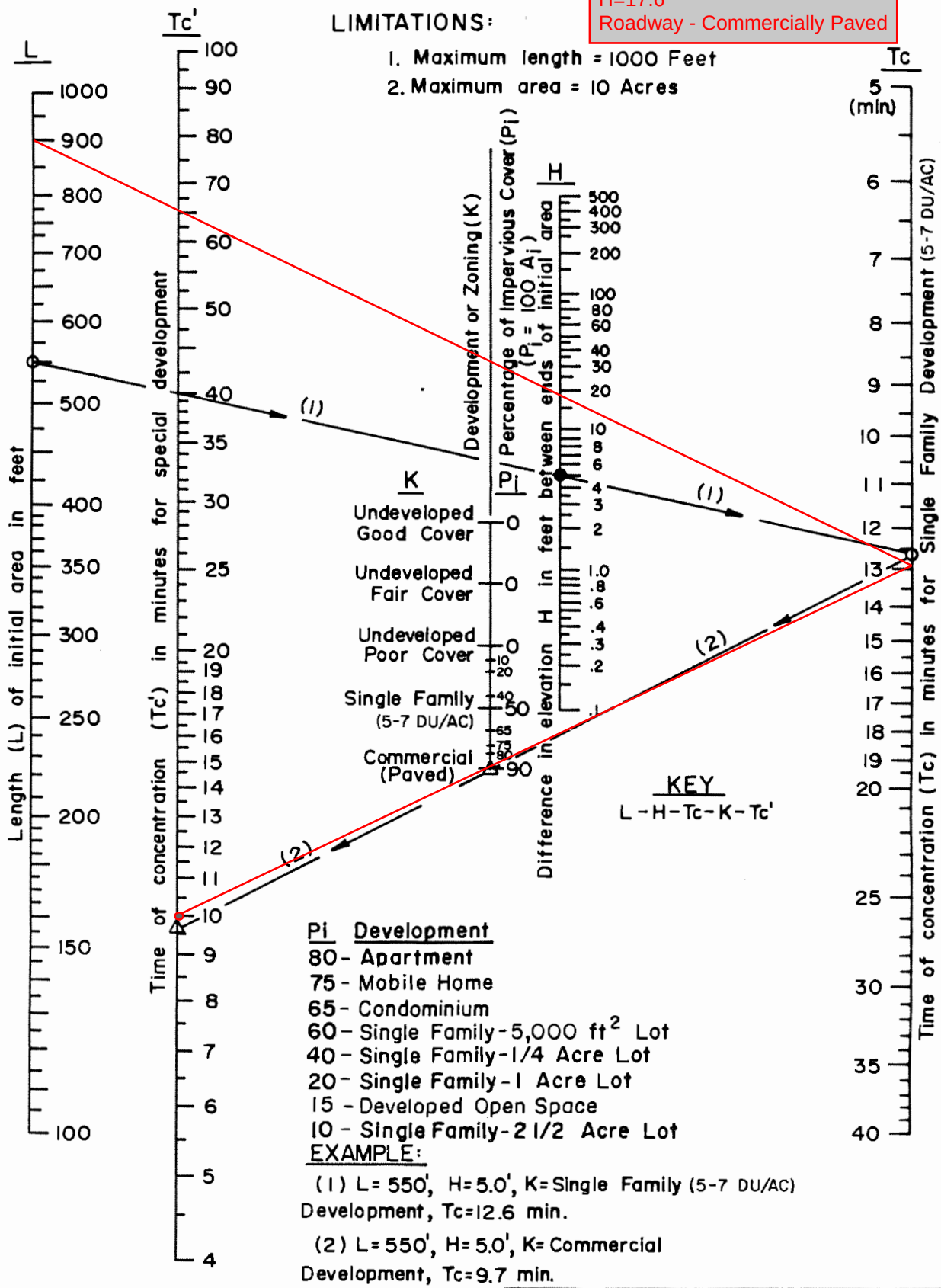


ORANGE COUNTY
HYDROLOGY MANUAL

MEAN PRECIPITATION INTENSITIES FOR NONMOUNTAINOUS AREAS

Figure B-3

Longest Flow Path, L=900'
Upstream Elev = 381.9 OG
Downstream Elev = 364.3 FG
H=17.6'
Roadway - Commercially Paved



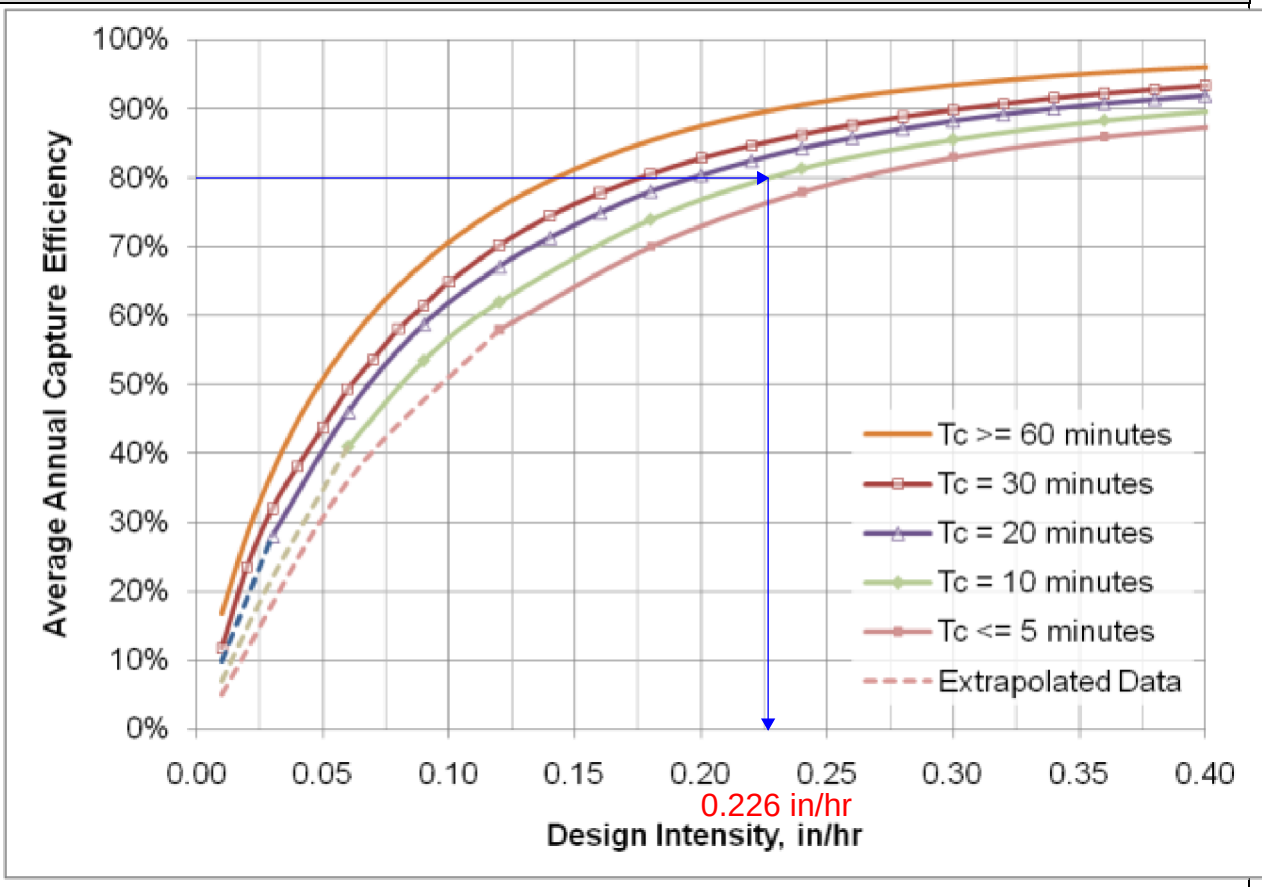
ORANGE COUNTY
HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

Worksheet F: Determining Capture Efficiency of a Flow-based BMP based on Treatment Capacity

Graphical Operations



Provide supporting graphical operations.

SECTION (_____)
Filterra® Bioscape Configuration
Bioretention System Standard Specification

1.0 GENERAL

1.1 This item shall govern the furnishing and installation of the Filterra® Bioscape Bioretention System by Contech Engineered Solutions LLC, complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents.

1.2 Contractor shall furnish all labor, materials, equipment and incidentals necessary to install and/or prepare the site for placement of the bioretention system, appurtenances and incidentals in accordance with the Drawings and as specified herein.

1.3 Bioretention system shall utilize the physical, chemical and biological mechanisms of an engineered biofiltration media, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system shall be a fully equipped, pre-constructed, drop-in-place unit designed for applications in the urban landscape to treat contaminated runoff from impervious surfaces.

1.4 Bioretention plants shall be incorporated into the system with plant material extending into the treatment zone of the engineered media at time of Activation.

1.5 The bioretention system shall be of a type that has been installed and in use for a minimum of five (5) consecutive years preceding the date of installation of the system. The Manufacturer shall have been, during the same consecutive five (5) year period, engaged in the engineering design and production of systems deployed for the treatment of storm water runoff and which have a history of successful production, acceptable to the Engineer of Record and/or the approving Jurisdiction. The Manufacturer of the Filterra Bioscape Bioretention System shall be, without exception:

Contech Engineered Solutions LLC
9025 Centre Pointe Drive
West Chester, OH, 45069
Tel: 1 800 338 1122

1.6 Applicable provisions of any Division shall govern work in this section.

1.7 Manufacturer or authorized supplier to submit shop drawings for bioretention system with engineered biofiltration media and accessory equipment. Drawings shall include principal dimensions, engineered biofiltration media placement, and location of piping.

1.7.1 Manufacturer or authorized supplier shall submit site preparation and installation instructions to the contractor.

1.7.2 Manufacturer or authorized supplier shall submit Operations and Maintenance Manual to the contractor.

1.7.3 Before installation of the bioretention system, Contractor shall obtain the written approval of the Engineer of Record for the system drawings.

1.8 No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the Engineer of Record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

2.0 MATERIALS

2.1 All system components including engineered biofiltration media, underdrain stone, PVC underdrain piping, and mulch must be included as part of the bioretention system and shall be provided by Contech Engineered Solutions LLC.

2.1.1 Engineered biofiltration media shall consist of both organic and inorganic components. Stormwater shall be directed to flow vertically through the media profile, saturating the full media profile without downstream flow control.

2.1.2 Underdrain stone shall be of size and shape to provide adequate bridging between the media and stone for the prevention of migration of fine particles. Underdrain stone must also be able to convey the design flow rate of the system without restriction and be approved for use in the Filterra Bioscape Bioretention System by Contech Engineered Solutions LLC.

2.1.3 PVC Underdrain Piping shall be SDR35 with perforation pattern designed to convey system design flow rate without restriction.

2.1.4 Mulch shall be double shredded wood or bark mulch approved for use with the Filterra Bioscape Bioretention System by Contech Engineered Solutions LLC.

2.2 Vegetation shall be provided by the contractor and comply with the type and size required by the site plans and shall be alive and free of obvious signs of disease.

2.3 Filterra Bioscape containment basin or structure shall be provided by the contractor in accordance with the Engineer of Record site plans.

3.0 PERFORMANCE

3.1 Treatment Capabilities shall be verified via third-party report following either TAPE or TARP protocols.

3.1.1 Engineered biofiltration media minimum treatment flow rate shall be 140"/hr. The system shall be designed to ensure that high flow events shall bypass the engineered biofiltration media preventing erosion and resuspension of

pollutants.

3.1.2 The system shall remove a minimum of 85% Total Suspended Solids (TSS).

3.1.3 The system shall remove a minimum of 62% Total Phosphorus (TP).

3.1.4 The system shall remove a minimum of 34% Total Nitrogen (TN).

3.2 Quality Assurance and Quality Control procedures shall be followed for all batches of engineered biofiltration media produced. Engineered biofiltration media shall be certified by the Manufacturer for performance and composition.

3.2.1 Media particle size distribution and composition shall be verified as per relevant ASTM Standards.

3.2.2 Media pollutant removal performance shall be verified as per relevant ASTM Standards as well as a minimum of one scientific method approved by the USEPA.

3.2.3 Media hydraulic performance shall be verified as per relevant ASTM Standards.

3.2.4 Media fertility shall be verified as per a minimum of one published scientific method.

3.3 The Manufacturer shall ensure through third party full scale field testing of installed units that the design flow rate of the system is not reduced over time. Studies shall be performed on a minimum of 10 systems of various ages, maintenance frequencies, and land uses. At least 80% of the tested systems shall have been installed 2.5 or more years. At least 50% of the systems shall have previous maintenance intervals greater than 2 times the manufacturer's recommendation.

4.0 EXECUTION

4.1 Contractor to prepare site for installation of the Filterra Bioscape Bioretention system as per the "Filterra Bioscape Activation Guide for Contractors" provided by the Manufacturer.

4.1.1 Excavation of basin or installation of Cast-in-Place vault for the placement of system components shall be completed by contractor

4.1.2 Inlet and outlet pipes shall be provided to the edge of the extents of the Engineered Media for connection of underdrain during system installation by contractor.

4.1.3 All bypass structures, piping, or other mechanisms should be installed and in place by contractor prior to Filterra Bioscape System Activation.

4.2 The bioretention system shall not be placed in operation (activated) until the project site is clean and stabilized (construction erosion control measures no longer required). The project site includes any surface that contributes storm drainage to the system. All impermeable

surfaces shall be clean and free of dirt and debris. All catch basins, manholes and pipes shall be free of dirt and sediment.

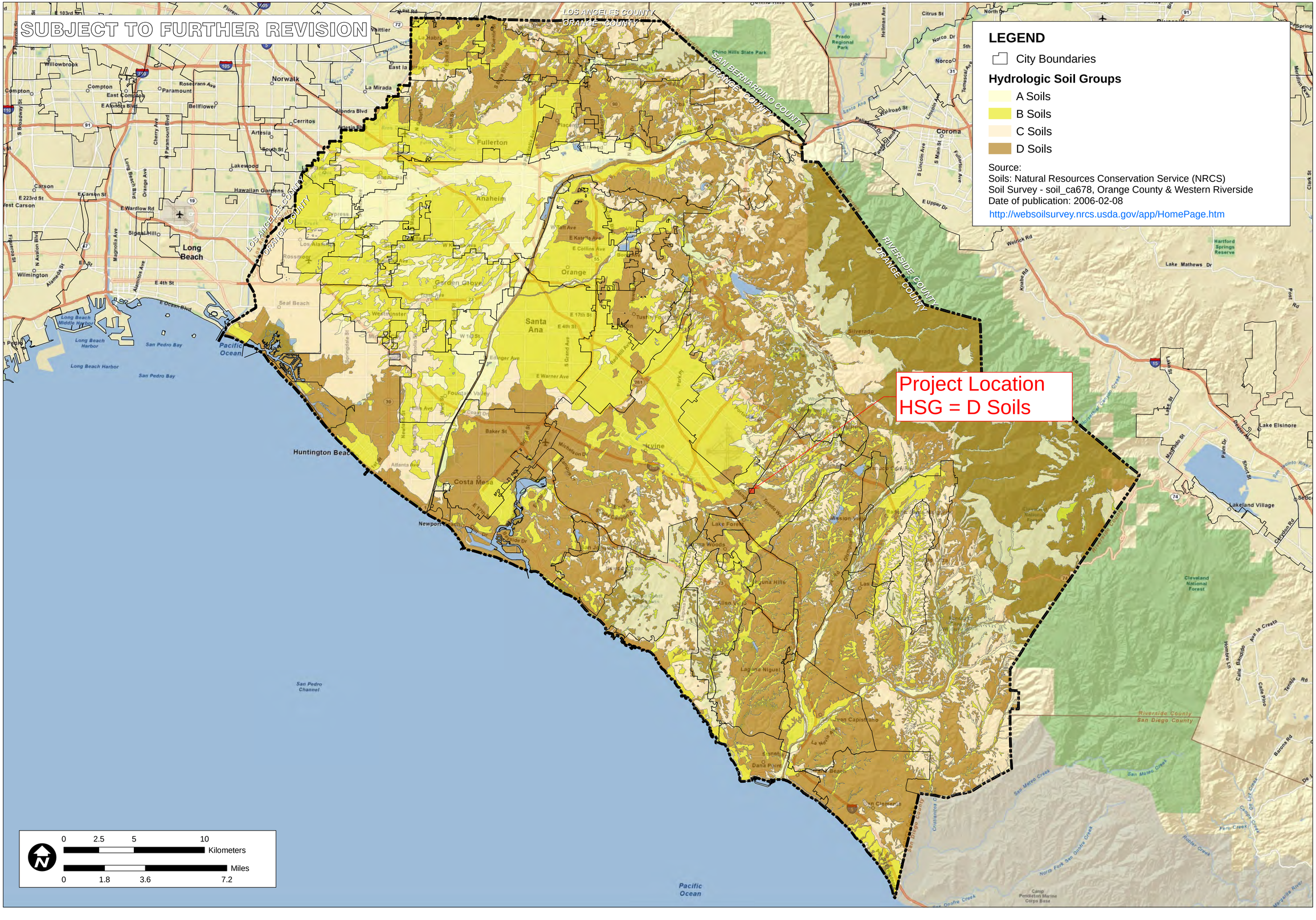
4.3 Activation consists of the placement of all system components identified in Section 2.1. Activation must be provided by the contractor under supervision by Contech Engineered Solutions, LLC, or a Contech certified 3rd Party Activation provider.

4.4 To ensure long term performance of the bioretention system, continuing annual maintenance programs should be performed or purchased by the owner per the latest Filterra Bioscape Bioretention System Operation and Maintenance manual.

ATTACHMENT D

Supporting Rainfall, Groundwater, and Soils Information

SUBJECT TO FURTHER REVISION



LEGEND

- City Boundaries

Hydrologic Soil Groups

- A Soils
- B Soils
- C Soils
- D Soils

Source:
Soils: Natural Resources Conservation Service (NRCS)
Soil Survey - soil_ca678, Orange County & Western Riverside
Date of publication: 2006-02-08
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

0 2.5 5 10 Kilometers
0 1.8 3.6 7.2 Miles

TITLE
NRCS HYDROLOGIC SOILS GROUPS

JOB
ORANGE COUNTY INFILTRATION STUDY
ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2a

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2a_HydroSoils_20110215.mxd

SUBJECT TO FURTHER REVISION

LEGEND

City Boundaries

Hydrologic Soil Groups

D Soils

Source:
D Soils: Natural Resources Conservation Service (NRCS)
Soil Survey - soil_ca678, Orange County & Western Riverside
Date of publication: 2006-02-08
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

Project Location
HSG = D Soils

0 2.5 5 10 Kilometers
0 1.8 3.6 7.2 Miles

TITLE
HYDROLOGIC SOIL GROUP
TYPE D NRCS SOIL SURVEY

JOB
ORANGE COUNTY
INFILTRATION STUDY
ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2b

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2b_D-Soils_20110215.mxd

SUBJECT TO FURTHER REVISION

LEGEND

City Boundaries

Seismic Hazards

Potential Landslide Area

Source:
Seismic Hazard Zone Maps
Division of Mines and Geology, California Geology Survey,
Publication Date: 2005; Data Downloaded 02-09-2011

http://www.conservation.ca.gov/cgs/shzp/Pages/Index.aspx

Project Location
No Landslides

LOS ANGELES COUNTY
ORANGE COUNTY

SAN BERNARDINO COUNTY
ORANGE COUNTY

RIVERSIDE COUNTY
ORANGE COUNTY

0 2.5 5 10 Kilometers

0 1.8 3.6 7.2 Miles

TITLE
HYDROLOGIC SOIL GROUP
TYPE D NRCS SOIL SURVEY

JOB
ORANGE CO.
INFILTRATION STUDY
CA

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2c

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2c_Landslides_20110215.mxd

SUBJECT TO FURTHER REVISION

LEGEND

- Depth To First Groundwater Contours
- City Boundaries
- OCWD Groundwater Basin Protection Boundary

Note: Data are not available for South Orange County at this time.

Source:
Sprotte, Fuller and Greenwood, 1980.
California Division of Mines and Geology;
California Geological Survey

LOS ANGELES COUNTY
ORANGE COUNTY

SAN BERNARDINO COUNTY
ORANGE COUNTY

RIVERSIDE COUNTY
ORANGE COUNTY

Project Location
No Groundwater
Within Boundary

0 2 4 8 Kilometers
0 1.25 2.5 5 Miles

TITLE
NORTH ORANGE COUNTY
MAPPED DEPTH TO FIRST
GROUNDWATER

JOB
ORANGE CO.
ORANGE COUNTY
INFILTRATION STUDY
CA

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2d

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2d_DepthToGroundwaterOverview_20110215.mxd

SUBJECT TO FURTHER REVISION

LEGEND

City Boundaries

OCWD Groundwater Basin Protection Boundary

Depth To Groundwater

<= 5'

5-10'

Note: Data are not available for South Orange County at this time.

Source:
Sprotte, Fuller and Greenwood, 1980.
California Division of Mines and Geology;
California Geological Survey

LOS ANGELES COUNTY
ORANGE COUNTY

SAN BERNARDINO COUNTY
ORANGE COUNTY

RIVERSIDE COUNTY
ORANGE COUNTY

0 2 4 8 Kilometers

0 1.25 2.5 5 Miles

TITLE

NORTH ORANGE COUNTY
MAPPED SHALLOW GROUNDWATER

ORANGE COUNTY
INFILTRATION STUDY

CA

JOB

ORANGE CO.

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE

XVI-2e

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2e_DepthToGroundwater15ft_20110215.mxd

SUBJECT TO FURTHER REVISION

LEGEND

- City Boundaries
- OCWD Groundwater Basin Protection Boundary

Plume Protection Boundaries

- North Basin Groundwater Protection Project
- South Basin Groundwater Protection Project
- El Toro Marine Base
- Tustin Marine Air Base
- Approximate Selenium Contamination Area

Note: Individual contamination sites are not plotted.
See State Water Resources Control Board Geotracker database (http://geotracker.waterboards.ca.gov),
Department of Toxic Substance Control Envirostor database (http://www.envirostor.dtsc.ca.gov) and other applicable sources for current listing of active contaminated sites.

Groundwater basin and plume protection boundaries for South Orange County are not shown on this exhibit at this time

LOS ANGELES COUNTY
ORANGE COUNTY

SAN BERNARDINO COUNTY
ORANGE COUNTY

RIVERSIDE COUNTY
ORANGE COUNTY

Project Location
No Plume Area

0 2 4 8 Kilometers
0 1.25 2.5 5 Miles

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2f_NorthOCGroundwaterProtectionAreasStreetMap_20110215.mxd

TITLE
NORTH ORANGE COUNTY
GROUNDWATER PROTECTION
AREAS

ORANGE COUNTY
INFILTRATION STUDY

JOB
ORANGE CO.

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

CA

PACE
Advanced Water Engineering

FIGURE
XVI-2f

SUBJECT TO FURTHER REVISION

LEGEND

- OCWD Groundwater Basin Protection Boundary
- City Boundaries

Infiltration Constraints

- 1 Constraint
- 2 Overlapping Constraints
- 3 Overlapping Constraints
- 4 Overlapping Constraints

Analysis Layers Included: 1. Hydrologic Soil Group D, 2. Landslide Hazard Zone, 3. Groundwater Protection Areas 4. Approximate Selinium Area, 5. Depth to Groundwater <= 5'

Note: Screening datasets are not exhaustive. The applicant should always conduct a review of available site-specific information relative to infiltration constraints as part of assessing the feasibility of stormwater infiltration.
Source;
Infiltration Constraint Analysis: PACE/Geosyntec

Project Location
1 Constraint - HSG D

0 2.5 5 10 Kilometers
0 1.8 3.6 7.2 Miles

TITLE
INFILTRATION ANALYSIS
OVERLAPPING CONSTRAINT LOCATIONS

JOB
ORANGE COUNTY
INFILTRATION STUDY
ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2g

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2g_InfiltrationFinal_20110215.mxd

Soil Map—Orange County and Part of Riverside County, California
(Bake and Jeronimo Soil Map)

Map Scale: 1:1,850 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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: Orange County and Part of Riverside County, California
Survey Area Data: Version 15, Sep 13, 2021

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

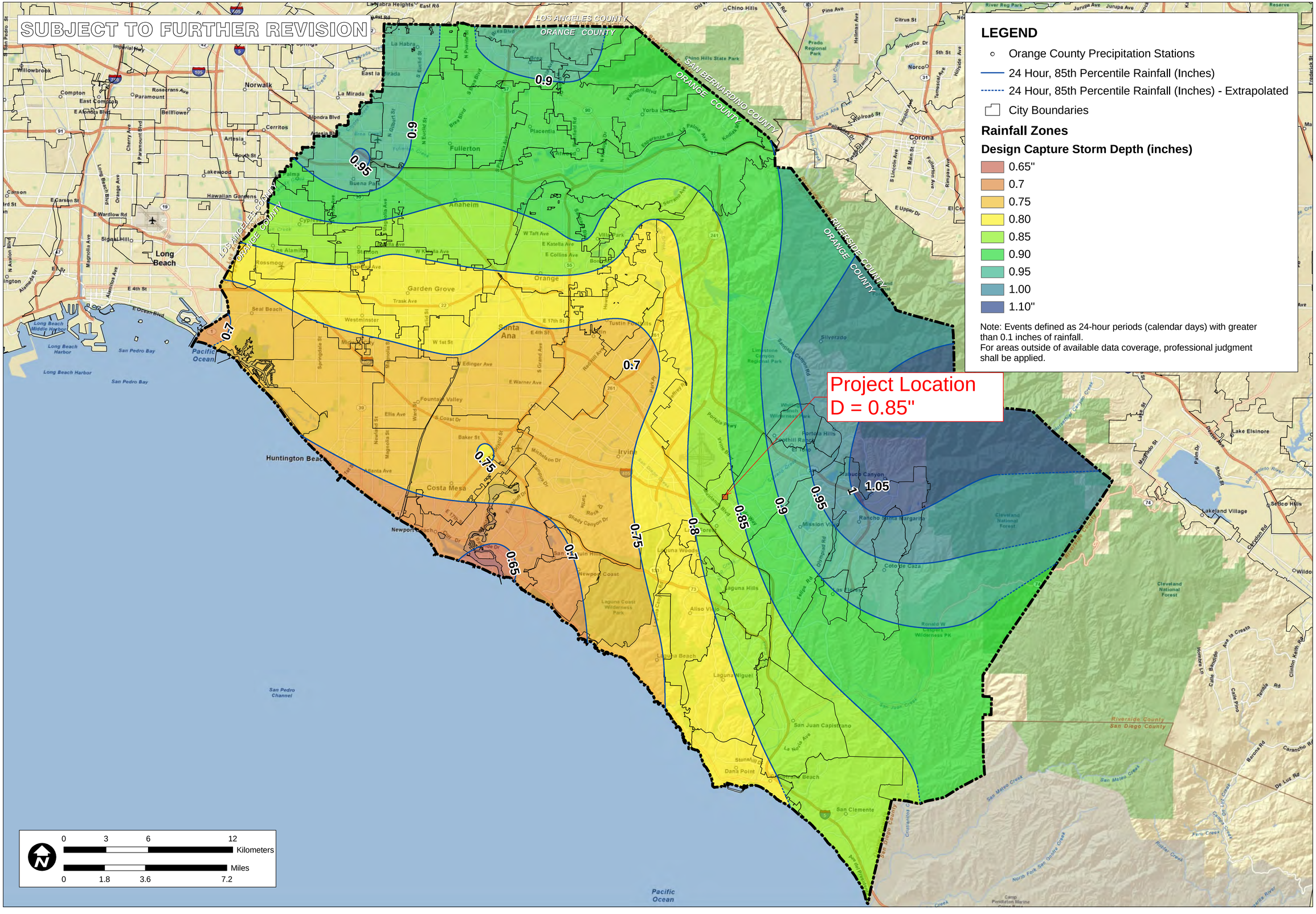
Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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
173	Myford sandy loam, 2 to 9 percent slopes	14.8	100.0%
Totals for Area of Interest		**14.8**	**100.0%**

SUBJECT TO FURTHER REVISION



LEGEND

- Orange County Precipitation Stations
- 24 Hour, 85th Percentile Rainfall (Inches)
- 24 Hour, 85th Percentile Rainfall (Inches) - Extrapolated
- City Boundaries

Rainfall Zones

Design Capture Storm Depth (inches)

- 0.65"
- 0.7
- 0.75
- 0.80
- 0.85
- 0.90
- 0.95
- 1.00
- 1.10"

Note: Events defined as 24-hour periods (calendar days) with greater than 0.1 inches of rainfall.
For areas outside of available data coverage, professional judgment shall be applied.

0 3 6 12 Kilometers
0 1.8 3.6 7.2 Miles

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-1_RainfallZones_20110215.mxd

TITLE: RAINFALL ZONES

ORANGE COUNTY
TECHNICAL GUIDANCE
DOCUMENT

JOB: ORANGE CO. CA

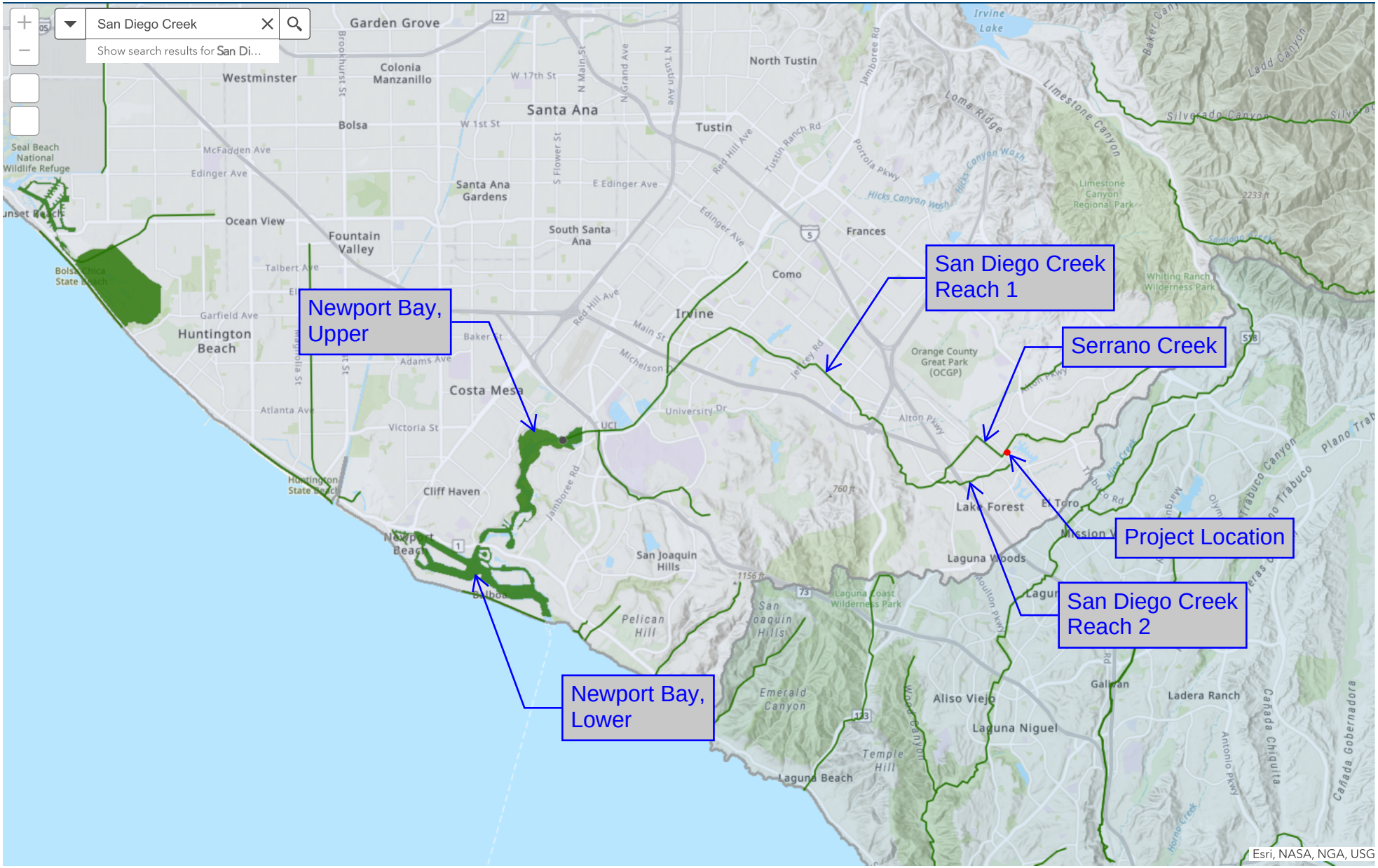
SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

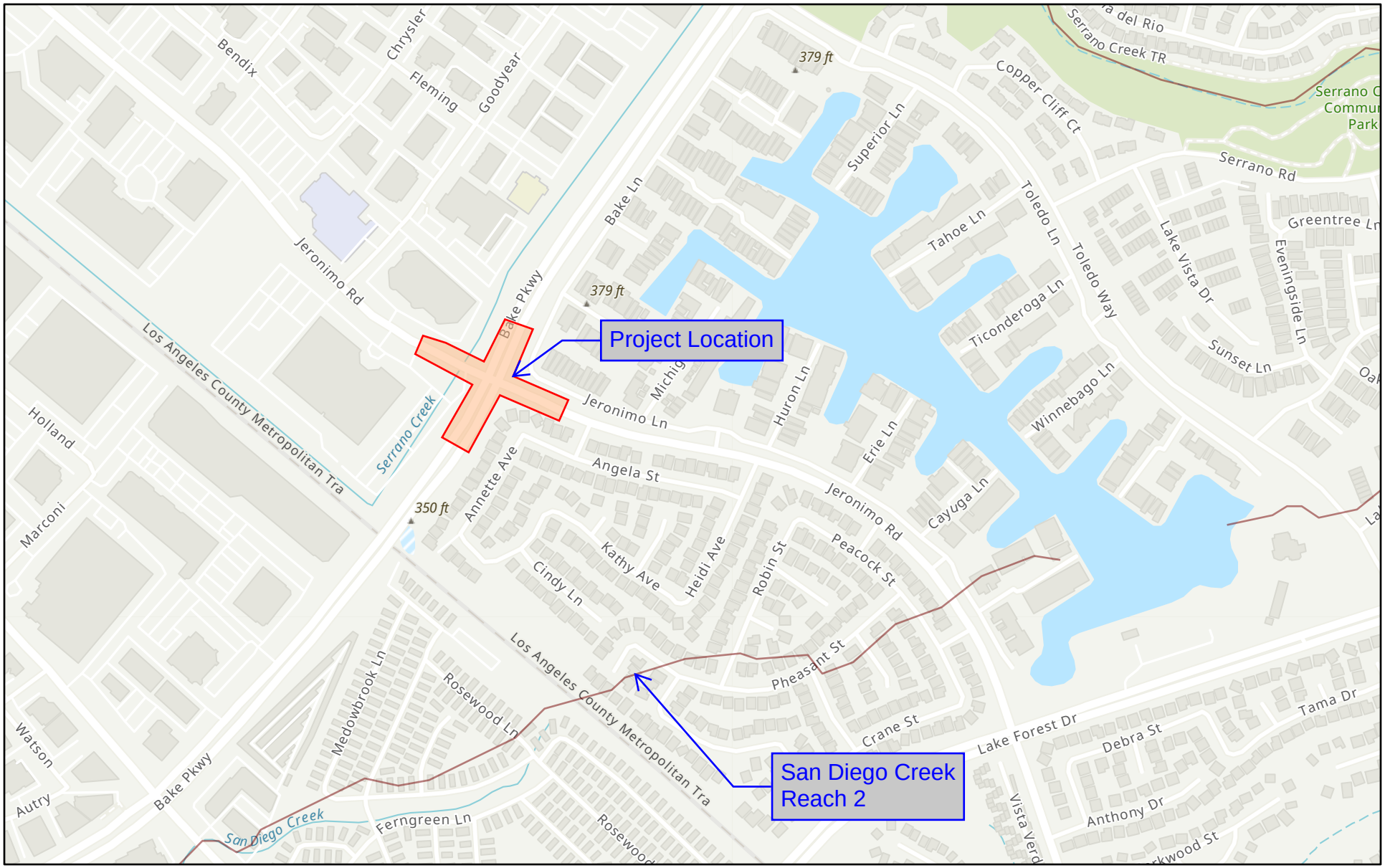
FIGURE
XVI-1

ATTACHMENT E

Impaired Waterbodies Map


San Diego Creek
Show search results for San Di...
Newport Bay, Upper
San Diego Creek Reach 1
Serrano Creek
Project Location
San Diego Creek Reach 2
Newport Bay, Lower
Garden Grove
Westminster
Colonia Manzanillo
Santa Ana
North Tustin
Tustin
Bolsa
Seal Beach National Wildlife Refuge
Santa Ana Gardens
Ocean View
Fountain Valley
South Santa Ana
Frances
Como
Irvine
Huntington Beach
Costa Mesa
Orange County Great Park (OCGP)
Lake Forest
El Toro
Laguna Woods
Cliff Haven
San Joaquin Hills
Pelican Hill
Laguna Coast Wilderness Park
Emerald Canyon
Aliso Viejo
Laguna Niguel
Ladera Ranch
Laguna Beach
Temple Hill
Limestone Canyon Regional Park
Whiting Ranch Wilderness Park
Irvine Lake
Esri, NASA, NGA, USG
2mi

303(d) Waters



11/17/2023

Impaired Lines

1:9,028

0 0.05 0.1 0.2 mi

0 0.1 0.2 0.4 km

ATTACHMENT F

Operations and Maintenance Plan

CONTECH® ENGINEERED SOLUTIONS

filterra® Bioretention Systems
A Growing Idea in Stormwater Filtration

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

Contech has created a network of Certified Maintenance Providers (CCMP's) to provide maintenance on Filterra systems. To find a CCMP in your area please visit www.conteches.com/maintenance

Filterra Owner's Manual

filterra®

Bioretention Systems

CONTECH®
ENGINEERED SOLUTIONS

This Owner's Manual applies to all precast Filterra Configurations, including Filterra Bioscape Vault.

filterra®
Bioretention Systems

Table of Contents

CONTECH®
ENGINEERED SOLUTIONS

Introduction

Thank you for your purchase of the Filterra® Bioretention System. Filterra is a specially engineered stormwater treatment system incorporating high performance biofiltration media to remove pollutants from stormwater runoff. The system's biota (vegetation and soil microorganisms) then further breakdown and absorb captured pollutants. All components of the system work together to provide a sustainable long-term solution for treating stormwater runoff.

The Filterra system has been delivered to you with protection in place to resist intrusion of construction related sediment which can contaminate the biofiltration media and result in inadequate system performance. These protection devices are intended as a best practice and cannot fully prevent contamination. It is the purchaser's responsibility to provide adequate measures to prevent construction related runoff from entering the Filterra system.

Included with your purchase is Activation of the Filterra system by the manufacturer as well as a 1-year warranty from delivery of the system and 1-year of routine maintenance (mulch replacement, debris removal, and pruning of vegetation) up to twice during the first year after activation.

Design and Installation

Each project presents different scopes for the use of Filterra systems. 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.

Activation Overview

Activation of the Filterra system is a procedure completed by the manufacturer to place the system into working condition. This involves the following items:

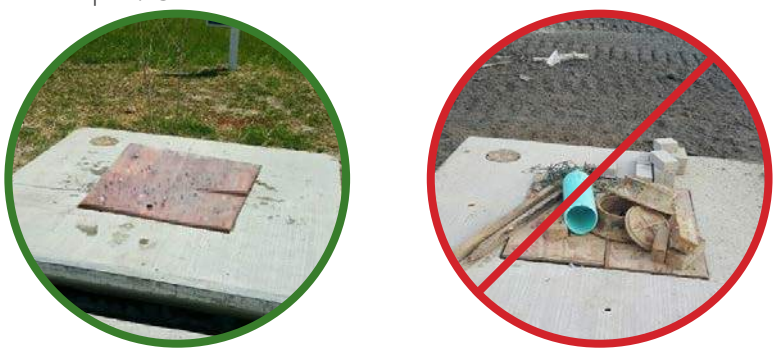
- Removal of construction runoff protection devices
- Planting of the system's vegetation
- Placement of pretreatment mulch layer using mulch certified for use in Filterra systems.

Activation MUST be provided by the manufacturer to ensure proper site conditions are met for Activation, proper installation of the vegetation, and use of pretreatment mulch certified for use in Filterra systems.

Minimum Requirements

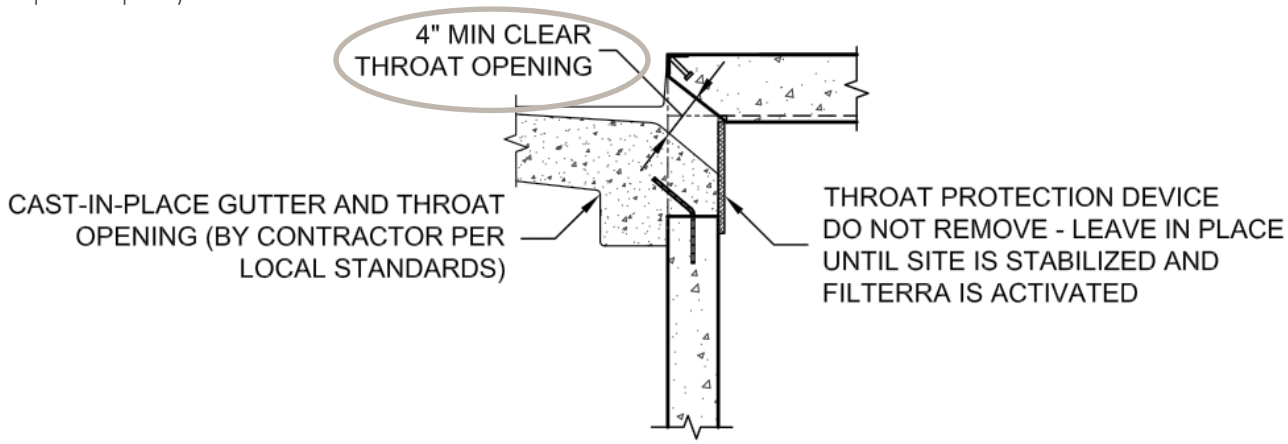
The minimum requirements for Filterra Activation are as follows:

1. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.



2. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Filterra system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Filterra system.

3. Where curb inlets are included as part of the Filterra system, Filterra throat opening should be at least 4" in order to ensure adequate capacity for inflow and debris.



An Activation Checklist is included on page 12 to ensure proper conditions are met for Contech to perform the Activation services. A charge of $500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation.

Filterra Plant Selection Overview

A Plant List is available on the Contech website highlighting recommended plants for Filterra systems in your area. Keep in mind that plants are subject to availability due to seasonality and required minimum size for the Filterra system. Plants installed in the Filterra system are container plants (max 15 gallon) from nursery stock and will be immature in height and spread at Activation.

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

The "Planting Requirements for Filterra Systems" document is included as an appendix and discusses proper selection and care of the plants within Filterra systems.

Warranty Overview

Refer to the Contech Engineered Solutions LLC Stormwater Treatment System LIMITED WARRANTY for further information. The following conditions may void the Filterra system's warranty and waive the manufacturer provided Activation and Maintenance services:

- Unauthorized activation or performance of any of the items listed in the activation overview
- Any tampering, modifications or damage to the Filterra system or runoff protection devices
- Removal of any Filterra system components
- Failure to prevent construction related runoff from entering the Filterra system
- Failure to properly store and protect any Filterra components (including media and underdrain stone) that may be shipped separately from the vault

Routine Maintenance Guidelines

With proper routine maintenance, the biofiltration media within the Filterra system should last as long as traditional bioretention media. Routine maintenance is included by the manufacturer on all Filterra systems for the first year after activation. This includes a maximum of 2 visits to remove debris, replace pretreatment mulch, and prune the vegetation. More information is provided in the Operations and Maintenance Guidelines. Some Filterra systems also contain pretreatment or outlet bays. Depending on site pollutant loading, these bays may require periodic removal of debris, however this is not included in the first year of maintenance, and would likely not be required within the first year of operation.

These services, as well as routine maintenance outside of the included first year, can be provided by certified maintenance providers listed on the Contech website. Training can also be provided to other stormwater maintenance or landscape providers.

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. Other reasons to maintain are:

- Avoiding legal challenges from your jurisdiction's maintenance enforcement program.
- Prolonging the expected lifespan of your Filterra media.
- Avoiding more costly media replacement.
- Helping 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 inlet. This may include trash, silt and leaves etc. which will be contained 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.

Maintenance visits are typically 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 provider 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) during the first year.

Exclusion of Services

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 (where applicable) 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, where applicable (up to 170 lbs each). If tree grate opening expansion is necessary, safety glasses/goggles and a 3lb or greater mini sledgehammer are required. 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 media bay size. Mulch should be a double shredded, hardwood variety. Some visits may require additional Filterra engineered soil media available from the Supplier.

Media Bay Length	Media Bay Width	Filter Surface Area (ft^2)	Volume at 3" (ft^3)	# of 2 ft^3 Mulch Bags
4	4	16	4	2
6	4	24	6	3
8	4	32	8	4
6	6	36	9	5
8	6	48	12	6
10	6	60	15	8
12	6	72	18	9
13	7	91	23	12

Other sizes not listed - 1 bag per 8 ft^2 of media.

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 (if applicable)	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 (if applicable) and erosion control stones

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

3. Removal of debris, trash and mulch

Record on Maintenance Report the following:

Silt/Clay	yes | no
Cups/ Bags	yes | no
Leaves	yes | no
Buckets Removed	_____

- After removal of mulch and debris, measure distance from the top of the Filterra engineered media soil to the top of the top slab. Compare the measured distance to the distance shown on the approved Contract Drawings for the system. Add Filterra media (not top soil or other) to bring media up as needed to distance indicated on drawings.

Record on Maintenance Report the following:

Distance to Top of Top Slab (inches)	_____
Inches of Media Added	_____

4. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 3".
- Refer to Filterra Mulch Specifications for information on acceptable sources.
- Ensure correct repositioning of erosion control stones by the Filterra inlet to allow for entry of trash during a storm event.
- Replace Filterra grates (if applicable) correctly using appropriate lifting or moving tools, taking care not to damage the plant.
- Where applicable, if 6" tree grate opening is too close to plant trunk, the grate opening may be expanded to 12" using a mini sledgehammer. Refer to instructions in Appendix 3.

5. Plant health evaluation and pruning or replacement as necessary

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

Record on Maintenance Report the following:

Height above top of Filterra Unit	_____ (ft)
Width at Widest Point	_____ (ft)
Health	healthy | unhealthy
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.				

Filterra Inspection & Maintenance Log

Filterra System Size/Model:_____**Location:** _____

Date	Mulch & Debris Removed	Depth of Mulch Added	Mulch Brand	Height of Vegetation Above Top of Vault	Vegetation Species	Issues with System	Comments
1/1/17	*5 – 5 gal Buckets*	*3"*	*Lowe's Premium Brown Mulch*	*4'*	*Galaxy Magnolia*	*- Standing water in downstream structure*	*- Removed blockage in downstream structure*

Appendix 1 – Filterra® Activation Checklist

Project Name: _____ Company: _____

Site Contact Name: _____ Site Contact Phone/Email: _____

Site Owner/End User Name: _____ Site Owner/End User Phone/Email: _____

Preferred Activation Date: _____ (provide 2 weeks minimum from date this form is submitted)

Site Designation	System Size	Final Pavement / Top Coat Complete	Landscaping Complete / Grass Emerging	Construction materials / Piles / Debris Removed	Throat Opening Measures 4" Min. Height	Plant Species Requested
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No ☐ N/A	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No ☐ N/A	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No ☐ N/A	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No ☐ N/A	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No ☐ N/A	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No ☐ N/A	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No ☐ N/A	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No ☐ N/A	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No ☐ N/A	

Attach additional sheets as necessary.

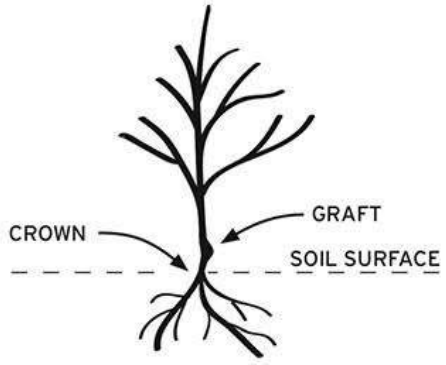
NOTE: A charge of $500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation. ONLY Contech authorized representatives can perform Activation of Filterra systems; unauthorized Activations will void the system warranty and waive manufacturer supplied Activation and 1st Year Maintenance.

_____ _____

Signature Date

Appendix 2 – Planting Requirements for Filterra® Systems

Plant Material Selection



- Select plant(s) as specified in the engineering plans and specifications.
- Select plant(s) with full root development but not to the point where root bound.
- Use local nursery container plants only. Ball and burlapped plants are not permitted.
- For precast Filterra systems with a tree grate, plant(s) must not have scaffold limbs at least 14 inches from the crown due to spacing between the top of the mulch and the tree grate. Lower branches can be pruned away provided there are sufficient scaffold branches for tree or shrub development.
- For precast Filterra systems with a tree grate, at the time of installation, it is required that plant(s) must be at least 6" above the tree grate opening at installation for all Filterra configurations. This DOES NOT apply to Full Grate Cover designs.
- Plant(s) shall not have a mature height greater than 25 feet.
- For standard 21" media depth, a 7 – 15 gallon container size shall be used. Media less than 21" (Filterra boxes only) may require smaller container plants.
- For precast Filterra systems, plant(s) should have a single trunk at installation, and pruning may be necessary at activation and maintenance for some with a tree grate of the faster growing species, or species known to produce basal sprouts.

Plant Installation

- During transport protect the plant foliage from wind and excessive jostling.
- Prior to removing the plant(s) from the container, ensure the soil moisture is sufficient to maintain the integrity of the root ball. If needed, pre-wet the container plant.
- Cut away any roots which are growing out of the container drain holes. Plants with excessive root growth from the drain holes should be rejected.
- Plant(s) should be carefully removed from the pot by gently pounding on the sides of the container with the fist to loosen root ball. Then carefully slide out. Do not lift plant(s) by trunk as this can break roots and cause soil to fall off. Extract the root ball in a horizontal position and support it to prevent it from breaking apart. Alternatively the pot can be cut away to minimize root ball disturbance.
- Remove any excess soil from above the root flare after removing plant(s) from container.
- Excavate a hole with a diameter 4" greater than the root ball, gently place the plant(s).
- If plant(s) have any circling roots from being pot bound, gently tease them loose without breaking them.
- If root ball has a root mat on the bottom, it should be shaved off with a knife just above the mat line.
- Plant the tree/shrub/grass with the top of the root ball 1" above surrounding media to allow for settling.
- All plants should have the main stem centered in the tree grate (where applicable) upon completion of installation.
- With all trees/shrubs, remove dead, diseased, crossed/rubbing, sharply crotched branches or branches growing excessively long or in wrong direction compared to majority of branches.
- To prevent transplant shock (especially if planting takes place in the hot season), it may be necessary to prune some of the foliage to compensate for reduced root uptake capacity. This is accomplished by pruning away some of the smaller secondary branches or a main scaffold branch if there are too many. Too much foliage relative to the root ball can dehydrate and damage the plant.
- Plant staking may be required.

Mulch Installation

- Only mulch that meets Contech Engineered Solutions' mulch specifications can be used in the Filterra system.
- Mulch must be applied to a depth of 3" evenly over the surface of the media.

Irrigation Requirements

- Each Filterra system must receive adequate irrigation to ensure survival of the living system during periods of drier weather.
- Irrigation sources include rainfall runoff from downspouts and/or gutter flow, applied water through the top/tree grate or in some cases from an irrigation system with emitters installed during construction.
- At Activation: Apply about one (cool climates) to two (warm climates) gallons of water per inch of trunk diameter over the root ball.
- During Establishment: In common with all plants, each Filterra plant will require more frequent watering during the establishment period. One inch of applied water per week for the first three months is recommended for cooler climates (2 to 3 inches for warmer climates). If the system is receiving rainfall runoff from the drainage area, then irrigation may not be needed. Inspection of the soil moisture content can be evaluated by gently brushing aside the mulch layer and feeling the soil. Be sure to replace the mulch when the assessment is complete. Irrigate as needed**.
- Established Plants: Established plants have fully developed root systems and can access the entire water column in the media. Therefore irrigation is less frequent but requires more applied water when performed. For a mature system assume 3.5 inches of available water within the media matrix. Irrigation demand can be estimated as 1" of irrigation demand per week. Therefore if dry periods exceed 3 weeks, irrigation may be required. It is also important to recognize that plants which are exposed to windy areas and reflected heat from paved surfaces may need more frequent irrigation. Long term care should develop a history which is more site specific.

** Five gallons per square yard approximates 1 inch of water Therefore for a 6' by 6' Filterra approximately 20-60 gallons of water is needed. To ensure even distribution of water it needs to be evenly sprinkled over the entire surface of the filter bed, with special attention to make sure the root ball is completely wetted. NOTE: if needed, measure the time it takes to fill a five gallon bucket to estimate the applied water flow rate then calculate the time needed to irrigate the Filterra. For example, if the flow rate of the sprinkler is 5 gallons/minute then it would take 12 minutes to irrigate a 6' by 6' filter.

Appendix 3 – Filterra® Tree Grate Opening Expansion Procedure

The standard grates used on all Filterra configurations that employ Tree Grates are fabricated with a 6″ opening that is designed with a breakaway section that can be removed, allowing the grate opening to be expanded to 12″ as the tree matures and the trunk widens.

The following tools are required to expand the opening:

- Mini sledgehammer (3 lb. or greater)
- Safety Glasses / Goggles

The following guidelines should be followed to properly expand the tree opening from 6″ to 12″:

1. Remove the grate from the Filterra frame, place it flat on a hard surface, and support the grate by stepping on the edge or using other weighted items such as a few mulch bags if this is being done during a Filterra maintenance event. Put on safety glasses/goggles. Align the mini sledgehammer as shown in the figure to the left. The head of the sledgehammer should be aimed just inside the wide cast iron bar between the larger grate section and the breakaway section.

2. Repeatedly hit the grate at this spot with the mini sledgehammer.

3. After several hits, the breakaway section should snap cleanly off of the larger grate section. Reinstall the grate into the Filterra grate frame. Recycle or dispose of the breakaway section per local guidelines.

CONTECH®
ENGINEERED SOLUTIONS

9025 Centre Pointe Drive, Suite 400
West Chester, OH 45069
info@conteches.com | 800-338-1122
www.ContechES.com

PDF 6/21

SECTION (_____)
Filterra® Bioscape Configuration
Bioretention System Standard Specification

1.0 GENERAL

1.1 This item shall govern the furnishing and installation of the Filterra® Bioscape Bioretention System by Contech Engineered Solutions LLC, complete and operable as shown and as specified herein, in accordance with the requirements of the plans and contract documents.

1.2 Contractor shall furnish all labor, materials, equipment and incidentals necessary to install and/or prepare the site for placement of the bioretention system, appurtenances and incidentals in accordance with the Drawings and as specified herein.

1.3 Bioretention system shall utilize the physical, chemical and biological mechanisms of an engineered biofiltration media, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The treatment system shall be a fully equipped, pre-constructed, drop-in-place unit designed for applications in the urban landscape to treat contaminated runoff from impervious surfaces.

1.4 Bioretention plants shall be incorporated into the system with plant material extending into the treatment zone of the engineered media at time of Activation.

1.5 The bioretention system shall be of a type that has been installed and in use for a minimum of five (5) consecutive years preceding the date of installation of the system. The Manufacturer shall have been, during the same consecutive five (5) year period, engaged in the engineering design and production of systems deployed for the treatment of storm water runoff and which have a history of successful production, acceptable to the Engineer of Record and/or the approving Jurisdiction. The Manufacturer of the Filterra Bioscape Bioretention System shall be, without exception:

Contech Engineered Solutions LLC
9025 Centre Pointe Drive
West Chester, OH, 45069
Tel: 1 800 338 1122

1.6 Applicable provisions of any Division shall govern work in this section.

1.7 Manufacturer or authorized supplier to submit shop drawings for bioretention system with engineered biofiltration media and accessory equipment. Drawings shall include principal dimensions, engineered biofiltration media placement, and location of piping.

1.7.1 Manufacturer or authorized supplier shall submit site preparation and installation instructions to the contractor.

1.7.2 Manufacturer or authorized supplier shall submit Operations and Maintenance Manual to the contractor.

1.7.3 Before installation of the bioretention system, Contractor shall obtain the written approval of the Engineer of Record for the system drawings.

1.8 No product substitutions shall be accepted unless submitted 10 days prior to project bid date, or as directed by the Engineer of Record. Submissions for substitutions require review and approval by the Engineer of Record, for hydraulic performance, impact to project designs, equivalent treatment performance, and any required project plan and report (hydrology/hydraulic, water quality, stormwater pollution) modifications that would be required by the approving jurisdictions/agencies. Contractor to coordinate with the Engineer of Record any applicable modifications to the project estimates of cost, bonding amount determinations, plan check fees for changes to approved documents, and/or any other regulatory requirements resulting from the product substitution.

2.0 MATERIALS

2.1 All system components including engineered biofiltration media, underdrain stone, PVC underdrain piping, and mulch must be included as part of the bioretention system and shall be provided by Contech Engineered Solutions LLC.

2.1.1 Engineered biofiltration media shall consist of both organic and inorganic components. Stormwater shall be directed to flow vertically through the media profile, saturating the full media profile without downstream flow control.

2.1.2 Underdrain stone shall be of size and shape to provide adequate bridging between the media and stone for the prevention of migration of fine particles. Underdrain stone must also be able to convey the design flow rate of the system without restriction and be approved for use in the Filterra Bioscape Bioretention System by Contech Engineered Solutions LLC.

2.1.3 PVC Underdrain Piping shall be SDR35 with perforation pattern designed to convey system design flow rate without restriction.

2.1.4 Mulch shall be double shredded wood or bark mulch approved for use with the Filterra Bioscape Bioretention System by Contech Engineered Solutions LLC.

2.2 Vegetation shall be provided by the contractor and comply with the type and size required by the site plans and shall be alive and free of obvious signs of disease.

2.3 Filterra Bioscape containment basin or structure shall be provided by the contractor in accordance with the Engineer of Record site plans.

3.0 PERFORMANCE

3.1 Treatment Capabilities shall be verified via third-party report following either TAPE or TARP protocols.

3.1.1 Engineered biofiltration media minimum treatment flow rate shall be 140"/hr. The system shall be designed to ensure that high flow events shall bypass the engineered biofiltration media preventing erosion and resuspension of

pollutants.

3.1.2 The system shall remove a minimum of 85% Total Suspended Solids (TSS).

3.1.3 The system shall remove a minimum of 62% Total Phosphorus (TP).

3.1.4 The system shall remove a minimum of 34% Total Nitrogen (TN).

3.2 Quality Assurance and Quality Control procedures shall be followed for all batches of engineered biofiltration media produced. Engineered biofiltration media shall be certified by the Manufacturer for performance and composition.

3.2.1 Media particle size distribution and composition shall be verified as per relevant ASTM Standards.

3.2.2 Media pollutant removal performance shall be verified as per relevant ASTM Standards as well as a minimum of one scientific method approved by the USEPA.

3.2.3 Media hydraulic performance shall be verified as per relevant ASTM Standards.

3.2.4 Media fertility shall be verified as per a minimum of one published scientific method.

3.3 The Manufacturer shall ensure through third party full scale field testing of installed units that the design flow rate of the system is not reduced over time. Studies shall be performed on a minimum of 10 systems of various ages, maintenance frequencies, and land uses. At least 80% of the tested systems shall have been installed 2.5 or more years. At least 50% of the systems shall have previous maintenance intervals greater than 2 times the manufacturer's recommendation.

4.0 EXECUTION

4.1 Contractor to prepare site for installation of the Filterra Bioscape Bioretention system as per the "Filterra Bioscape Activation Guide for Contractors" provided by the Manufacturer.

4.1.1 Excavation of basin or installation of Cast-in-Place vault for the placement of system components shall be completed by contractor

4.1.2 Inlet and outlet pipes shall be provided to the edge of the extents of the Engineered Media for connection of underdrain during system installation by contractor.

4.1.3 All bypass structures, piping, or other mechanisms should be installed and in place by contractor prior to Filterra Bioscape System Activation.

4.2 The bioretention system shall not be placed in operation (activated) until the project site is clean and stabilized (construction erosion control measures no longer required). The project site includes any surface that contributes storm drainage to the system. All impermeable

surfaces shall be clean and free of dirt and debris. All catch basins, manholes and pipes shall be free of dirt and sediment.

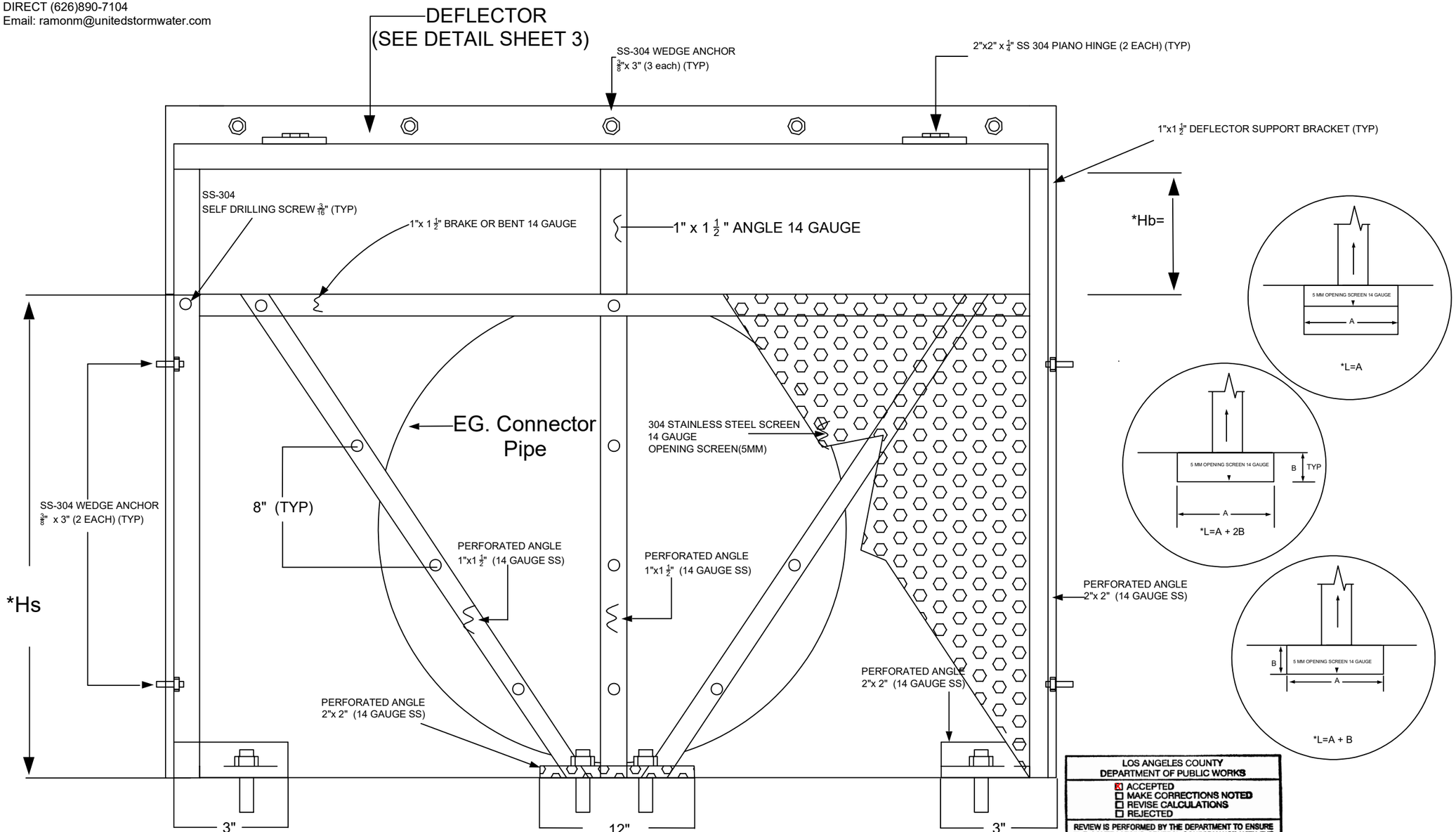
4.3 Activation consists of the placement of all system components identified in Section 2.1. Activation must be provided by the contractor under supervision by Contech Engineered Solutions, LLC, or a Contech certified 3rd Party Activation provider.

4.4 To ensure long term performance of the bioretention system, continuing annual maintenance programs should be performed or purchased by the owner per the latest Filterra Bioscape Bioretention System Operation and Maintenance manual.

CONNECTOR PIPE SCREEN (CPS)
MODEL USW-2M2 FIXED SCREEN WITH HINGED DEFLECTOR ACCESS

UNITED STORM WATER INC.
Protecting Our Water Resources

14000 E. VALLEY BLVD
CITY OF INDUSTRY, CA 91746
RAMON MENJIVAR
OFFICE (626)961-9326 FAX (626)-434-6994
DIRECT (626)890-7104
Email: ramonm@unitedstormwater.com



FRONT VIEW
SHOWN WITH DEFLECTOR CLOSED

LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC WORKS

- [x] ACCEPTED
- [ ] MAKE CORRECTIONS NOTED
- [ ] REVISE CALCULATIONS
- [ ] REJECTED

REVIEW IS PERFORMED BY THE DEPARTMENT TO ENSURE THE CONTRACTOR'S GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE SPECIFICATIONS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE CORRECTNESS OF DIMENSIONS, PROPER CONSTRUCTION AND INSTALLATION METHODS, AND FOR FULFILLING ALL CONTRACTUAL REQUIREMENTS. ACCEPTANCE INDICATED HEREON DOES NOT RELIEVE THE CONTRACTOR OF THESE OBLIGATIONS.

BY Steven Dickson DATE 03-01-22

General Notes

* SEE APPENDIX A-1
AND CPS SIZING TABLE 1&2

THIS MODEL FOR USE IN CATCH BASINS WHERE THERE IS 10" OR MORE CLEARANCE FROM BOTTOM OF TRAFFIC GRATE, OR CATCH BASIN DECK, TO TOP OF DEFLECTOR FOR MOSQUITO ABATEMENT ACTIVITIES.

No.	Revision/Issue	Date

Firm Name and Address

UNITED STORM WATER INC.
14000 E. Valley Blvd
City of Industry CA.91746

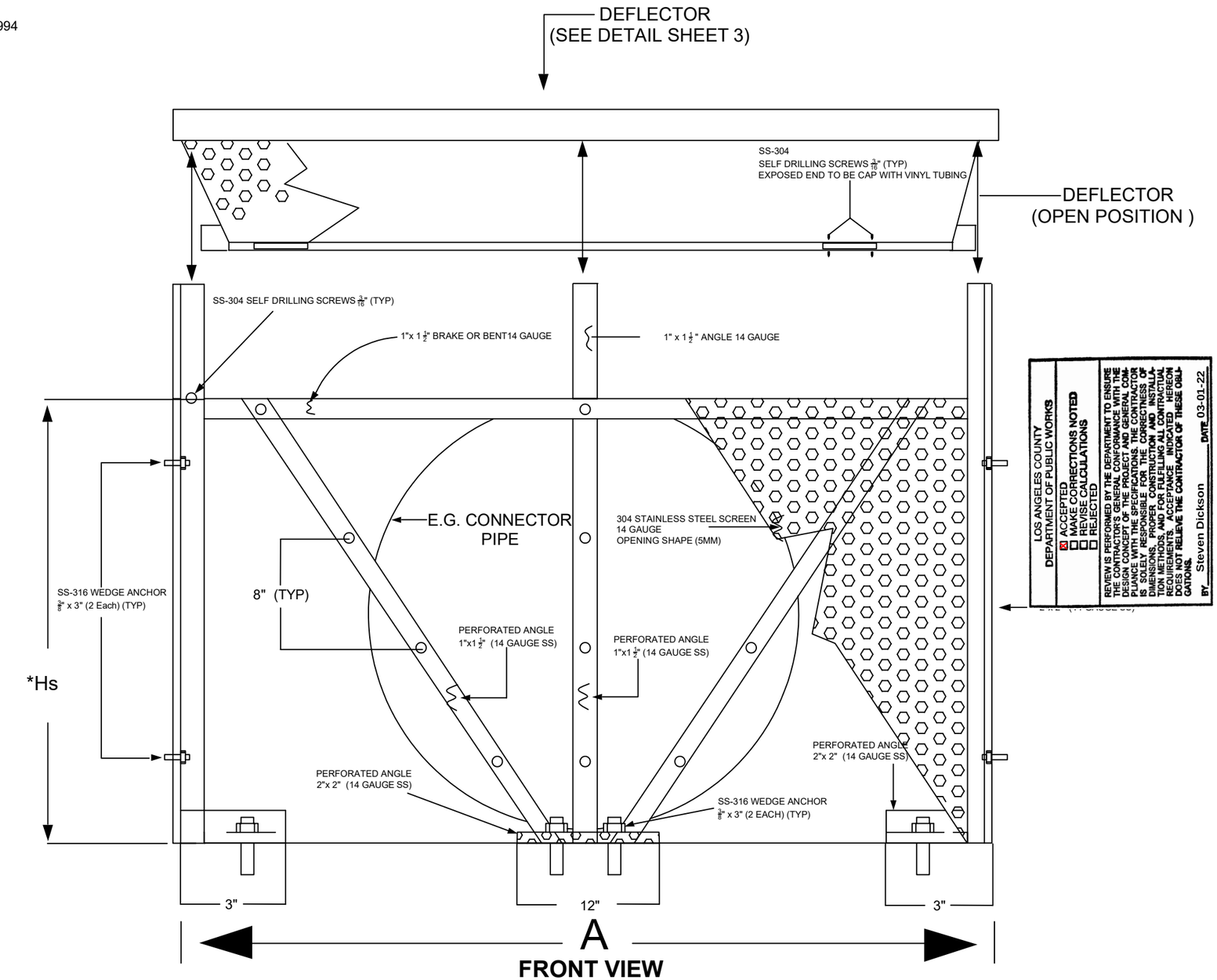
Project Name and Address

Project	USW-2M2
Date	10/10/2021
Scale	NOT TO SCALE
Sheet	1 of 5

UNITED STORM WATER, Inc.
Protecting Our Water Resources

14000 E. VALLEY BLVD
CITY OF INDUSTRY, CA 91746
RAMON MENJIVAR
OFFICE (626) 961-9326 FAX (626)434-6994
DIRECT (626) 890-7104
EMAIL: ramonm@unitedstormwater.com

CONNECTOR PIPE SCREEN (CPS)
MODEL USW-2M2 FIXED SCREEN WITH HINGED DEFLECTOR ACCESS



FRONT VIEW
SHOWN WITH DEFLECTOR OPEN

LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC WORKS
☒ ACCEPTED
☐ MAKE CORRECTIONS NOTED
☐ REVISE CALCULATIONS
☐ REJECTED

REVIEW IS PERFORMED BY THE DEPARTMENT TO ENSURE THE CONTRACTOR'S GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE SPECIFICATIONS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE CORRECT DIMENSIONS, PROPER CONSTRUCTION AND INSTALLATION METHODS, AND FOR FULFILLING ALL CONTRACTUAL REQUIREMENTS. ACCEPTANCE INDICATED HEREON DOES NOT RELIEVE THE CONTRACTOR OF THESE OBLIGATIONS.

BY Steven Dickson DATE 03-01-22

General Notes

* SEE APPENDIX A-1
AND CPS SIZING TABLE 1&2

THIS MODEL FOR USE IN CATCH BASINS WHERE THERE IS 10" OR MORE CLEARANCE FROM BOTTOM OF TRAFFIC GRATE, OR CATCH BASIN DECK, TO TOP OF DEFLECTOR FOR MOSQUITO ABATEMENT ACTIVITIES.

No.	Revision/Issue	Date

Firm Name and Address

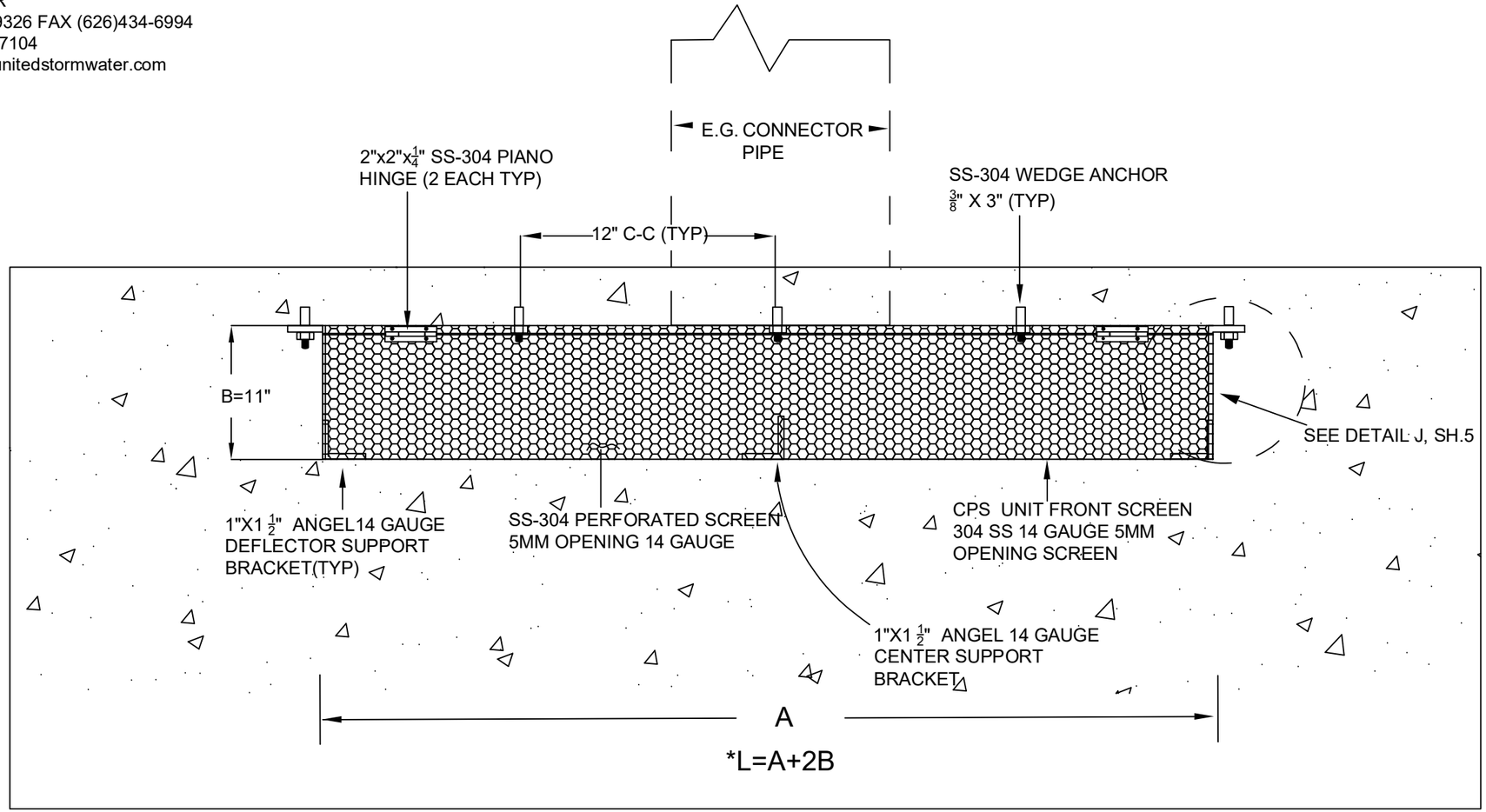
UNITED STORM WATER, Inc.
Protecting Our Water Resources
14000 E. VALLEY BLVD
CITY OF INDUSTRY CA.91746

Project Name and Address

Project	Sheet
USW-2M2	2 of 5
Date: 7/7/2022	
Scale: NOT TO SCALE	

CONNECTOR PIPE SCREEN (CPS)
MODEL USW-2M2 FIXED SCREEN WITH HINGED DEFLECTOR ACCESS

14000 E. VALLEY BLVD
CITY OF INDUSTRY, CA 91746
RAMON MENJIVAR
OFFICE (626)961-9326 FAX (626)434-6994
DIRECT (626)890-7104
EMAIL: ramonm@unitedstormwater.com



DEFLECTOR DETAIL
PLAN VIEW (SHEET 1)

LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC WORKS

- [X] ACCEPTED
- [ ] MAKE CORRECTIONS NOTED
- [ ] REVISE CALCULATIONS
- [ ] REJECTED

REVIEW IS PERFORMED BY THE DEPARTMENT TO ENSURE THE CONTRACTOR'S GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE SPECIFICATIONS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE CORRECTNESS OF DIMENSIONS, PROPER CONSTRUCTION AND INSTALLATION METHODS, AND FOR FULFILLING ALL CONTRACTUAL REQUIREMENTS. ACCEPTANCE INDICATED HEREON DOES NOT RELIEVE THE CONTRACTOR OF THESE OBLIGATIONS.

BY Steven Dickson DATE 03-01-22

General Notes

* SEE APPENDIX A-1 AND CPS SIZING TABLE 1 & 2

THIS MODEL FOR USE IN CATCH BASINS WHERE THERE IS 10" OR MORE CLEARANCE FROM BOTTOM OF TRAFFIC GRATE, OR CATCH BASIN DECK, TO TOP OF DEFLECTOR FOR MOSQUITO ABATEMENT ACTIVITIES.

No.	Revision/Issue	Date

Firm Name and Address

14000 E. VALLEY BLVD
CITY OF INDUSTRY, CA 91746

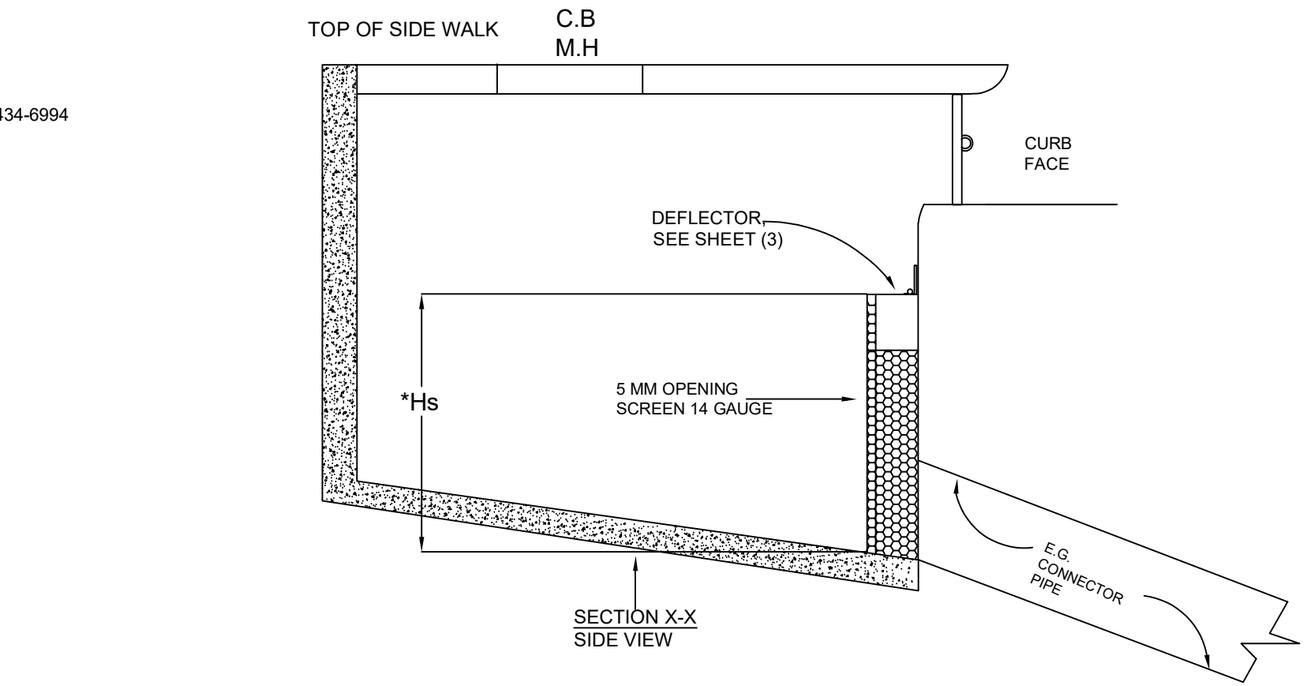
Project Name and Address

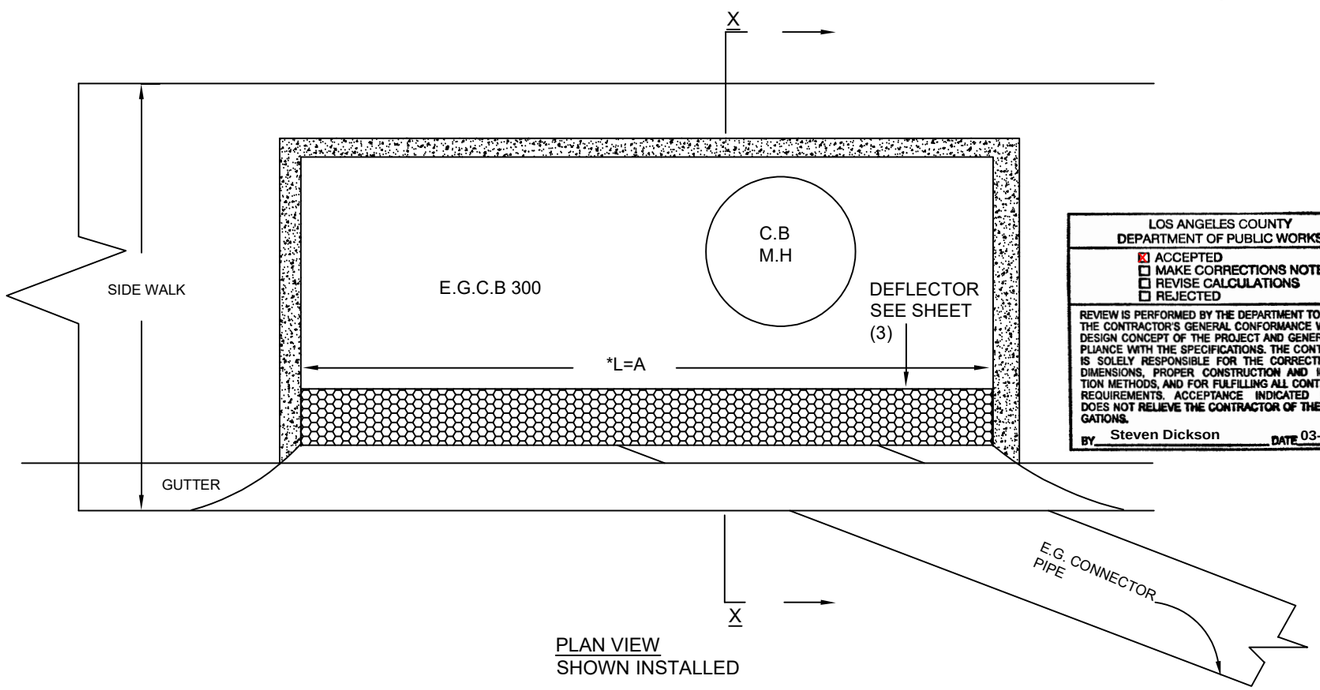
Project USW-2M2	Sheet 3 of 5
Date 10/10/2021	
Scale NOT TO SCALE	

UNITED STORM WATER INC.
Protecting Our Water Resources

14000 E. VALLEY BLVD
CITY OF INDUSTRY, CA 91746
RAMON MENJIVAR
OFFICE (626)961-9326 EXT 243 FAX (626)434-6994
DIRECT (626)890-7104
EMAIL:ramonm@unitedstormwater.com

CONNECTOR PIPE SCREEN (CPS)
MODEL USW-2M2 FIXED SCREEN WITH HINGED DEFLECTOR ACCESS





PLAN VIEW
SHOWN INSTALLED

*L=A

LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC WORKS

- [X] ACCEPTED
- [ ] MAKE CORRECTIONS NOTED
- [ ] REVISE CALCULATIONS
- [ ] REJECTED

REVIEW IS PERFORMED BY THE DEPARTMENT TO ENSURE THE CONTRACTOR'S GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE SPECIFICATIONS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE CORRECTNESS OF DIMENSIONS, PROPER CONSTRUCTION AND INSTALLATION METHODS, AND FOR FULFILLING ALL CONTRACTUAL REQUIREMENTS. ACCEPTANCE INDICATED HEREON DOES NOT RELIEVE THE CONTRACTOR OF THESE OBLIGATIONS.

BY Steven Dickson DATE 03-01-22

General Notes

* SEE APPENDIX A-1 AND APPENDIX B CPS SIZING TABLE1&2

THIS MODEL FOR USE IN CATCH BASINS WHERE THERE IS 10" OR MORE CLEARANCE FROM BOTTOM OF TRAFFIC GRATE, OR CATCH BASINS DECK, TO TOP OF DEFLECTOR FOR MOSQUITO ABATEMENT ACTIVITIES.

No.	Revision/Issue	Date

Firm Name and Address

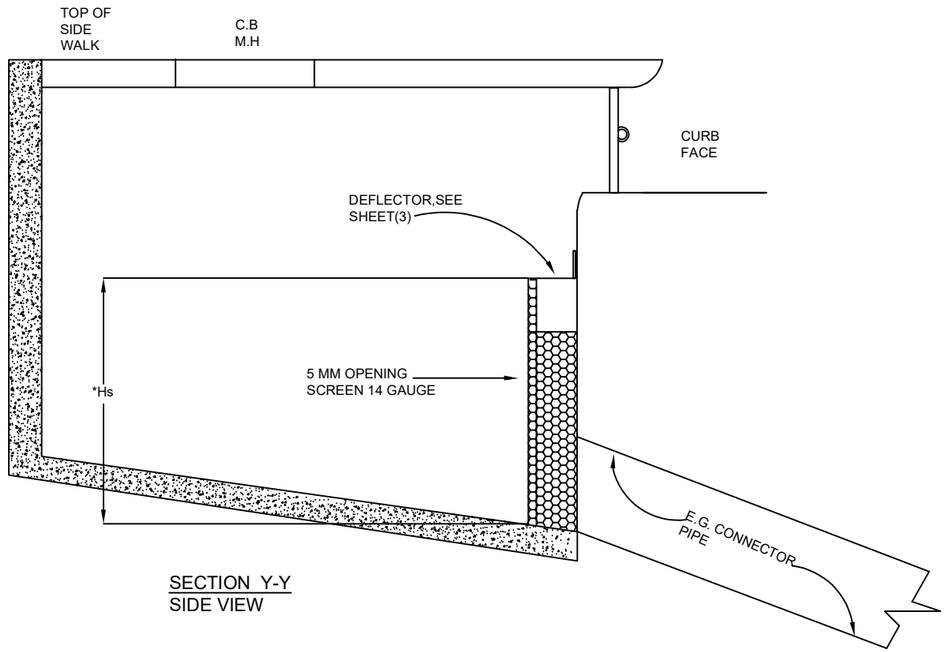
Project Name and Address

UNITED STORM WATER INC.
14000 E. VALLEY BLVD
CITY OF INDUSTRY CA 91746

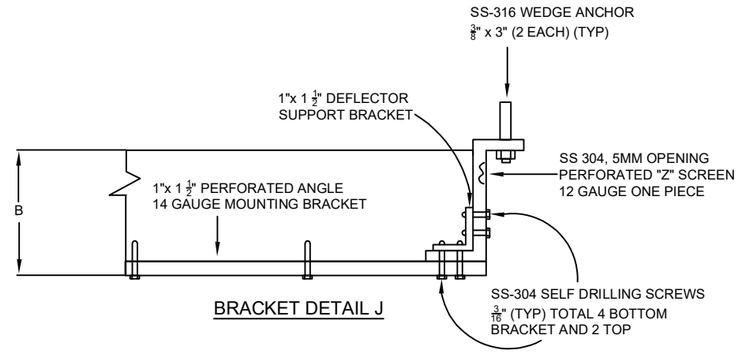
Project	Sheet
USW-2M2	4 of 5
Date: 10/10/2021	
Scale: NOT TO SCALE	

CONNECTOR PIPE SCREEN (CPS)
MODEL USW-2M2 FIXED SCREEN WITH HINGED DEFLECTOR ACCESS

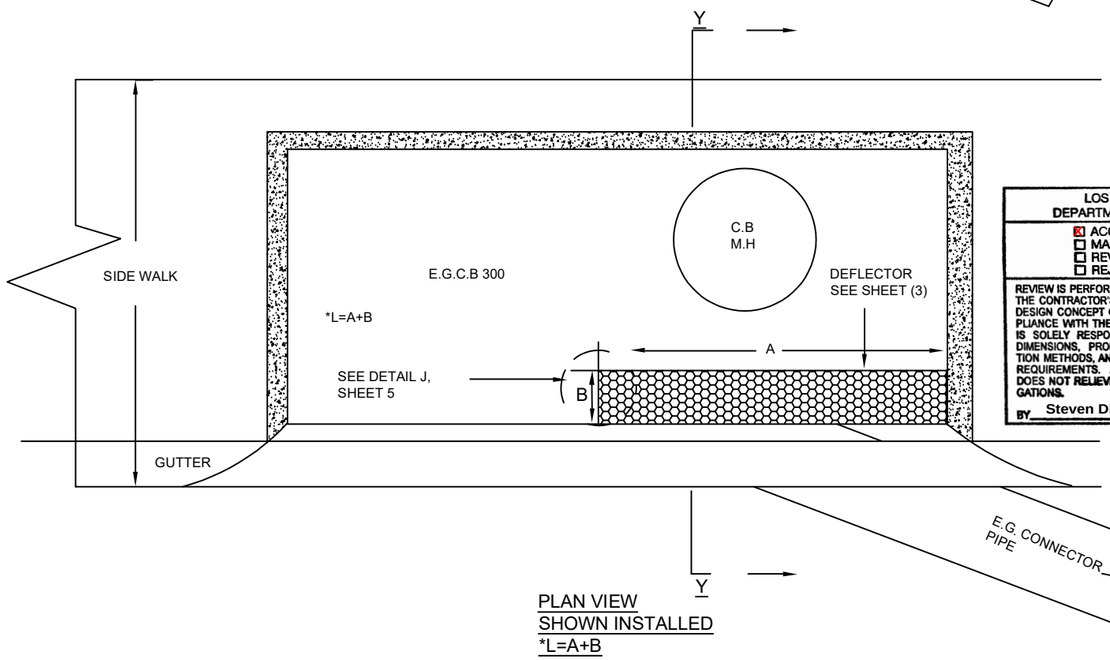
14000 E. VALLEY BLVD
CITY OF INDUSTRY,CA 91746
RAMON MENJIVAR
OFFICE (626)961-9326 Ext 243
DIRECT (626) 890-7104
EMAIL:ramonm@unitedstormwater.com



SECTION Y-Y
SIDE VIEW



BRACKET DETAIL J



PLAN VIEW
SHOWN INSTALLED
*L=A+B

LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC WORKS

- [X] ACCEPTED
- [ ] MAKE CORRECTIONS NOTED
- [ ] REVISE CALCULATIONS
- [ ] REJECTED

REVIEW IS PERFORMED BY THE DEPARTMENT TO ENSURE THE CONTRACTOR'S GENERAL CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND GENERAL COMPLIANCE WITH THE SPECIFICATIONS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR THE CORRECTNESS OF DIMENSIONS, PROPER CONSTRUCTION AND INSTALLATION METHODS, AND FOR FULFILLING ALL CONTRACTUAL REQUIREMENTS. ACCEPTANCE INDICATED HEREON DOES NOT RELIEVE THE CONTRACTOR OF THESE OBLIGATIONS.

BY Steven Dickson DATE 03-01-22

General Notes

* SEE APPENDIX A-1 AND APPENDIX B CPS SIZING TABLE

** BOTH LEGS OF DEFLECTOR SUPPORT BRACKET MUST EXTEND TO THE TOP OF THE DEFLECTOR AND ALSO EXTEND AT LEAST TO THE BOTTOM OF THE MOUNTING BRACKET

THIS MODEL FOR USE IN CATCH BASINS WHERE THERE IS 10" OR MORE CLEARANCE FROM BOTTOM OF TRAFFIC GRATE, OR CATCH BASIN DECK, TO TOP OF DEFLECTOR FOR MOSQUITO ABATEMENT ACTIVITIES.

No.	Revision/Issue	Date

Firm Name and Address

UNITED STORM WATER INC.
14000 E. VALLEY BLVD
CITY OF INDUSTRY, CA 91746

Project Name and Address

Project USW-2M2	Sheet 5 OF 5
Date 10/10/2021	
Scale Not to Scale	