PRELIMINARY WATER QUALITY MANAGEMENT PLAN (WQMP)

DANA POINT HARBOR REVITALIZATION PLAN

PLANNING AREAS 1 & 2

Dana Point, California

Prepared For
County of Orange
OC Dana Point Harbor Department
24650 Dana Point Harbor Drive
Dana Point, CA 92629
(949) 923-2236

Prepared By
Fuscoe Engineering, Inc.
16795 Von Karman, Suite 100
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949.474.1960
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Project Manager:
Raymond Tokihiro, Principal

Date Prepared: August 26, 2013
Date Revised: March 14, 2014
Job Number: 307.08.01

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March 14, 2014

307.08.01

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WQ 13-XXXX

County of Orange/San Diego Region

PRELIMINARY WATER QUALITY MANAGEMENT PLAN (PWQMP)

Project Name:

DANA POINT HARBOR REVITALIZATION PLAN

PLANNING AREAS 1 & 2

Prepared for:

County of Orange
OC Dana Point Harbor Department
24650 Dana Point Harbor Drive
Dana Point, CA 92629
(949) 923-2236

Prepared by:

FUSCOE ENGINEERING, INC.
16975 Von Karman, Suite 100
Irvine, CA 92606
949.474.1960
Contact: Raymond Tokihiro

Date Prepared: August 26, 2013
Date Revised: March 14, 2014

PROJECT OWNER'S CERTIFICATION			
Planning Application No. (If applicable)	TBD	**Grading Permit No.**	TBD
Tract/Parcel Map and Lot(s) No.		**Building Permit No.**	TBD
Address of Project Site and APN	South of Golden Lantern and Dana Point Harbor Drive Dana Point, CA 92629 APNs: 682-022-07, -09, -12, -16, -17, -20, -22		

This Water Quality Management Plan (WQMP) has been prepared for the County of Orange by Fuscoe Engineering, Inc. The WQMP is intended to comply with the requirements of the City of Dana Point Local Implementation Plan (LIP) and Storm Water/Surface Runoff Water Quality Ordinance, as well as the Municipal Separate Storm Sewer System (MS4) Permit, Order R9-2009-0002, requiring the preparation of the plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan , including the ongoing operation and maintenance of all best management practices (BMPs), and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current City LIP 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 San Diego Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

OWNER:			
Title			
Company	County of Orange – OC Dana Point Harbor Department		
Address	24650 Dana Point Harbor Drive Dana Point, CA 92629		
Email			
Telephone #	949.923.2236		
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.			
Owner Signature		**Date**	

PREPARER (ENGINEER):			
Title		**PE Registration #**	
Company	Fuscoe Engineering, Inc.		
Address	16795 Von Karman, Suite 100, Irvine, CA 92606		
Email			
Telephone #	949.474.1960		
I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R9-2009-0002/NPDES No. CAS0108740, of the San Diego Regional Water Quality Control Board.			
Preparer Signature:		**Date**	
Place Stamp Here			

CONTENTS

SECTION I PERMIT(S) AND WATER QUALITY CONDITIONS OF APPROVAL OR ISSUANCE

PROJECT INFORMATION			
Permit/Application No. (if applicable)	Pending	**Grading or Building Permit No. (If applicable)**	Pending
Address of Project Site (or Tract Map and Lot Number if no address) and APN	South of Golden Lantern and Dana Point Harbor Drive Dana Point, CA 92629 APNs: 682-022-07, -09, -12, -16, -17, -20, -22		
WATER QUALITY CONDITIONS OF APPROVAL OR ISSUANCE			
Water Quality Conditions of Approval or Issuance applied to this project. (Please list verbatim.)	Pending. To be provided in the Final WQMP.		
WATERSHED-BASED PLAN CONDITIONS			
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	TMDL for Bacteria indicators/pathogens, adopted in February 2010.		
CONCEPTUAL WQMP			
Was a Conceptual Water Quality Management Plan previously approved for this project?	A conceptual WQMP, or Program WQMP, was approved in 2006 for the Dana Point Harbor Revitalization Plan, which included a WQMP Amendment for Planning Areas 1 and 2. Due to changes to the site plan and the water quality goals of the Dana Point Harbor Revitalization Plan, this WQMP will serve as the Preliminary WQMP for the project instead of the previously grandfathered Conceptual WQMP Amendment developed and approved in 2006. The water quality goals of the Dana Point Harbor Revitalization Plan are to comply with the 2011 Model WQMP and Technical Guidance Document requirements for incorporating low impact development (LID) principles in its design, where feasible.		

SECTION II PROJECT DESCRIPTION

II.1 Project Description

The proposed Dana Point Harbor Revitalization Plan for Planning Areas 1 & 2 project site encompasses approximately 37.7 acres in the City of Dana Point. The project site is bounded by Dana Point Harbor Drive to the north, Puerto Place to the east, the Pacific Ocean to the south, and Casitas Place to the west. A Vicinity Map is included in Section VI.

<table>
<tr><th colspan="3">DESCRIPTION OF PROPOSED PROJECT</th></tr>
<tr><td>Development Category (Verbatim from WQMP):</td><td colspan="2">1. New development projects that create 10,000 square feet or more of impervious surface. This category includes commercial, industrial, residential housing subdivisions, mixed-use, and public projects on private or public property that falls under the planning and building authority or the Permittees.
3. Restaurants where the land area of development is 5,000 square feet or more including parking area. This category is defined as facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812), where the land area for development is greater than 5,000 square feet.
6. Parking lots 5,000 square feet or more, or parking lots with 15 parking spaces or more, including associated drive aisle, and potentially exposed to urban stormwater runoff. A parking lot is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce.
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.
8. All significant redevelopment projects, where significant redevelopment is defined as the addition of 5,000 or more square feet of impervious surface on an already developed site, and the existing development or redevelopment project falls under another Priority Project Category.</td></tr>
<tr><td>Project Area (ft^2):
1,642,212 ft^2 or 37.7 Ac</td><td>Number of Dwelling Units: N/A</td><td>SIC Code: 5812, 5399, 4493</td></tr>
<tr><td>Narrative Project Description:</td><td colspan="2">The proposed Planning Areas 1 and 2 project site is an approximately 37.7-acre parcel in the City of Dana Point, CA. The Planning Areas are part of the Dana Point Harbor Revitalization Plan and are owned and operated by the County of Orange. Planning Area 1 is approximately 17.4 acres, which includes portions of Dana Point Harbor Drive and</td></tr>
</table>

	Puerto Place. Planning Area 2 is roughly 18.7 acres, which also includes a portion of Casitas Place and Dana Point Harbor Drive. This WQMP also covers a 1.6-acre parking lot section of Planning Area 3. The project site is bounded by Dana Point Harbor Drive to the north and the marina waters to the south. Planning Area 1 extends from Doheny Beach (at Puerto Place) west to Embarcadero Place. From Embarcadero Place, Planning Area 2 continues west past Street of the Golden Lantern where the project limits end at Casitas Place (see Site Plan in Section VI of this Preliminary WQMP). Currently, the site is occupied by boat storage parking areas, automotive parking lots, restaurant and retail buildings, and a boat maintenance yard. The existing boat storage and automotive parking lots are paved with asphalt and are surrounded by concrete curb and gutters. The retail and restaurant buildings are one to two stories in height, with wood frame construction and conventional foundations. There is minimal landscaping within the subject property. The proposed redevelopment activities plan to reconfigure the existing retail, restaurant, office, and parking spaces within Planning Areas 1 and 2. Businesses will remain open during construction, which will be phased to provide access to these businesses. A building and parking summary is provided in Section VI. A total of 138,200 square feet of retail, office, and restaurant space will be provided, where existing conditions currently provide 135,258 square feet of tenant space. Planning Area 1 will include the removal of existing buildings and structures and a portion of the existing parking lot to construct a new 50,000 ft^2 Dry Boat Storage Building with an attached Office/Retail space and maintenance canopy. The boat storage building will be built partially out over the existing bay, cantilevered on piles and will contain an automated crane to transport boats from the bay to their storage locations. Due to concerns with metals impairment in the Harbor (303(d) listed for copper and zinc), the piles will be constructed of pre-stressed concrete rather than steel piles employing sacrificial cathodic protection for pile corrosion. The pre-stressed concrete piles will not require sacrificial cathodic protection to prevent pile degradation. The maintenance canopy will be located along the southeast side of the Dry Boat Storage Building. The current access road to the Marine Services Area, Embarcadero Place will be removed, with a new entrance constructed along Puerto Place. The layout of the parking lots will also be reconfigured, with removal and replacement of sections due to their present poor condition, and to incorporate pervious pavement for LID and water quality treatment via infiltration of storm water runoff. The

existing boat launch ramp and shipyard will be protected in-place.

Planning Area 2 will involve minor exterior improvements to existing buildings and surrounding landscaping within Dana Wharf. However, the southern portion of Building 5 will be demolished and removed while Building 4 will receive an addition along its north side. Buildings 1 through 5 will then be upgraded with new siding and stone accents and new roofs. Restaurant buildings will be provided with new grease interceptors and existing delivery areas and trash enclosure areas within the Wharf area will be removed and replaced.

The existing buildings with the Mariners Village area will be demolished and removed to allow construction of a new three-story Retail/Office building (Building 6), three new two-story Retail/Restaurant buildings (Buildings 7, 8, and 9), two new one-story Restaurant buildings (Buildings 10 and 11), a new two-story Locker/Public Restroom building (Building 12), and a two level parking structure (Parking Deck P1). In addition, a parking podium (Podium P2) will be constructed between the parking structure and Buildings 6, 7, and 8 and will create drive aisles, drop-off-areas, and parking spaces along the north sides of the buildings. The upper level of the podium will wrap between and around the buildings to create elevated outdoor seating decks along the south sides of the buildings. A ramp supported by retaining walls will lead up to the podium from Street of the Golden Lantern. The second levels of Buildings 6 and 7 will also be connected by a pedestrian bridge that will be constructed over the Dana Wharf access driveway.

Other changes to the Dana Wharf and Mariners Village areas will consist of almost the complete removal of existing Street of the Golden Lantern and its replacement with a ramped driveway and podium structure. New concrete walkways, stairways, patios and site walls will be constructed around the new buildings. In addition, Casitas Place and the walkway along the south side of Dana Point Harbor Drive will be widened and the layout of the existing parking lots will be revised. Due to their poor existing condition, it is likely that the existing parking lot and drive aisle pavement sections will need to be removed and replaced with new sections, and also to incorporate pervious pavement for LID and storm water runoff treatment, where feasible.

Planning Area 1, the Marine Services area, will have 495 dry boat storage spaces, 336 vehicle with trailer parking spaces, and 309 automobile parking spaces. Planning Area 2, which is comprised of the Commercial Core and Wharf Areas, will have a total of 1,706 automobile parking spaces, 690 of which will be in the form of the new multi-level parking structure.

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Project Area	Pervious Surface		Impervious Surface	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	3.8 acres	10%	33.9 acres	90%
Post-Project Conditions	3.8 acres	10%	33.9 acres	90%
Drainage Patterns/Connections	Under proposed conditions, five proposed storm drain lines will collect and convey runoff from Planning Areas 1 and 2 to the Pacific Ocean. Generally, surface runoff will flow in a southerly direction towards the harbor waters. Curb and gutters will direct flows towards LID BMPs (permeable pavement and proprietary bioretention systems) located throughout the property for low flow storm water runoff treatment prior to discharging into the proposed storm drain system. See the Preliminary WQMP Exhibit in Section VI for details. Storm drain line A collects runoff from the majority of Planning Area 2 west of Street of the Golden Lantern. This includes Casitas Place, the surface parking lots, and the new ramped driveway into the Harbor. It also includes runoff from proposed Buildings 9, 10, and 11. Three underground detention facilities are proposed in this area to match post-development peak flows to pre-development runoff rates. Ultimately, all collected runoff is discharged into the East Marina through an existing 15-inch outfall through the quay seawall. Storm drain line B collects runoff from the central portion of Planning Area 2. This includes part of the west parking lot, Building 12 and its surrounding landscaping, and the southern portion of the ramped driveway. Storm drain line B ultimately ties into an existing 60-inch storm drain that conveys upstream off-site drainage from the City of Dana Point. The co-mingled runoff will then discharge into the East Marina through an existing outfall along the quay seawall just south of Building 9. Storm drain line C collects runoff from the eastern half of Planning Area 2. This is primarily comprised of Dana Wharf, as well as Buildings 7 and 8 in Mariners Village. An underground detention facility will be located adjacent to the proposed multi-level parking structure for peak flow runoff control. Ultimately, all collected runoff is discharged into the East Marina through an existing 15-inch storm drain outfall through the quay seawall as with Lines A and B. Storm drain line D collects runoff from the majority of Planning Area 1, which includes the boat launch, surface parking lot and storage area, the			

	northern half of the proposed Dry Boat Storage Building, and a small portion of Puerto Place. Line D also collects runoff from the proposed parking structure in Planning Area 2 and will include an underground detention system for peak flow runoff control. The boat wash down area, however, is plumbed to the sewer. Line D ultimately outlets into East Marina via a new 42-inch outfall adjacent to the boat launch. It is worth noting that an existing 18-inch storm drain that conveys runoff from the City of Dana Point underneath Planning Area 1 will be truncated and joined to Line D. Therefore, offsite runoff will comingle with on-site runoff in Line D. Storm drain line E collects runoff from the southeast portion of Planning Area 1, which includes the southern half of the Dry Boat Storage Building and parking area. The boat repair maintenance area is plumbed to the sewer and is under canopy, so it does not receive any contact with precipitation. Line E ultimately outlets into East Marina via an existing 15-inch outfall.

II.2 Potential Storm Water Pollutants

The table below, derived from Table 2 of the Countywide Model WQMP Technical Guidance Document (December 2011), summarizes the categories of land use or project features of concern and the general pollutant categories associated with them.

POLLUTANTS OF CONCERN			
Pollutant	**Check One: E=Expected to be of concern**	**N=Not Expected to be of concern**	**Additional Information and Comments**
Bacteria and Viruses	E ☒	N ☐	TMDL for Pacific Ocean Shoreline, Dana Point HSA.
Metals	E ☒	N ☐	
Nutrients	E ☒	N ☐	
Pesticides	E ☒	N ☐	
Organic Compounds	E ☒	N ☐	

Sediments	E ☒	N ☐	
Trash and Debris	E ☒	N ☐	
Oxygen-Demanding Substances	E ☒	N ☐	
Oil and Grease	E ☒	N ☐	

II.3 Hydrologic Conditions of Concern

The purpose of this section is to identify any hydrologic conditions of concern (HCOC) with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. As specified in Section 2.3.3 of the 2011 Model WQMP, projects must identify and mitigate any HCOCs. A HCOC is a combination of upland hydrologic conditions and stream biological and physical conditions that presents a condition of concern for physical and/or biological degradation of streams.

Is the proposed project potentially susceptible to hydromodification impacts?

☐ **Yes** ☒ **No**

HYDROLOGIC CONDITIONS OF CONCERN (HCOCS)
The proposed Dana Point Harbor Revitalization Plan for Planning Areas 1 and 2 are considered exempt from hydromodification requirements. All existing and proposed storm drain lines serving the project site, storm drain lines A through E, discharge directly into the Pacific Ocean at the Harbor's sea wall. Therefore, there are no hydrologic conditions of concern for the proposed project.

II.4 Post Development Drainage Characteristics

See Section II.1 for details, under Drainage Patterns/Connections.

II.5 Property Ownership/Management

Public Streets	Puerto Place – County of Orange Casitas Place – County of Orange Dana Point Harbor Drive (Not a Part) – County of Orange/City of Dana Point
Landscaped Areas	County of Orange

Open Space (Slopes)	County of Orange
Easements	Pacific Telephone and Telegraph Company; Dana Point Sanitary District
Buildings	County of Orange
Storm Drain	County of Orange
Structural BMPs	County of Orange

The Owner, OC Dana Point Harbor Department, shall assume all BMP maintenance and inspection responsibilities for the proposed project. Inspection and maintenance responsibilities are outlined in Section V of this report.

SECTION III SITE DESCRIPTION

III.1 Physical Setting

Planning Area/ Community Name:	Dana Point Harbor
Location/Address	South of Golden Lantern and Dana Point Harbor Drive Dana Point, CA 92629
Land Use	Harbor Marine Land; Visitor/Recreation Commercial
Zoning	DPHPC
Acreage	37.7
Predominant Soil Type	D
Impervious Conditions	Existing: 10% Proposed: 10% Due to its preliminary stage in design, impervious estimates are based on the project's land use category, as referenced in the OC Hydrology Manual. As landscape plans are further developed, a more accurate assessment of impervious conditions will be provided in the Final WQMP.

III.2 Site Characteristics

Precipitation Zone	0.80
Topography	The majority of the site is relatively flat and level and drains by sheet flow towards the south to existing storm drain catch basins. There is an approximately 5-foot high slope between the boat storage parking lot and Street of the Golden Lantern, a 5- to 10-foot high slope along the north side of the boat storage parking lot adjacent to Dana Point Harbor Drive, and 1- to 10-foot high slopes along the east and west sides of Embarcadero Place. In addition, there are minor slopes less than 5 feet in height within the southwest portion of the site between the existing retail buildings and automotive parking lots. Elevations within the site range from a high of approximately 25 feet above mean sea level within the northern portion of the site to a low of approximately 6 feet above mean sea level within the southern portion of the site. The majority of the site is covered by either asphalt pavement or concrete flatwork; however, there are planter and landscape areas that contain flowers, groundcover, shrubs, and

	occasional trees.
Drainage Patterns/Connections	There are currently two major pipe outfalls within Planning Areas 1 and 2. The easternmost storm drain pipe, an 18-inch reinforced concrete pipe (RCP), discharges runoff from an area near the harbor and its surrounding bluffs. The larger storm drain pipe, a 60-inch RCP (county facility L00P01) discharges runoff from a storm drain network that extends much further inland and includes part of the surrounding city. These two existing storm drains service only a small portion of Planning Areas 1 and 2. In Planning Area 2, the project area west of Street of the Golden Lantern (Mariner's Village Facilities) sheet flows in a southward direction towards and into the waters of the East Marina. The project area east of Street of the Golden Lantern (Launch Ramp Parking Lot) sheet flows in a southeasterly direction and enters the harbor waters at the boat launch ramp. The area south of the boat launch ramp sheet flows northwest and discharges offsite into the waters of the East Marina. In Planning Area 1 east of Embarcadero Place, the northeast portion of the project area (Marina Services) sheet flows southwest and discharges into the harbor waters north of the boat launch ramp. The remaining southern portion of Planning Area 1 (Embarcadero Parking Lot) sheet flows northwest and enters into the harbor waters east of the boat launch ramp.
Soil Type, Geology, and Infiltration Properties	Soil boring logs (DH-5, DH-7, DH-10, DH-11, and DH-16) were obtained by GMU Geotechnical Inc. in July 2013 and indicate that the site is underlain by approximately 15 to 20 feet of engineered fill overlying bedrock materials of the Capistrano Formation. The fill materials are highly variable and consist of intermixed layers of silts, clays, silty sands and clayey sands while the bedrock materials consist of hard to very hard and massive sandstones with occasional thick layers of moderately hard to hard claystones and siltstones. As a result of the 15 to 20 feet of engineered fill, there appears to be an infiltration zone above the underlying bedrock classified as HSG D that could potentially be utilized for infiltration BMPs, where feasible. Infiltration testing was performed within the site in general accordance with the Santa Ana Regional Water Quality Control Board Technical Guidance Document (TGD) Appendices dated March 2011, utilizing the shallow percolation test procedure contained in Section VII.3.8. The holes were drilled to depths of 3 to 4 feet and infiltration was monitored from depths ranging from approximately 2 to 4 feet below grade which correspond to the infiltration zone of a potential infiltration system. The results of the infiltration testing indicate infiltration rates ranging from 0.57 to 1.18 inches per hour with an average rate of 0.83 inches per hour. This is the

	measured infiltration rate used for the project. A safety factor of 2.19 was applied to this rate, giving a design infiltration rate of 0.38 inches/hour (see Worksheed H in Attachment E). With this opportunity for infiltration, it was confirmed with the geotechnical engineer that there will not be any compaction of soil below the subgrade of any pervious pavement sections proposed and the tested infiltration rates will be preserved and not be affected by construction activities.
Hydrogeologic (Groundwater) Conditions	Groundwater was encountered within drill holes and CPT soundings at elevations that primarily ranged from 8 feet below mean sea level (MSL) to 6 feet above MSL (depths of 8 to 14 feet below existing grades). However, within one of our CPT soundings (CPT-6), groundwater was encountered at a depth of only 5 feet below existing grade. This is likely due to the proximity of the CPT sounding to the adjacent boat launch ramp and due to high tide conditions at the time the test was taken. Historical high groundwater is 5 feet below ground surface, based on the Seismic Hazard Zone Report for the Dana Point Quadrangle (CDMG, 2001). Groundwater elevations across the site are controlled by the elevation of the water within the adjacent bay but are also somewhat influenced by the pre-development topography, with lower elevations found closest to the seawalls. It should be noted that the groundwater elevations measured during exploration were affected by the time of day as it relates to the local tidal cycle, and therefore should be assumed to fluctuate with the tides, the lunar cycle, and recent rainfall events.
Geotechnical Conditions (relevant to infiltration)	With groundwater depths of 8 to 14 feet bgs, a 5-foot minimum separation for infiltration BMPs, such as pervious pavement, appears feasible for a large portion of the site, with the exception of the area south of the Boat Launch Ramp as it was tested at 5 feet bgs. Separation requirements from infiltration BMPs and the groundwater table is primarily a concern for groundwater quality as a source of drinking water supply. This is not a concern for the proposed project, as groundwater within the project limits is attributed to saltwater/sea water intrusion. Separation distances are, thus, not applicable unless it affects the infiltration capacity of the proposed BMP. Therefore, shallow infiltration BMPs are recommended to remain above the groundwater table, but the separation can be less than 5 feet. Groundwater mounding effects are discussed in Section IV.3.2 of this WQMP and it has been determined that mounding potential would not affect the clearance of infiltration BMPs from the groundwater table. With infiltration practices in coastal areas, sea level rise is a potential concern. Research projects that sea levels on the Southern California coast will rise five to twenty-four inches above 2000 levels by 2050 (National

	Research Council of the National Academies, 2012). It should also be noted that sea level rise projections are characterized by substantial uncertainty. Therefore, it is difficult to plan for and predict impacts cause by this phenomenon. Nevertheless, the design of shallow infiltration BMPs proposed for the project will factor this into consideration. Currently, proposed infiltration BMPs will have an average design storage depth of 2 feet (or 3 feet for the entire porous paver section), which provides adequate separation from the groundwater table of approximately 5 feet at its shallowest point. Should sea level rise as projected over future decades, proposed infiltration BMPs will maintain adequate separation from groundwater. Moreover, in the case of pervious pavement, the design storage depth can be adjusted to a shallower depth (i.e. 2 feet to 1 foot) should the need arise, as there is ample parking lot surface area to convert to pervious pavement in the future to offset the reduction in storage depth.
Off-Site Drainage	All off-site drainage from the City of Dana Point bypasses Planning Areas 1 and 2 via the existing 60-inch and 18-inch storm drain lines that run underneath the property. The 60-inch storm drain conveys approximately 234 acres of upstream drainage, while the 18-inch storm drain conveys 4.6 acres from the City of Dana Point. A small portion of surface flow from the intersection of Street of the Golden Lantern and Dana Point Harbor Drive, approximately 3,500 square feet, drains into the property.
Utility and Infrastructure Information	Existing utilities and infrastructure include sewer, water, storm drain, power, and gas. They are currently in use as the site is operational and occupied. Approximately 95% of existing utilities and infrastructure will be removed and replaced as part of the proposed project's redevelopment.

III.3 Watershed Description

Receiving Waters	Pacific Ocean Shoreline, Dana Point HSA
303(d) Listed Impairments	Copper, Toxicity, Zinc. Listed in 2010, with potential sources being urban runoff/storm sewers and marinas & recreational boating.
Applicable TMDLs	TMDL for Bacteria indicators/pathogens, which was adopted in February 2010.
Pollutants of Concern for the Project	Sediments, nutrients, heavy metals, pathogens, pesticides, oil & grease, toxic organic compounds, trash & debris.
Hydrologic Conditions of Concern	None. This project directly discharges into the Pacific Ocean. Refer to Section II.3
Environmentally Sensitive and Special Biological Significant Areas	Dana Point Harbor is designated as an Environmentally Sensitive Area in the City of Dana Point Local Implementation Plan (LIP).

SECTION IV BEST MANAGEMENT PRACTICES (BMPS)

IV.1 Project Performance Criteria

Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?

☐ Yes ☒ No

PROJECT PERFORMANCE CRITERIA	
Hydromodification Control Performance Criteria **(Model WQMP Section 7.II-2.4.2.2)**	If a hydrologic condition of concern (HCOC) exists, priority projects must implement the following criteria by comparing the predevelopment (naturally occurring) and post-project flow rates and duration using a continuous simulation hydrologic model: ▪ For flow rates from ten percent of the two-year storm event to the five-year storm event, the post-project peak flows shall not exceed predevelopment (naturally occurring) peak flows. ▪ For flow rates from the five-year storm event to the ten-year storm event, post-project peak flows may exceed predevelopment (naturally occurring) flows by up to ten percent for a one-year frequency interval.
LID Performance Criteria **(Model WQMP Section 7.II-2.4.3)**	Infiltrate, harvest and use, evapotranspire, or biotreat/biofilter, the 85th percentile, 24-hour storm event (Design Capture Volume). LID BMPs must be designed to retain, on-site, (infiltrate, harvest and use, or evapotranspire) storm water runoff up to 80 percent average annual capture efficiency. A properly designed biotreatment system may only be considered if infiltration, harvest and use, and evapotranspiration (ET) cannot be feasibly implemented for the full design capture volume. In this case, infiltration, harvest and use, and ET practices must be implemented to the greatest extent feasible and biotreatment may be provided for the remaining design capture volume.
Treatment Control BMP Performance Criteria **(Model WQMP Section 7.II-3.2.2)**	If LID performance criteria have not been met through retention and biotreatment, the Project shall participate in the LID Waiver Program (see Section 7.II- 3.3) and treatment control BMPs shall be provided prior to discharge to Waters of the US. Sizing of treatment control BMP(s) shall be based on either: ▪ The unmet volume as calculated in TGD Appendix VI. Treatment control sizing, or ▪ If no controls have been provided upstream of treatment control BMPs, permit based sizing criteria may be used: • Capture and infiltrate, filter, or treat 80 percent of average annual runoff volume, OR

	• Capture and infiltrate, filter, or treat the runoff from the 24-hour, 85th percentile storm event, as determined from the County of Orange's 85th Percentile Precipitation Isopluvial Map and draw down the stored volume in no more than 48 hours following the end of precipitation, OR • Treat the maximum flow rate of runoff produced by the 85th percentile hourly rainfall intensity, as determined from the local historical rainfall record, multiplied by a factor of two, OR • The maximum flow rate of runoff produced from a rainfall intensity of 0.2 inch of rainfall per hour, for each hour of a storm event.
LID Design Storm Capture Volume	DCV = C × d × A × 43560 sf/ac × 1/12 in/ft Where: *DCV = design storm capture volume, cu-ft* *C = runoff coefficient = (0.75 × imp + 0.15)* *Imp = impervious fraction of drainage area (ranges from 0 to 1)* *d = storm depth (inches)* *A = tributary area (acres)* Imp = 0.90 d = 0.80 inches A = 31.09 acres (excludes Dana Point Harbor Drive) DCV = (0.75 x 0.90 +0.15) x 0.8 x 31.09 ac x 43560 sf/ac x 1/12 in/ft = 74,485 ft^3

IV.2 Site Design and Drainage Plan

The following section describes the site design BMPs used in this project and the methods used to incorporate them. Careful consideration of site design is a critical first step in storm water pollution prevention from new developments and redevelopments.

IV.2.1 Site Design BMPs

Minimize Impervious Area

The project proposes to incorporate permeable concrete pavers and pervious concrete for hardscape throughout the site, where feasible.

Maximize Natural Infiltration Capacity

The project proposes to incorporate permeable concrete pavers and pervious concrete for hardscape throughout the site, where feasible, to promote infiltration of storm water runoff.

Preserve Existing Drainage Patterns and Time of Concentration

Drainage patterns of the project site will, more or less, resemble existing conditions. Peak flow runoff will be detained on-site to match pre-development flows in order to utilize existing outfalls to discharge project runoff downstream.

Disconnect Impervious Areas

Impervious areas drain to pervious surfaces, such as landscaping or pervious hardscape, prior to discharging into storm drain, where feasible.

Protect Existing Vegetation and Sensitive Areas, and Revegetate Disturbed Areas

There are no vegetated surfaces or sensitive areas to preserve on the property. The area is completely built-out. Existing eucalyptus trees along Dana Point Harbor Drive, however, will be preserved.

Xeriscape Landscaping

All trees, shrubs, vines, ground cover, and potted plant materials proposed have a water use classification value of very low water use (VL) and low water use (L). Turf grasses proposed have a medium water use (M) classification. Overall, the site will utilize drought tolerant, native plant species throughout.

IV.2.2 Drainage Management Areas

In accordance with the MS4 permit and the new Model WQMP, the Design Capture Volumes (DCVs) presented in the following table represent the minimum volume of storm water runoff required to be treated by LID and/or treatment control BMPs for the proposed project. The total DCV noted in the table represents the treatment requirement for all of the development areas. Preliminary footprints and depths required by each BMP are summarized in the following sections. Detailed calculations are provided in Attachment A.

Hydrologically, there are 5 major drainage areas for the project site. Each drainage area is delineated by the tributary areas to the 5 storm drain outfalls of Planning Areas 1 and 2, noted as storm drain Lines A, B, C, D, and E. Please note that the numbering for the project's 45 DMAs do not necessarily correlate with the 5 drainage area designations for hydrology.

DRAINAGE MANAGEMENT AREAS								
Drainage Area or BMP Name	Drainage Area (ac)	% impervious	Runoff Coefficient	Design Storm Depth[1] (in)	Average 2-year Tc (min)	Intensity[2] (in/hr)	DCV (ft^3)	Q_{LID} (cfs)
1	1.29	90	0.83	0.80	5	0.26	3,091	0.277

DRAINAGE MANAGEMENT AREAS								
Drainage Area or BMP Name	Drainage Area (ac)	% impervious	Runoff Coefficient	Design Storm Depth[1] (in)	Average 2-year Tc (min)	Intensity[2] (in/hr)	DCV (ft^3)	Q_{LID} (cfs)
2	0.61	90	0.83	0.80	5	0.26	1,461	0.131
3	0.87	90	0.83	0.80	5	0.26	2,084	0.187
4	0.19	90	0.83	0.80	5	0.26	455	0.041
5	0.79	90	0.83	0.80	5	0.26	1,893	0.169
6	0.78	90	0.83	0.80	5	0.26	1,869	0.167
7	0.33	90	0.83	0.80	5	0.26	791	0.071
8	0.44	90	0.83	0.80	5	0.26	1,054	0.094
9	0.34	90	0.83	0.80	5	0.26	815	0.073
10	0.97	90	0.83	0.80	5	0.26	2,324	0.208
11	1.06	90	0.83	0.80	5	0.26	2,540	0.227
12	0.70	90	0.83	0.80	5	0.26	1,677	0.150
13	0.27	90	0.83	0.80	5	0.26	647	0.058
14	0.08	90	0.83	0.80	5	0.26	192	0.017
15	0.08	90	0.83	0.80	5	0.26	192	0.017
16	0.31	90	0.83	0.80	5	0.26	743	0.066
17	0.94	90	0.83	0.80	5	0.26	2,252	0.202
18	0.77	90	0.83	0.80	5	0.26	1,845	0.165
19	0.43	90	0.83	0.80	5	0.26	1,030	0.092
20	2.97	90	0.83	0.80	5	0.26	7,116	0.637
21	0.47	90	0.83	0.80	5	0.26	1,126	0.101
22	0.72	90	0.83	0.80	5	0.26	1,725	0.154
23	1.27	90	0.83	0.80	5	0.26	3,043	0.272
24	0.29	90	0.83	0.80	5	0.26	695	0.062
25	0.77	90	0.83	0.80	5	0.26	1,845	0.165
26	0.32	90	0.83	0.80	5	0.26	767	0.069
27	3.95	90	0.83	0.80	5	0.26	9,463	0.847
28	1.21	00	0.15	0.80	5	0.26	527	0.047
29	0.43	90	0.83	0.80	5	0.26	1,030	0.092
30	0.49	90	0.83	0.80	5	0.26	1,174	0.105

DRAINAGE MANAGEMENT AREAS								
Drainage Area or BMP Name	Drainage Area (ac)	% impervious	Runoff Coefficient	Design Storm Depth[1] (in)	Average 2-year Tc (min)	Intensity[2] (in/hr)	DCV (ft^3)	Q_{LID} (cfs)
31	0.14	90	0.83	0.80	5	0.26	335	0.030
32	0.36	90	0.83	0.80	5	0.26	862	0.077
33	0.51	90	0.83	0.80	5	0.26	1,222	0.109
34	0.55	90	0.83	0.80	5	0.26	1,318	0.118
35	0.45	90	0.83	0.80	5	0.26	1,078	0.097
36	0.34	90	0.83	0.80	5	0.26	815	0.073
37	1.15	90	0.83	0.80	5	0.26	2,755	0.247
38	0.22	90	0.83	0.80	5	0.26	527	0.047
39	1.10	90	0.83	0.80	5	0.26	2,635	0.236
40	0.43	90	0.83	0.80	5	0.26	1,030	0.092
41	0.36	90	0.83	0.80	5	0.26	862	0.077
42	0.63	90	0.83	0.80	5	0.26	1,509	0.135
43	0.12	90	0.83	0.80	5	0.26	287	0.026
44	0.32	90	0.83	0.80	5	0.26	767	0.069
TOTAL	**30.82**						**71,468**	**6.396**

Notes:
1. Per Figure XVI-1 of the Model WQMP Technical Guidance Document (2011, December 16). See also Attachment A.
2. Per Figure III.4 of the Model WQMP Technical Guidance Document (2011, December 16). See also Attachment A.

IV.3 LID BMP Selection and Project Conformance Analysis

Low Impact Development (LID) BMPs are required in addition to site design measures and source controls to reduce pollutants in storm water discharges. LID BMPs are engineered facilities that are designed to retain or biotreat runoff on the project site. The 4th Term MS4 Storm Water Permit (Order R9-2009-0002) requires the evaluation and use of LID features using the following hierarchy of treatment: infiltration, evapotranspiration, harvest/reuse, and biotreatment. The following sections summarize the LID BMPs proposed for the project in accordance with the permit hierarchy and performance criteria outlined in Section IV.1.

IV.3.1 Hydrologic Source Controls (HSCs)

Hydrologic source controls (HSCs) can be considered to be a hybrid between site design practices and LID BMPs. HSCs are distinguished from site design BMPs in that they do not reduce the tributary area or reduce the imperviousness of a drainage area; rather they reduce the runoff volume that would result from a drainage area with a given imperviousness compared to what would result if HSCs were not used.

HYDROLOGIC SOURCE CONTROLS		
ID	**Name**	**Included?**
HSC-1	Localized on-lot infiltration	☐
HSC-2	Impervious area dispersion (e.g. roof top disconnection)	☐
HSC-3	Street trees (canopy interception)	☐
HSC-4	Residential rain barrels (not actively managed)	☐
HSC-5	Green roofs/Brown roofs	☐
HSC-6	Blue roofs	☐
HSC-7	Impervious area reduction (e.g. permeable pavers, site design)	☐

HSCs are not utilized for the project, as the above-listed categories of HSCs that are used on the project have been designed as infiltration BMPs, such as permeable pavers. Therefore, they were not assessed as HSCs.

However, the landscape area in DMA 28 has been determined to be self-retaining, as this area is entirely pervious (landscape) with no upstream tributary drainage. With a DCV of 139 ft^3 over 0.32 acres (13,939 ft^2), a retention depth of 0.1 inch would be needed to retain the DCV.

IV.3.2 Infiltration BMPs

Infiltration BMPs are LID BMPs that capture, store and infiltrate storm water runoff. These BMPs are engineered to store a specified volume of water and have no design surface discharge (underdrain or outlet structure) until this volume is exceeded. Examples of infiltration BMPs include infiltration trenches, bioretention without underdrains, drywells, permeable pavement, and underground infiltration galleries.

INFILTRATION		
ID	**Name**	**Included?**
INF-3 INF-4	Bioretention Without Underdrains	☐
	Rain Gardens	☐
	Porous Landscaping	☐
	Infiltration Planters	☐
	Retention Swales	☐

INFILTRATION		
ID	**Name**	**Included?**
INF-2	Infiltration Trenches	☐
INF-1	Infiltration Basins	☐
INF-5	Drywells	☐
INF-7	Subsurface Infiltration Galleries	☒
--	French Drains	☐
INF-6	Permeable Asphalt	☐
	Permeable Concrete	☒
	Permeable Concrete Pavers	☒
	Other:	☐

Based on infiltration tests performed by GMU Geotechnical Inc., documented in their July 19, 2013 report, percolation rates and groundwater depths show that shallow infiltration BMPs is permissible but is not presumed to be feasible for the entire DCV. The results of the infiltration testing indicate infiltration rates ranging from 0.57 to 1.18 inches per hour with an average rate of 0.83 inches per hour. This average infiltration rate was used as the design infiltration rate for BMPs, with a safety factor of 2.19 applied. The resultant infiltration rate used was 0.38 inches per hour for a conservative design approach.

Due to groundwater depths ranged primarily between 8 to 14 feet bgs, shallow infiltration BMPs were considered feasible. One boring (CPT-6) south of the boat launch area showed groundwater as shallow as 5 feet bgs and, therefore, in DMAs where infiltration constraints existed, the DCV was routed to other locations where infiltration was more favorable. This included routing to permeable pavement sections downstream of the DMA or routing to underground infiltration galleries located below proposed underground detention facilities. In doing so, the entire DCV for Planning Areas 1 and 2 is treated through infiltration via permeable pavement (INF-6) and underground infiltration galleries (INF-7).

For both proposed infiltration BMP types, groundwater mounding potential was evaluated to ensure that the bottom of proposed permeable pavement sections and underground infiltration galleries had enough clearance to remain above mounded groundwater elevations. Mounding estimates ranged from 0.209 feet to 1.419 feet, which provided sufficient separation for the proposed infiltration BMPs. Details are provided in Attachment E.

PERMEABLE PAVEMENT (INF-6)

Shallow permeable pavement sections are proposed throughout the parking areas of Planning Area 1 and 2, as well as along the pedestrian promenade in the Commercial Core. Permeable pavement, such as

permeable pavers and porous concrete, provides a surface suitable for light-loads and parking areas in which water can drain through pore spaces to an underlying rock reservoir (approximately 24" deep) underneath. The sub-surface base allows for physical and microbial filtering processes to take place, thereby removing pollutants such as particulates, organics, hydrocarbons, and total suspended sediments, including heavy metals. Several permeable pavement areas will also have piped-in flows directly into the underlying rock reservoir. Pre-treatment BMPs will be incorporated for those facilities to prevent premature clogging of the BMP.

The permeable pavement areas will consist of layers of pavers or porous concrete, geotechnical fabric, bedding course, and clean non-compacted aggregate base approximately 2 feet deep. The rock reservoir, with an approximate 40% porosity, allows for storm water runoff to be temporarily stored before infiltrating into the underlying soil. With a total section depth of approximately 3 feet, the permeable pavement will have adequate separation (at least 5 feet) from the groundwater table.

UNDERGROUND INFILTRATION GALLERY (INF-7)

There are 6 proposed underground infiltration gallery (UIG) BMPs for the project. These UIGs have been utilized where site constraints prevented the use of permeable pavement BMPs, such as along high traffic roadways and dense building clusters. Unlike permeable pavement, UIGs have storm water runoff piped directly into the rock reservoir beneath the pavement or hardscape. For three of the UIGs, they will be situated beneath proposed flood control detention facilities. As with permeable pavement, the rock reservoir of the UIG allows for physical and microbial filtering processes to take place, thereby removing pollutants such as particulates, organics, hydrocarbons, and total suspended sediments, including heavy metals. Primary treatment, however, occurs through infiltration into the underlying soils.

The UIGs will consist of geotechnical fabric and clean non-compacted aggregate base of varying depths. The rock reservoir, with an approximate 40% porosity, allows for storm water runoff to be temporarily stored before infiltrating into the underlying soil. Pre-treatment BMPs to remove gross pollutants and course sediments will be incorporated to prevent premature clogging of the BMP.

In accordance with the MS4 permit and the new Model WQMP, the Design Capture Volumes (DCVs) presented in the following table represent the minimum volume of storm water runoff required to be treated by LID and/or treatment control BMPs for the proposed project. Due to the shallow design depths, the infiltration BMPs will drain in less than 48 hours, and therefore the BMPs were sized utilizing the Capture Efficiency, Constant Drawdown BMP sizing methodology to achieve the target capture efficiency of 80%. For the purposes of the design calculations, a design infiltration rate of 0.38 inch per hour was utilized by applying a 2.19 safety factor to the measured infiltration rate. A drawdown time of approximately 25.3 hours would be achieved with most of the infiltration BMPs, as they are designed with 2.0 foot rock reservoir depth, providing an effective depth of 0.8 feet. Results are summarized in the following table based on preliminary footprints and depths required by each BMP. Detailed calculations are provided in Attachment A.

INFILTRATION BMP SUMMARY									
Drainage Management Area	% Impervious	Original Design Storm Depth[1] (in)	80% Capture Efficiency Design Storm Depth[2] (in)	Drainage Area (ac)	80% Capture Efficiency DCV (ft^3)	Infiltration BMP Type	Minimum Footprint Required (ft^2)	BMP Footprint Provided (ft^2)	80% Capture Efficiency DCV Met?
1	90%	0.80	0.64	1.29	2,225	UIG 1	*3,477*	*7,872**	YES
2	90%	0.80	0.8	0.61	1,169	Permeable Paver	*1,461*	*2,220*	YES
3	90%	0.80	0.8	0.87	1,667	Permeable Paver	*2,084*	*3,078*	YES
4	90%	0.80	0.64	0.19	328	UIG 1	*512*	*7,872**	YES
5	90%	0.80	0.8	0.79	1,514	Permeable Paver	*1,893*	*2,865*	YES
6	90%	0.80	0.8	0.78	1,495	Permeable Paver	*1,869*	*3,143*	YES
7	90%	0.80	1.52	0.33	791	UIG 3	*520*	*5,790**	YES
8	90%	0.80	1.52	0.44	1,054	UIG 3	*694*	*5,790**	YES
9	90%	0.80	0.96	0.34	717	Permeable Paver	*747*	*857*	YES
10	90%	0.80	0.8	0.97	1,859	Permeable Paver	*2,324*	*3,404*	YES
11	90%	0.80	0.8	1.06	2,032	Permeable Paver	*2,540*	*4,010*	YES
12	90%	0.80	1.52	0.70	1,677	UIG 3	*1,103*	*5,790**	YES

INFILTRATION BMP SUMMARY									
Drainage Management Area	% Impervious	Original Design Storm Depth[1] (in)	80% Capture Efficiency Design Storm Depth[2] (in)	Drainage Area (ac)	80% Capture Efficiency DCV (ft^3)	Infiltration BMP Type	Minimum Footprint Required (ft^2)	BMP Footprint Provided (ft^2)	80% Capture Efficiency DCV Met?
13	90%	0.80	0.64	0.27	466	UIG 1	*728*	*7,872**	YES
14	90%	0.80	0.64	0.08	138	UIG 1	*216*	*7,872**	YES
15	90%	0.80	0.64	0.08	138	UIG 1	*216*	*7,872**	YES
16	90%	0.80	0.64	0.31	535	UIG 1	*836*	*7,872**	YES
17	90%	0.80	1.52	0.94	2,252	UIG 3	*1,482*	*5,790**	YES
18	90%	0.80	1.2	0.77	1,753	UIG 4	*1,460*	*2,690**	YES
19	90%	0.80	1.2	0.43	979	UIG 4	*816*	*2,690**	YES
20	90%	0.80	1.16	2.97	6,760	UIG 5	*5,827*	*6,180*	YES
21	90%	0.80	0.8	0.47	901	Permeable Paver	*1,126*	*11,970*	YES
22	90%	0.80	1.44	0.72	1,690	Permeable Paver with piped in flows	*1,174*	*5,260*	YES
23	90%	0.80	1.44	1.27	2,982	Permeable Paver with piped in flows	*2,071*	*5,260*	YES
24	90%	0.80	1.52	0.29	695	UIG 3	*457*	*5,790**	YES
25	90%	0.80	0.8	0.77	1,476	Porous Concrete	*1,845*	*4,196*	YES

INFILTRATION BMP SUMMARY									
Drainage Management Area	% Impervious	Original Design Storm Depth[1] (in)	80% Capture Efficiency Design Storm Depth[2] (in)	Drainage Area (ac)	80% Capture Efficiency DCV (ft^3)	Infiltration BMP Type	Minimum Footprint Required (ft^2)	BMP Footprint Provided (ft^2)	80% Capture Efficiency DCV Met?
26	Self-treating DMA								
27	90%	0.80	0.8	3.95	7,571	Permeable Paver	*9,463*	*13,532*	YES
28	90%	0.80	0.8	1.21	2,319	Permeable Paver with piped in flows	*2,899*	*2,961*	YES
29	90%	0.80	0.8	0.43	824	Permeable Paver	*1,030*	*1,228*	YES
30	90%	0.80	0.4	0.49	646	Permeable Paver	*1,614*	*1,688*	YES
31	90%	0.80	0.8	0.14	268	Permeable Paver	*335*	*529*	YES
32	90%	0.80	0.8	0.36	690	Permeable Paver	*862*	*1,287*	YES
33	90%	0.80	0.8	0.51	977	Permeable Paver	*1,222*	*1,888*	YES
34	90%	0.80	0.8	0.55	1,054	Permeable Paver	*1,318*	*1,901*	YES
35	90%	0.80	0.8	0.45	862	Permeable Paver	*1,078*	*1,690*	YES
36	90%	0.80	0.8	0.34	652	Permeable Paver	*815*	*1,332*	YES
37	90%	0.80	0.96	1.15	2,425	Permeable Paver	*2,526*	*2,880*	YES
38	90%	0.80	0.8	0.22	422	UIG 6	*527*	*721*	YES

INFILTRATION BMP SUMMARY									
Drainage Management Area	% Impervious	Original Design Storm Depth[1] (in)	80% Capture Efficiency Design Storm Depth[2] (in)	Drainage Area (ac)	80% Capture Efficiency DCV (ft^3)	Infiltration BMP Type	Minimum Footprint Required (ft^2)	BMP Footprint Provided (ft^2)	80% Capture Efficiency DCV Met?
39	90%	0.80	0.5	1.10	1,634	Permeable Paver with piped in flows	*3,268*	*6,908*	YES
40	90%	0.80	0.92	0.43	824	UIG 7	*896*	*1,653**	YES
41	90%	0.80	0.92	0.36	690	UIG 7	*750*	*1,653**	YES
42	90%	0.80	1.44	0.63	1,479	Permeable Paver with piped in flows	*1,027*	*5,260*	YES
43	90%	0.80	1.44	0.12	282	Permeable Paver with piped in flows	*196*	*5,260*	YES
44	90%	0.80	0.8	0.32	613	Permeable Paver	*767*	*888*	YES

Notes:
1. Un-adjusted design storm depth per Figure XVI-1 from Model WQMP = 0.80 inches.
2. Adjusted per 80% Capture Efficiency Method for drawdown time. See attached worksheets in Attachment A.

UIG = Underground Infiltration Gallery.
*BMP footprint provided includes multiple tributary DMAs. UIGs are color coded to show which DMAs are tributary to them.
Infiltration BMPs assume rock reservoir with 40% porosity, depth varies. Pavement layer, bedding course, and base for pavement design not included. See Attachment A for details.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Evapotranspiration BMPs are a class of retention BMPs that discharges stored volume predominately to ET, though some infiltration may occur. ET includes both evaporation and transpiration, and ET BMPs may incorporate one or more of these processes. BMPs must be designed to achieve the maximum feasible ET, where required to demonstrate that the maximum amount of water has been retained on-site. Since ET is not the sole process in these BMPs, specific design and sizing criteria have not been developed for ET-based BMPs.

EVAPOTRANSPIRATION		
ID	**Name**	**Included?**
--	HSCs, *see Section IV.3.1*	☐
--	Surface-based infiltration BMPs	☐
--	Biotreatment BMPs, see *Section VI.3.4*	☐
	Other:	☐

Evapotranspiration BMPs have not prescribed for the project since its DCV is treated by infiltration BMPs.

Harvest and use (aka. Rainwater Harvesting) BMPs are LID BMPs that capture and store storm water runoff for later use. These BMPs are engineered to store a specified volume of water and have no design surface discharge until this volume is exceeded. Harvest and use BMPs include both above-ground and below-ground cisterns. Examples of uses for harvested water include irrigation, toilet and urinal flushing, vehicle washing, evaporative cooling, industrial processes and other non-potable uses.

HARVEST & REUSE / RAINWATER HARVESTING		
ID	**Name**	**Included?**
HU-1	Above-ground cisterns and basins	☐
HU-2	Underground detention	☐
--	Other:	☐

In order to quantify harvested water demand for the common areas of the project, the Modified Estimated Applied Water Use (EAWU) method was used, consistent with Appendix X of the Model WQMP's Technical Guidance Document (TGD), dated December 16, 2011.

The Modified EAWU method is modified from the OC Irrigation Code (County Ordinance No. 09-010) to account for the wet season demand and storm events (assuming that no irrigation would be applied for approximately 30% of the days in the wet season).

The equation used to calculate the Modified EAWU is:

$$Modified\ EAWU = \frac{(ETo_{wet} \times K_L \times LA \times 0.015)}{IE}$$

Where:

$Modified\ EAWU$ = estimated daily average water use during wet season
ETo_{wet} = average reference ET from November through April (inches per month) per Table X.2 of the TGD
K_L = landscape coefficient (Table X.4 of the TGD)
LA = landscape area irrigated with harvested water (square feet)
IE = irrigation efficiency (assumed at 90%)

Note: In the equation, the coefficient (0.015) accounts for unit conversions and shut down of irrigation during and for three days following a significant precipitation event.

For a system to be considered "feasible", the system must be designed with a storage volume equal to the DCV from the tributary area and achieve more than 40% capture. The system must also be able to drawdown in 30 days to meet the 40% capture value. In addition, Table X.6 of the Technical Guidance Document sets forth the demand thresholds for minimum partial capture.

TABLE X.6: HARVESTED WATER DEMAND THRESHOLDS FOR MINIMUM PARTIAL CAPTURE

Design Capture Storm Depth, inches	Wet Season Demand Required for Minimum Partial Capture, gpd per impervious acre
0.60	490
0.65	530
0.70	570
0.75	610
0.80	650
0.85	690
0.90	730
0.95	770
1.00	810

The following table summarizes the estimated applied water use for the common area landscaping of the project. As mentioned in Section IV.2.1, landscaping within the project site are primarily very low water use (VL) and low water use (L). Therefore, a conservation landscape type was used to determine estimated daily average water use during wet season for Planning Areas 1 and 2.

ESTIMATED APPLIED WATER USE (EAWU) FOR COMMON AREA LANDSCAPING									
Landscape Type	Total Area (ac)	% Impervious	Impervious Tributary (ac)	Irrigated LS Area (sf)	ETo_{Wet} [1] (in/mo)	K_L [2]	Modified EAWU (gpd)	Modified EAWU per impervious acre (gpd/ac)	Minimum Capture Threshold [3] (gpd/ac)
Conservation	31.09	90	28	135,428	2.75	0.35	2,173	77.6	650
			Design Capture Volume (gal)	557,151			Drawdown (days)		257

Notes:
1 Per Table X.2 for Laguna Beach Region (similar climate type), Model WQMP Technical Guidance Document, dated December 16, 2011.
2 Per Table X.4 of the Model WQMP Technical Guidance Document, dated December 16, 2011.
3 Per Table X.6 of Model WQMP Technical Guidance Document, dated December 16, 2011.

The results demonstrate that the based on the extensive drawdown time of 257 days, the minimum 40% capture efficiency cannot be met (generally 30 days or less). Moreover, the Modified EAWU for the site is 77.6 gpd/acre, where the minimum capture threshold is 650 gpd/acre. Therefore, harvest and re-use for landscape irrigation is considered infeasible for the proposed project.

Harvest and re-use for toilet and urinal flushing was also evaluated for feasibility. Harvest and re-use for this application is typically used in high-rise condominiums, office buildings, and institutional buildings where the Toilet Users to Impervious Area (TUTIA) ratio would be high enough to drain the tank sufficiently fast enough to be feasible. Nevertheless, this was considered for the proposed project. For feasibility screening, the minimum TUTIA threshold must achieve 40 percent average annual capture efficiency to be feasible for the project. This is considered the minimum partial capture volume. Based on Table X.7 of the TGD, a minimum TUTIA ratio of 130 toilet users/impervious acre (non-visitor) is needed for the project, based on retail and office commercial land use. With a projection of 96 employees for the Restaurants, 24 employees for the Offices, and 46 employees for retail, a total of 166 toilet users (non-visitor) are anticipated for the 33.9 acres of impervious area within the project site. This results in a TUTIA ratio of 4.9, which is significantly lower than the required minimum of 130 TUTIA to achieve minimum partial capture. Therefore, harvest and re-use for toilet and urinal flushing is also considered infeasible for the proposed project.

IV.3.4 Biotreatment BMPs

Not applicable. LID BMPs (infiltration) will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

IV.3.5 Hydromodification Control BMPs

Not applicable. LID BMPs (infiltration) will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

IV.3.6 Regional/Sub-Regional LID BMPs

Not applicable. LID BMPs (infiltration) will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

IV.3.7 Treatment Control BMPs

Not applicable. LID BMPs (infiltration) will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

IV.3.8 Non-Structural Source Control BMPs

The following tables show source control BMPs (routine non-structural and routine structural) included in this project and those that were not included.

NON-STRUCTURAL SOURCE CONTROL BMPS				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	
N6	Local Industrial Permit Compliance	☐	☒	Not an industrial facility.
N7	Spill Contingency Plan	☒	☐	
N8	Underground Storage Tank Compliance	☐	☒	No USTs proposed.

NON-STRUCTURAL SOURCE CONTROL BMPS				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N9	Hazardous Materials Disclosure Compliance	☒	☐	
N10	Uniform Fire Code Implementation	☒	☐	
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☐	☒	
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	No RGOs proposed.

N1, Education for Property Owners, Tenants and Occupants

Tenants within shall be provided education materials specified in Section VII of this WQMP upon first occupancy of the lease space and annually thereafter.

N2, Activity Restrictions

The Owner shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair and maintenance in non-designated areas, as well as any other activities that may potentially contribute to water pollution.

N3, Common Area Landscape Management

The Owner shall be responsible for ongoing maintenance and management of all landscaped areas on their property, consistent with OC DAMP Section 5.5, Management Guidelines for Use of Fertilizers as well as the City of Dana Point's AB 1881 Water Efficiency Landscape Ordinance. The program includes how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices, ongoing trimming and other landscape maintenance activities and proper disposal of landscape wastes by the owner and/or contractors.

N4, BMP Maintenance

The Owner will be responsible for the implementation and maintenance of each applicable non-structural BMP, as well as scheduling inspections and maintenance of all applicable structural BMP facilities through its staff, landscape contractor, and/or any other necessary maintenance contractors. Details on BMP Maintenance are provided in Section V of this WQMP, and the O&M Plan is included in Attachment B. The Owner shall incorporate maintenance activities as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.

N5, Title 22 CCR Compliance (How development will comply)

Hazardous waste management will conform to Title 22 CCR, Division 4.5, for any hazardous waste generated at the Marine Services area in Planning Area 1, should no management program currently exist. The Owner shall incorporate maintenance activities as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.

N7, Spill Contingency Plan

The Owner will develop a spill contingency plan for the Marine Services area to prepare and respond to spills of hazardous materials, should none currently exist. The Owner shall incorporate maintenance activities as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.

N9, Hazardous Materials Disclosure Compliance

The Owner shall comply with hazardous materials disclosure requirements, should none currently exist for the Marine Services area. The Owner shall incorporate maintenance activities as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.

N10, Uniform Fire Code Implementation

The Owner shall comply with Article 80 of the Uniform Fire Code for hazardous materials management, should none currently exist for the Marine Services area. The Owner shall incorporate maintenance activities as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.

N11, Common Area Litter Control

The Owner will be responsible for performing trash pick-up and sweeping of littered common areas on a weekly basis or whenever necessary, and proper disposal of waste collected. Responsibilities will also include investigating, noting and documenting improper disposal materials by the public. The Owner shall incorporate maintenance activities as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.

N12, Employee Training

All employees and any contractors will require training to ensure that employees are aware of maintenance activities that may result in pollutants reaching the storm drain. Training will include, but not

be limited to, spill cleanup procedures, proper waste disposal, housekeeping practices, etc. The Owner shall incorporate training activities as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.

N14, Common Area Catch Basin Inspection

All on-site catch basin inlets, area drains, ribbon gutters, curb and gutters, swales and other drainage systems shall be inspected and cleaned out by the Owner at least once a year, prior to the rainy season, no later than October 1st of each year in accordance with BMP Fact Sheet DF1 of the County's LIP. The Owner shall incorporate this activity as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.

N15, Street Sweeping Private Streets and Parking Lots

Parking lots shall be swept monthly at a minimum and prior to the rainy season, no later than October 1st each year. The Owner shall incorporate this activity as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.

IV.3.9 Structural Source Control BMPs

The table below indicates all BMPs to be incorporated in the project. For those designated as not applicable (N/A), a brief explanation why is provided.

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	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	No outdoor material storage areas proposed.
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☒	☐	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☐	☒	No slopes or channels proposed.
Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)				

STRUCTURAL SOURCE CONTROL BMPS				
Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S6	Dock areas	☐	☒	No loading docks proposed.
S7	Maintenance bays	☒	☐	
S8	Vehicle wash areas	☒	☐	
S9	Outdoor processing areas	☐	☒	No outdoor processing areas proposed.
S10	Equipment wash areas	☐	☒	No equipment wash areas proposed.
S11	Fueling areas	☐	☒	No fueling areas proposed.
S12	Hillside landscaping	☐	☒	The project does not reside on a hillside.
S13	Wash water control for food preparation areas	☒	☐	
S14	Community car wash racks	☐	☒	No community car wash racks proposed.

S1/SD-13, Provide storm drain system stenciling and signage

The Owner will be responsible for the stenciling of all catch basins to include a legible message such as "No Dumping - Drains to Ocean". The Owner will be responsible for maintaining and replacement of signage when necessary. The Owner shall incorporate this activity as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.

S3/SD-32, Design and construct trash and waste storage areas to reduce pollution introduction

There are two proposed outdoor trash enclosures for the project. Two additional trash storage areas are interior to buildings. All trash storage areas will be plumbed to the sewer. The trash storage areas will be designed to County and City standards, and will be walled, roofed, and proper drainage where runoff is diverted around the enclosure. Detailed drawings of outdoor trash enclosures will be provided in the Final WQMP and final grading plans.

S4/SD-12, Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control

The Owner will be responsible for the installation and maintenance of all common landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff. The

Owner will be responsible for implementing all efficient irrigation systems for common area landscaping including but not limited to provisions for water sensors and programmable irrigation cycles. The irrigation systems shall be in conformance with water use efficiency guidelines.

S7/SD-31, Properly Design: Maintenance bays

The proposed dry boat storage building will include one (1) canopied maintenance area. The canopy will preclude urban run-on and runoff from draining into the maintenance area. All non-stormwater discharges generated from the maintenance area will be drained to the sewer.

S8/SD-33, Properly Design: Vehicle wash areas

There currently is an existing boat wash down area in Planning Area 1 that will be redeveloped. The wash down area will be self-contained and drainage will be plumbed to the sewer. Detailed drawings of the boat wash down area will be provided in the Final WQMP and final grading plans.

S13, Properly Design: Wash water control for food preparation areas

All proposed food service facilities will have contained areas or sinks with sanitary sewer connections for disposal of wash waters containing kitchen and food wastes.

IV.4 Alternative Compliance Plan

IV.4.1 Water Quality Credits

Not applicable. LID BMPs (infiltration) will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

IV.4.2 Alternative Compliance Plan Information

Not applicable. LID BMPs (infiltration) will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

SECTION V INSPECTION/MAINTENANCE RESPONSIBILITY FOR BMPS

It has been determined that the OC Dana Point Harbor Department shall assume all BMP inspection and maintenance responsibilities for the Dana Point Harbor Revitalization Plan for Planning Areas 1 and 2 project.

Contact Name:	
Title:	
Company:	OC Dana Point Harbor Department
Address:	24650 Dana Point Harbor Drive Dana Point, CA 92629
Phone:	(949) 923-2236
Fax:	
Email:	

The Operations and Maintenance (O&M) Plan can be found in Attachment B. Dana Point Harbor is a Municipal Fixed Facility of the County of Orange. As such, O&M programs associated with the Harbor are primarily covered under the County's Local Implementation Plan. The O&M Plan associated with this WQMP will, therefore, be carried out either as part of the County's LIP or separately as a stand-alone O&M Plan, at the County's discretion.

Long-term funding for maintenance of BMPs shall be provided by the Owner through its operations budget and lease fees.

SECTION VI SITE PLAN AND DRAINAGE PLAN

The exhibits provided in this section are to illustrate the post construction BMPs prescribed within this WQMP. Drainage flow information of the proposed project, such as general surface flow lines, concrete or other surface drainage conveyances, and storm drain facilities are also depicted. All structural source control and treatment control BMPs are shown as well.

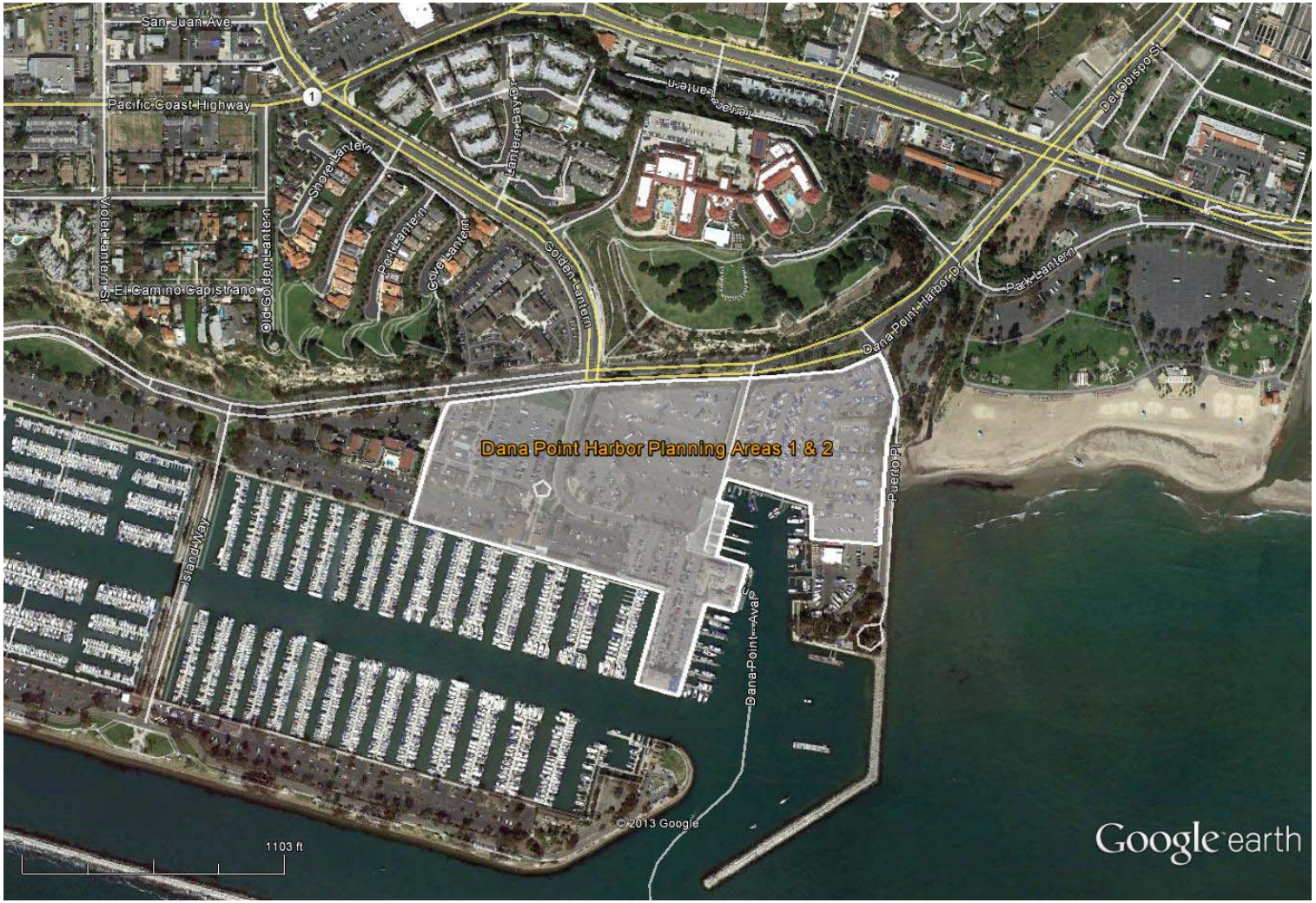
The following exhibits are attached to this WQMP:

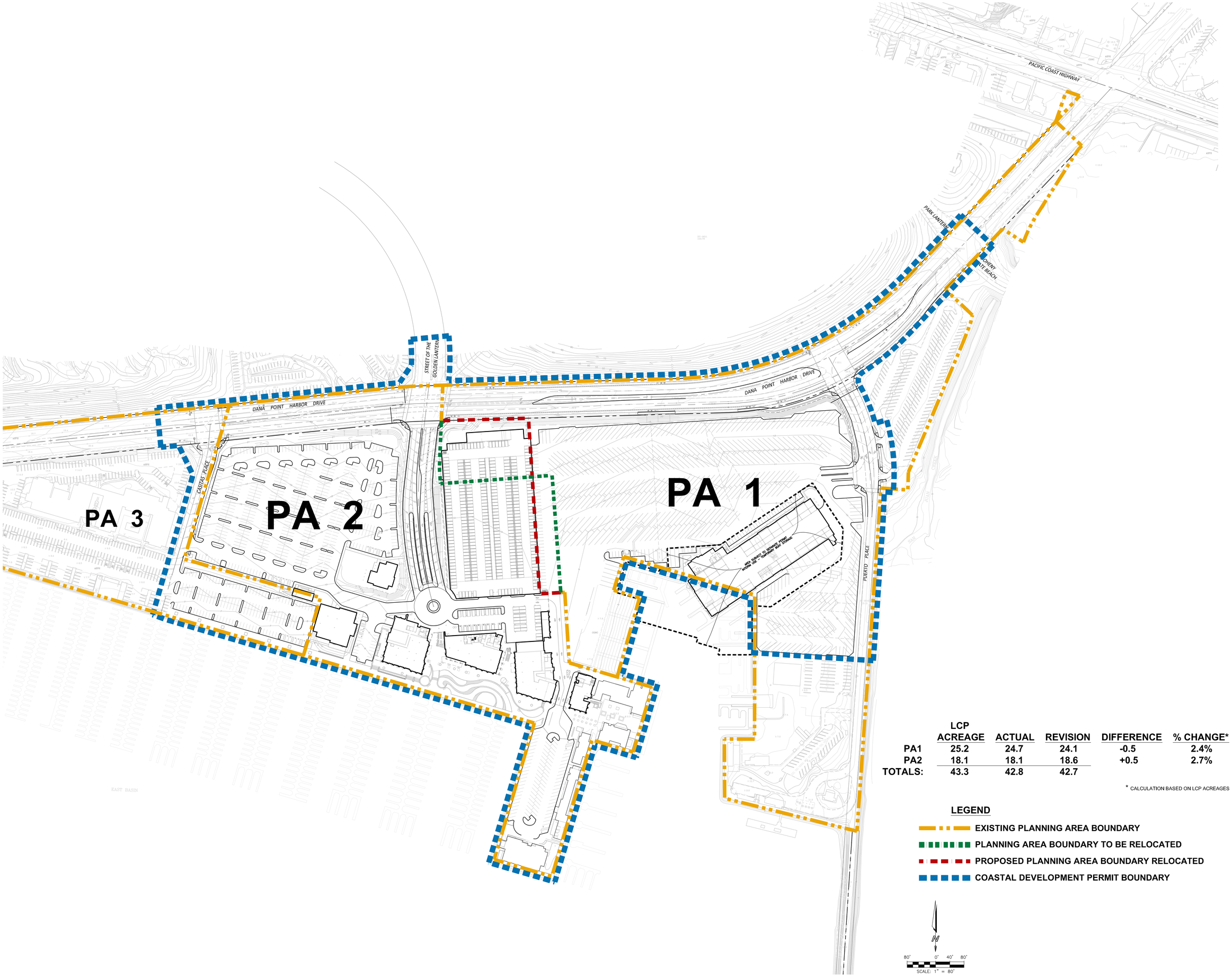
- Vicinity Map
- Planning Area Exhibit
- Conceptual Grading Plan Exhibit
- WQMP Exhibit

The following details are provided in this WQMP:

- Building and Parking Summary

VICINITY MAP





	LCP ACREAGE	ACTUAL	REVISION	DIFFERENCE	% CHANGE*
PA1	25.2	24.7	24.1	-0.5	2.4%
PA2	18.1	18.1	18.6	+0.5	2.7%
TOTALS:	43.3	42.8	42.7		

* CALCULATION BASED ON LCP ACREAGES

LEGEND

- EXISTING PLANNING AREA BOUNDARY
- PLANNING AREA BOUNDARY TO BE RELOCATED
- PROPOSED PLANNING AREA BOUNDARY RELOCATED
- COASTAL DEVELOPMENT PERMIT BOUNDARY

N

80' 0' 40' 80'

SCALE: 1" = 80'

DANA POINT HARBOR REVITALIZATION
COMMERCIAL CORE PROJECT

COUNTY OF ORANGE
DANA POINT HARBOR DRIVE
DANA POINT, CALIFORNIA

PROJECT DIMENSIONS INC

REVISED:	3/27/14
DATE:	12/20/13
PROJECT #:	307.08.01
SCALE:	1"=80'

0

NORTH

SHEET #: C-11

PLANNING AREA BOUNDARY ADJUSTMENT

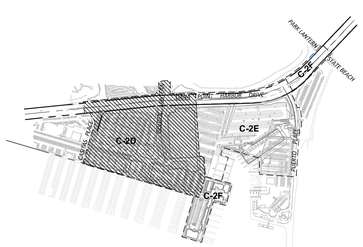
FUSCOE ENGINEERING
16795 Von Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 • fax 949.474.5315
www.fuscoe.com

P:\PROJECTS\307\DESIGN\CIVIL\ELEMENTS\COASTAL DEVELOPMENT PERMIT\307DEDP1.PLANE (04-21-14 12:28PM) Plotted by: Amy Grant

DANA POINT HARBOR REVITALIZATION
COMMERCIAL CORE PROJECT

COUNTY OF ORANGE
DANA POINT HARBOR DRIVE
DANA POINT, CALIFORNIA

DANA POINT HARBOR DRIVE
ASPH
SEE SHEET C-6 FOR STREET IMPROVEMENTS WITHIN DANA POINT HARBOR DRIVE RIGHT-OF-WAY
EXISTING CENTERLINE
EXISTING RIGHT-OF-WAY
SEE SHEET C-10 FOR COASTAL DEVELOPMENT PERMIT BOUNDARY LIMITS
STREET OF THE GOLDEN LANTERN
RELOCATE EXISTING SIGNAL POLE
EXISTING ELECTRICAL VAULTS / PEDESTALS SELECTIVE RECONSTRUCTION
HC RAMP
HC RAMPS
SIGN
CASITAS PLACE
NEW RIGHT TURN LANE
NOT A PART
PROPOSED PARKING DECK PD-2
PARKING DECK PD-1
MATCHLINE - SEE SHEET C-2E
MATCHLINE - SEE SHEET C-2F
PROPOSED BUILDING 12 FF=9.60 PAD=8.8
PROPOSED BUILDING 11 FF=16.20 PAD=15.2
PROPOSED BUILDING 10 FF=10.50 PAD=9.5
PROPOSED BUILDING 9 FF=10.50 PAD=9.5
PROPOSED BUILDING 8 FF=10.50 PAD=9.5
PROPOSED BUILDING 7 FF=10.50 PAD=9.5
LOADING DOCK FF=10.00
NEW TRASH ENCLOSURE
HV-9010
EXISTING SEAWALL ELEVATION 7.3'
18" SEATWALL
6' SCREEN WALL



SHEET INDEX
N.T.S.

LEGEND
- COASTAL DEVELOPMENT PERMIT BOUNDARY
- RAMMED AGGREGATE PIER FOUNDATION SYSTEM

SCALE: 1" = 30'

REVISED:	3/27/14
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PROJECT #:	307.08.01
SCALE:	1"=30'

NORTH

SHEET #: C-2D

CONCEPTUAL GRADING PLAN SUB-AREA 1

FUSCOE ENGINEERING
16795 Von Karmon, Suite 100
Irvine, California 92606
tel 949.474.1960 • fax 949.474.5315
www.fuscoe.com

DANA POINT HARBOR REVITALIZATION
COMMERCIAL CORE PROJECT

COUNTY OF ORANGE
DANA POINT HARBOR DRIVE
DANA POINT, CALIFORNIA

DANA POINT HARBOR DRIVE

EXISTING CENTERLINE

EXISTING RIGHT-OF-WAY

SEE SHEET C-6 FOR STREET IMPROVEMENTS WITHIN DANA POINT HARBOR DRIVE RIGHT-OF-WAY

PUERTO PLACE

SEE SHEET C-6 FOR STREET IMPROVEMENTS

NOT A PART

MATCHLINE – SEE SHEET C-2D

MATCHLINE – SEE SHEET C-2F

AREA SUBJECT TO SEPARATE PERMIT
INTERIM USE – TEMPORARY BOAT STORAGE

PROPOSED
DRY STACK BOAT
STORAGE BUILDING
FF=10.00
PAD= 9.00

BOAT WASH DOWN AREA DRAINS TO SEWER

BOAT MAINTENANCE AREA DRAINS TO SEWER

NEW TRASH ENCLOSURE

SEWER LIFT STATION (SCWD)

EXISTING CONC. BOAT LAUNCH RAMP TO REMAIN

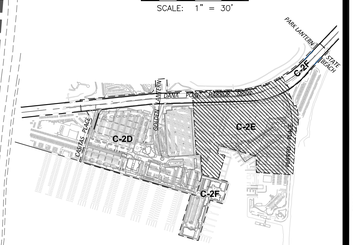
LEGEND

- COASTAL DEVELOPMENT PERMIT BOUNDARY
- RAMMED AGGREGATE PIER FOUNDATION SYSTEM

N

30' 0' 15' 30'

SCALE: 1" = 30'



SHEET INDEX

N.T.S.

REVISED:	3/27/14
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SCALE:	1"=30'

NORTH

SHEET #: C-2E

CONCEPTUAL GRADING PLAN SUB-AREA 2

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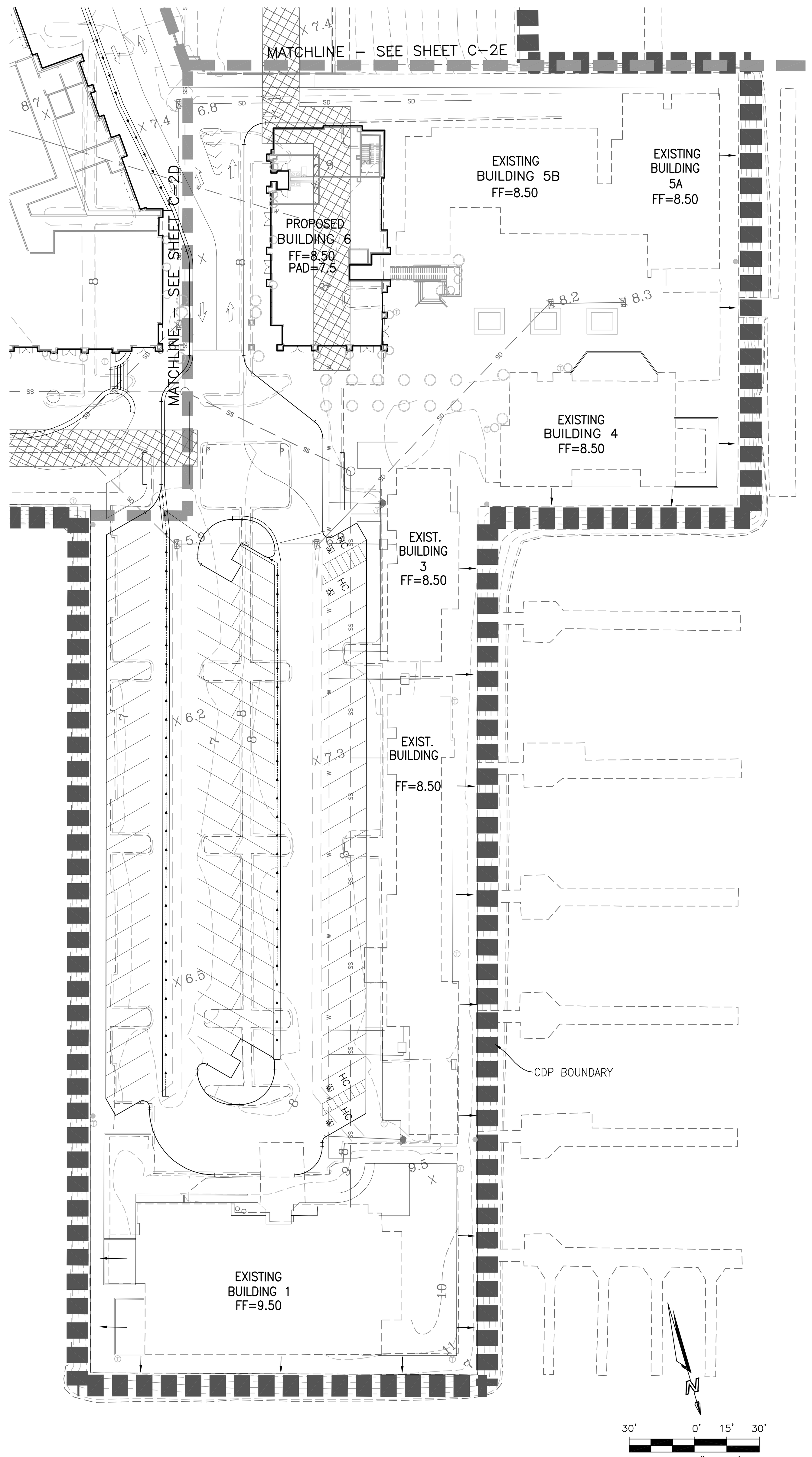
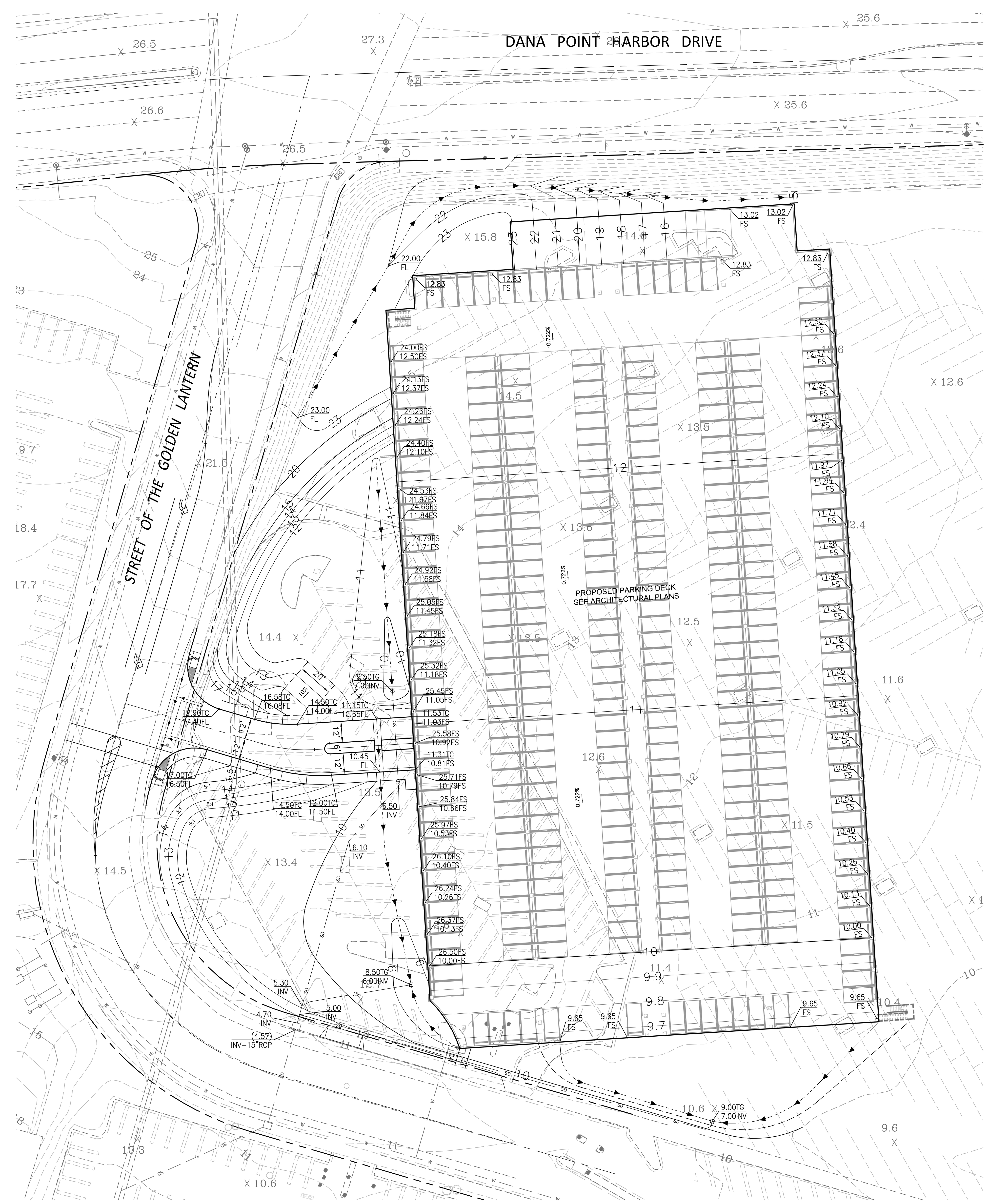
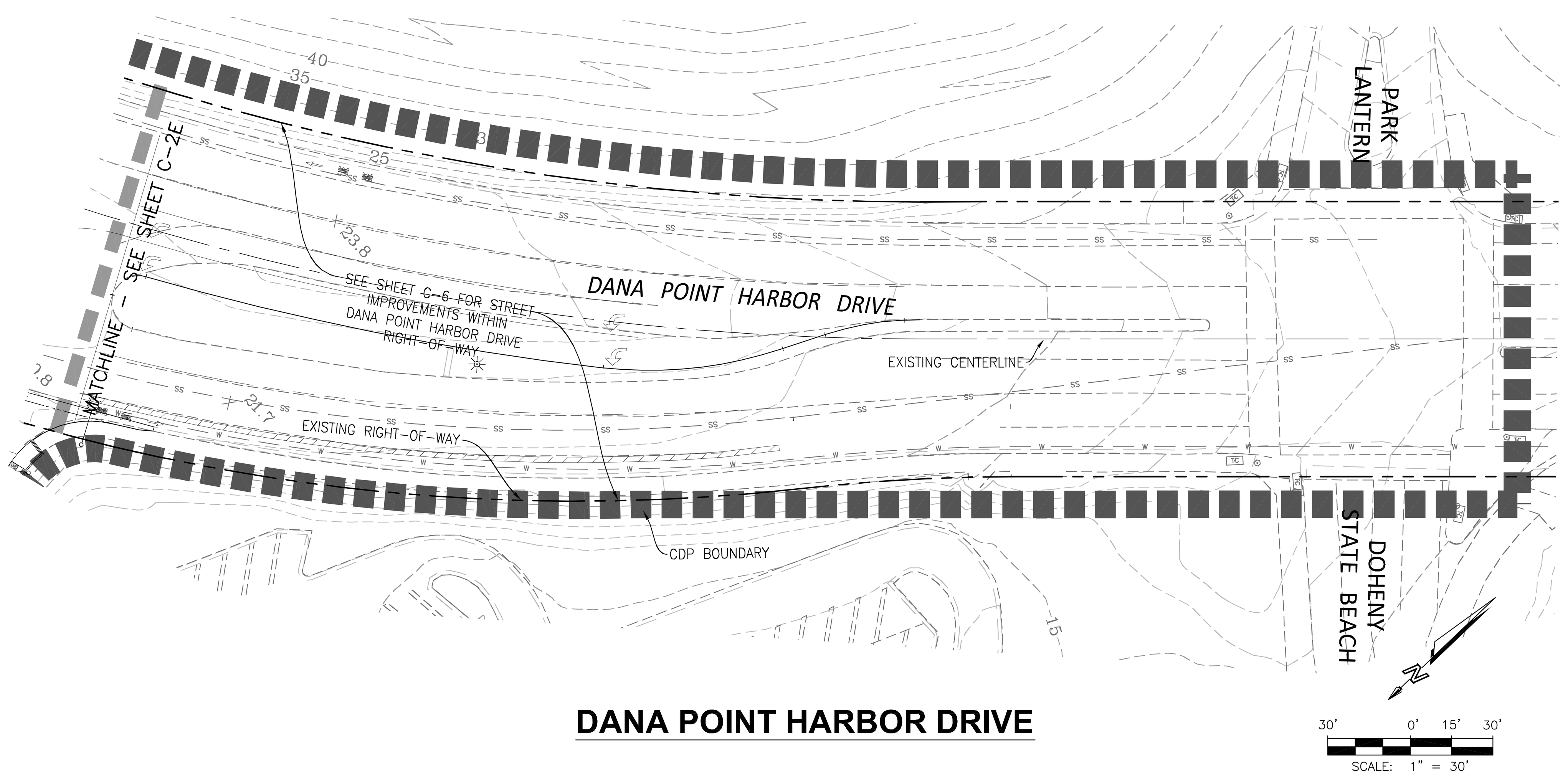


DANA WHARF

DANA WHARF AREA CONSISTS OF VARIOUS WALLS OF VARIOUS HEIGHTS ±5'



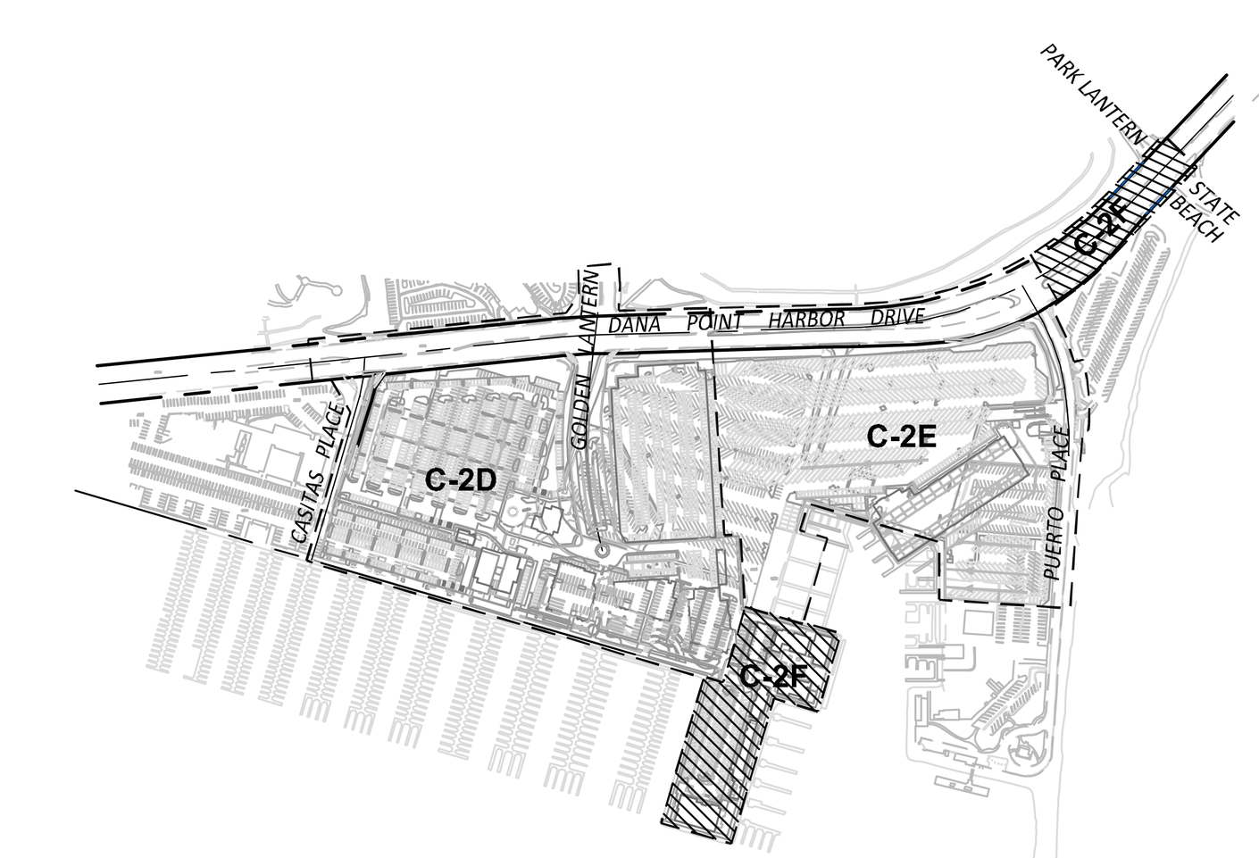
TEMPORARY ACCESS TO PARKING DECK EXHIBIT



DANA POINT HARBOR DRIVE

LEGEND

- COASTAL DEVELOPMENT PERMIT BOUNDARY
- RAMMED AGGREGATE PIER FOUNDATION SYSTEM



SHEET INDEX
N.T.S.

DANA POINT HARBOR REVITALIZATION COMMERCIAL CORE PROJECT

COUNTY OF ORANGE
DANA POINT HARBOR DRIVE
DANA POINT, CALIFORNIA

PROJECT DIMENSIONS

REVISED:	3/27/14
DATE:	12/20/13
PROJECT #:	307.08.01
SCALE:	1"=30'

NORTH
SHEET #: C-2F

CONCEPTUAL GRADING PLAN SUB-AREA 3

DANA WHARF, DANA POINT HARBOR DRIVE, & INTERIM PARKING DECK ACCESS

FUSCOE ENGINEERING
16795 Von Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 • fax 949.474.5315
www.fuscoe.com

DANA POINT HARBOR REVITALIZATION
COMMERCIAL CORE PROJECT

COUNTY OF ORANGE
DANA POINT HARBOR DRIVE
DANA POINT, CALIFORNIA

DANA POINT HARBOR DRIVE
STREET OF THE GOLDEN LANTERN
CASITAS PLACE
PUERTO PLACE
PARKING DECK
BUILDING 1
BUILDING 2
BUILDING 3
BUILDING 4
BUILDING 5
BUILDING 6
BUILDING 7
BUILDING 8
BUILDING 10
BUILDING 11
LAT 'A-1'
LAT 'A-2'
LAT 'A-3'
LAT 'A-4'
LAT 'A-5'
LAT 'A-6'
LAT 'A-7'
LAT 'A-8'
LAT 'C-2'
LAT 'C-3'
LAT 'D-1'
LAT 'D-2'
LINE 'A'
LINE 'B-1'
LINE 'B-2'
LINE 'B-3'
LINE 'C'
LINE 'C-3'
LINE 'D'
LINE 'E'
PROPOSED EXTERIOR TRASH AREA DRAINS TO SEWER
BOAT WASH DOWN AREA DRAINS TO SEWER
AREA SUBJECT TO SEPARATE PERMIT INTERIM USE – TEMPORARY BOAT STORAGE
BOAT REPAIR AREA DRAINS TO SEWER INSTALL GREASE & OIL/WATER SEPARATORS
EXISTING CONC. BOAT LAUNCH RAMP TO REMAIN
EXISTING TRENCH DRAIN AT BOAT LAUNCH RAMP TO REMAIN
EXISTING EXTERIOR TRASH AREA DRAINS TO SEWER
SUMP PUMP (WATER QUALITY TRENCH DRAIN TERMINUS)
PROPOSED WATER QUALITY TRENCH DRAIN

LEGEND

- EXISTING BUILDING TO REMAIN
- COASTAL DEVELOPMENT PERMIT BOUNDARY
- DRAINAGE AREA BOUNDARY
- PROPERTY LINE OR STREET RIGHT OF WAY
- GRADING CONTOUR
- PROPOSED STORM DRAIN (SIZE VARIES)
- EXISTING STORM DRAIN (10", 15", OR 18")
- EXISTING STORM DRAIN (60")
- STORM DRAIN LOW FLOW (WATER QUALITY) DIVERSION OR RETURN PIPE
- TRASH AREA
- CATCH BASIN OR GRATE INLET
- HIGH FLOW TRENCH DRAIN
- LOW FLOW TRENCH DRAIN
- SUMP PUMP
- STORM DRAIN DETENTION STRUCTURE
- STORM DRAIN UNDERGROUND INFILTRATION GALLERY PER DETAIL &
- LOW FLOW INTERCEPTION CATCH BASIN (IMMEDIATELY UPSTREAM OF STORM DRAIN BASIN)
- HIGH FLOW CATCH BASIN WITH INTERNAL LOW FLOW DIVERSION WEIR
- BOAT AREA (FLOWS TO SEWER)
- WATER QUALITY BMP TREATMENT (SURFACE FLOW PERVIOUS PAVERS) PER DETAIL
- WATER QUALITY BMP TREATMENT (SURFACE FLOW PERVIOUS PAVERS AND PIPE FLOW) PER DETAIL
- WATER QUALITY BMP TREATMENT (PERVIOUS CONCRETE) PER DETAIL
- TRIBUTARY AREA TO POROUS PAVEMENT TREATMENT DEVICE PER DETAIL
- SELF TREATING BMP TREATMENT AREA
- TRIBUTARY AREA TO UNDERGROUND INFILTRATION GALLERY 1 PER DETAIL
- TRIBUTARY AREA TO UNDERGROUND INFILTRATION GALLERY 3 PER DETAIL
- TRIBUTARY AREA TO UNDERGROUND INFILTRATION GALLERY 4 PER DETAIL
- TRIBUTARY AREA TO UNDERGROUND INFILTRATION GALLERY 5 PER DETAIL
- TRIBUTARY AREA TO UNDERGROUND INFILTRATION GALLERY 6 PER DETAIL
- TRIBUTARY AREA TO UNDERGROUND INFILTRATION GALLERY 7 PER DETAIL

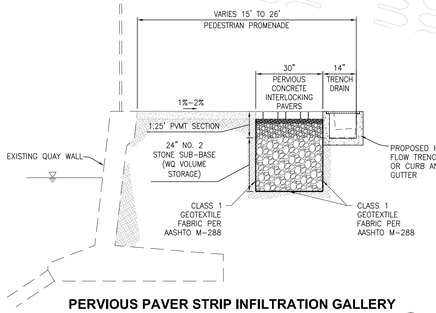
LID BMP SUMMARY TABLE

Previous Pavers & Previous Concrete (Infiltration)

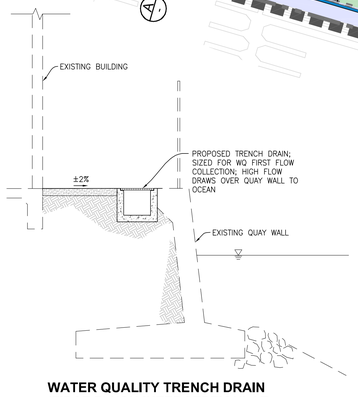
BMP Tributary Area Designation (18)	Total Drainage Area (ft²)	Tributary Area (acres)	Adjusted DCV (ft³)	Footprint Needed (ft²)	Footprint Provided (ft²)
2	26,572	0.61	1,169	1,461	2,220
3	37,897	0.87	1,667	2,084	3,078
5	34,412	0.79	1,514	1,893	2,865
6	33,977	0.78	1,495	1,869	3,143
9	14,810	0.34	717	747	857
10	42,253	0.97	1,859	2,324	3,404
11	48,174	1.06	2,032	2,540	4,010
21	20,473	0.47	901	1,126	11,970
22	31,363	0.72	1,690	1,174	5,260
23	55,321	1.27	2,982	2,071	5,260
25	33,541	0.77	1,476	1,845	4,196
26	13,939	0.32	Self Treating		
27	172,062	3.95	7,571	9,463	13,532
28	52,708	1.21	2,319	2,899	2,961
29	18,731	0.43	824	1,030	1,228
30	21,344	0.49	646	1,614	1,688
31	6,098	0.14	268	335	529
32	15,682	0.36	690	862	1,287
33	22,216	0.51	977	1,222	1,888
34	23,958	0.55	1,054	1,318	1,901
35	19,602	0.45	862	1,078	1,690
36	14,810	0.34	652	815	1,332
37	50,094	1.15	2,425	2,526	2,880
39	47,916	1.10	1,634	3,268	6,908
42	27,443	0.63	1,479	1,027	5,260
43	5,227	0.12	282	196	5,260
44	13,939	0.32	613	767	888

Underground Infiltration Gallery

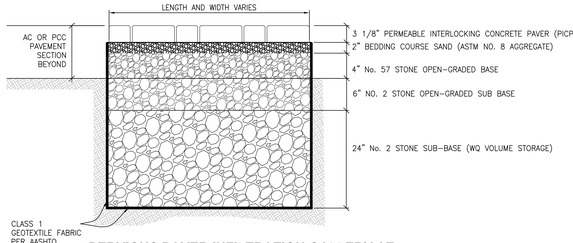
BMP Tributary Area Designation (18)	Total Drainage Area (ft²)	Tributary Area (acres)	Adjusted DCV (ft³)	Footprint Needed (ft²)	Total Footprint Needed (ft²)	Total Footprint Provided (ft²)
1	56,192	1.29	2,225	3,477	5,984	7,872
4	8,276	0.19	328	512		
13	11,761	0.27	466	728		
14	3,485	0.08	138	216		
15	3,485	0.08	138	216		
16	13,504	0.31	535	836		
7	14,375	0.33	791	520	4,256	5,790
8	19,166	0.44	1,054	694		
12	30,492	0.70	1,677	1,103		
17	40,946	0.94	2,252	1,482		
24	12,632	0.29	695	457		
18	33,541	0.77	1,753	1,460	2,276	2,690
19	18,731	0.43	979	816		
20	129,373	2.97	6,760	5,827	5,827	6,180
38	9,583	0.22	422	527	527	721
40	18,731	0.43	824	896	1,646	1,653
41	15,682	0.36	690	750		



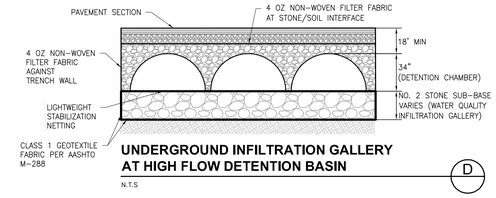
PERVIOUS PAVER STRIP INFILTRATION GALLERY AT HARBOR PEDESTRIAN PROMENADE AREA (A)
N.T.S.



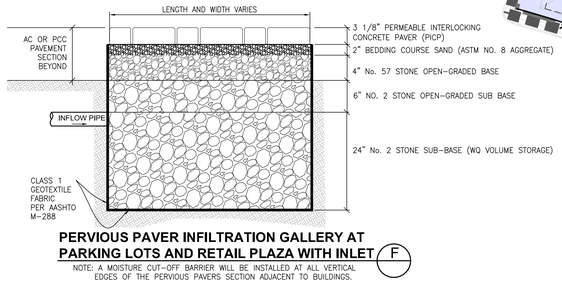
WATER QUALITY TRENCH DRAIN (FIRST FLUSH INTERCEPTION) AT WHARF PROMENADE AREAS (B)
N.T.S.



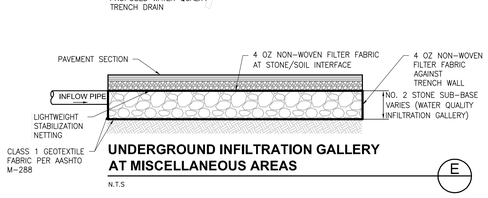
PERVIOUS PAVER INFILTRATION GALLERY AT PARKING LOTS AND RETAIL PLAZA (C)
NOTE: A MOISTURE CUT-OFF BARRIER WILL BE INSTALLED AT ALL VERTICAL EDGES OF THE PERVIOUS PAVERS SECTION ADJACENT TO BUILDINGS.



UNDERGROUND INFILTRATION GALLERY AT HIGH FLOW DETENTION BASIN (D)
N.T.S



PERVIOUS PAVER INFILTRATION GALLERY AT PARKING LOTS AND RETAIL PLAZA WITH INLET (F)
NOTE: A MOISTURE CUT-OFF BARRIER WILL BE INSTALLED AT ALL VERTICAL EDGES OF THE PERVIOUS PAVERS SECTION ADJACENT TO BUILDINGS.



UNDERGROUND INFILTRATION GALLERY AT MISCELLANEOUS AREAS (E)
N.T.S

N
50' 0' 25' 50'
SCALE: 1" = 50'

REVISED: 3/27/14
DATE: 12/20/13
PROJECT #: 307.08.01
SCALE: 1"=50'
0
NORTH
SHEET #: C-4

PROPOSED BUILD-OUT PRELIMINARY WATER QUALITY PLAN

FUSCOE ENGINEERING
16795 Von Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 • fax 949.474.5315
www.fuscoe.com

Dana Point Harbor Revitalization

Project Summary

Printed: 8/19/2013

Planning Area 1

Dry Storage Building			
Dry Stack Building	390		
10x25	7		
10x30	86		
10x35	12		
Total Dry Storage Spaces	495		
Required Dry Storage Spaces	493		
Delta	2		
Vehicles With Trailers			
10x30	14		
10x35	8		
10X40	56		
10x45	193		
10x50	44		
12x40	1		
12X45	2		
12x50	18		
Total Vehicle With Trailer Spaces	336		
Required Vehicle With Trailer Spaces	334		
Delta	2		
Marine Services Building			
Office Area	5,600		
Retail Area	2,000		
Total Area	7,600		
Allowable Area	7,600		
PA1 Parking Requirements			
Dry Boat Storage			
Building	98	0.25	Per Boat Space
Surface	26	0.25	Per Boat Space
Office	23	1	per 250
Retail	10	1	per 200
Total Required Parking	157		
PA1 Parking Provided	309		

Planning Area 2 Wharf Area

Tenant	Interior	Outdoor	Total	Total Area By Tenant Type			Parking Required		
Space	Area	Patio	Area	Retail	Restaurant	Office	Retail	Restaurant	Office
Wind and Sea	9,375	2,112	11,487		11,487		-	134	-
Proud Mary's	1,572	1,112	2,684		2,684		-	27	-
Turks	1,911		1,911		1,911		-	20	-
Top Brass	1,140		1,140	1,140			6	-	-
Golden Galleon Boutique	1,322		1,322	1,322			7	-	-
Dana Wharf Sport Fishing	3,643		3,643	3,643			19	-	-
Jolly Roger	5,337	850	6,187		6,187		-	68	-
Jon's Fishmarket	1,930	654	2,584		2,584		-	26	-
Slice of New York	514		514		514		-	6	-
Harbor Deli	1,890		1,890		1,890		-	19	-
Momilani's Island	-		-				-	-	-
Da Vine Food & Wine	-		-				-	-	-
Total	28,634	4,728	33,362	6,105	27,257	-	32	300	-
							Total Parking		332

Total Areas	**PA1**	**PA2**	**Total**	**Proposed**	**Delta**
Retail	2,000	29,949	31,949	34,800	(2,851)
Restaurants	-	91,000	91,000	91,000	-
Office	5,600	6,709	12,309	12,400	(91)
Total	7,600	127,658	135,258	138,200	(2,942)

Restaurant Area		
Indoor	**Max**	**Delta**
77,178	78,400	(1,222)
Outdoor	**Max**	**Delta**
13,822	12,600	1,222

Total Parking Required	**PA1**	**PA2**	**Total**		
Retail	10	163	173	1 per 200 s.f.	
Restaurant	-	1,016	1,016	1 per 100 s.f. (first 4,000 s.f.) 1 per 80 s.f. (area above 4,000 s.f.)	
Office	23	28	51	1 per 250 s.f.	
Boat Storage	124		124	0.25 per space	
Boat Slips		70	70	0.6 per slip	
Charter Boats		16	16	1 per 3 passengers	
Sport Fishing		125	125	Measured Use	
				Provided	Delta
Total	157	1,418	1,575	1,706	131

Total Parking Provided			
Planning Area 1			
Launch Ramp	117		
Puerto Place (North)	161		
Puerto Place (South)	31		46 spaces for shipyard not included
PA 1 Total Parking	309		
Planning Area 2			
Parking Deck	690		
Podium	86	16	H.C. Spaces
Wharf	95	4	H.C. Spaces
Mariner's	526	9	H.C. Spaces
PA 2 Total Parking	1,397		
Total Parking Provided	1,706		

Planning Area 2 New Commercial Core

Level	Building	Tenant	Interior	Outdoor	Total	Total Area By Tenant Type			Parking Required		
		Space	Area	Patio	Area	Retail	Restaurant	Office	Retail	Restaurant	Office
Level 1	9	TENANT 01	1,661		1,661	1,661			9	-	-
	9	TENANT 02	824		824	824			5	-	-
	9	TENANT 03	916		916	916			5	-	-
	9	TENANT 04	1,490		1,490	1,490			8	-	-
	9	TENANT 05	1,196		1,196	1,196			6	-	-
	9	TENANT 06	803		803	803			5	-	-
	9	TENANT 07	643		643	643			4	-	-
	9	TENANT 08	2,504	400	2,904		2,904			30	-
	8	TENANT 09	3,563	1491	5,054		5,054		-	54	-
	8	TENANT 10	2,924		2,924	2,924			15	-	-
	8	TENANT 11	1,859		1,859	1,859			10	-	-
	8	TENANT 12	725		725	725			4	-	-
	8	TENANT 13	797		797	797			4	-	-
	7	TENANT 14	804		804	804			5	-	-
	7	TENANT 15	3,168	460	3,628		3,628		-	37	-
	7	TENANT 16	1,270		1,270	1,270			7	-	-
	7	TENANT 17	627		627	627			4	-	-
	7	TENANT 18	1,403		1,403	1,403			8	-	-
	7	TENANT 19	1,471		1,471	1,471			8	-	-
	7	TENANT 20	1,099		1,099	1,099			6	-	-
	6	TENANT 21	1,154		1,154	1,154			6	-	-
	6	TENANT 22	375		375	375			2	-	-
	6	TENANT 23	1,803		1,803	1,803			10	-	-
	10	TENANT E	10,000	1000	11,000		11,000		-	128	-
	11	TENANT F	4,004	1000	5,004		5,004		-	53	-
Level 2	9	TENANT A (w/ Mezz)	11,051	1507	12,558		12,558		-	147	-
	8	TENANT B	6,713	1004	7,717		7,717		-	87	-
	8	TENANT C	6,116	1027	7,143		7,143		-	80	-
	7	TENANT D	7,530	1205	8,735		8,735		-	100	-
	6	TENANT 24	1,900		1,900			1,900	-	-	8
	6	TENANT 25	1,593		1,593			1,593	-	-	7
Level 3	6	TENANT 26	3216		3,216			3,216	-	-	13
Total			85,202	9,094	94,296	23,844	63,743	6,709	131	716	28
									Total Parking		875

Note:

120 parking spaces are required for the Catalina Ferry service which departs from Planning Area 2. These 120 parking spaces will be provided in Planning Area 3 parking lots during the non-peak season (October through May) and in Planning Area 4 during the peak season (June through September). Also during the peak season, the 125 parking spaces for Sport Fishing will shift from Planning Area 2 to Planning Area 3. This will make an additional 125 parking spaces available in Planning Area 2 during the peak season.

SECTION VII EDUCATIONAL MATERIALS INCLUDED

The educational materials included in this WQMP are provided to inform people involved in future uses, activities, or ownership of the site about the potential pitfalls associated with careless storm water management. "The Ocean Begins at Your Front Door" provides users with information about storm water that is/will be generated on site, what happens when water enters a storm drain, and its ultimate fate, discharging into the ocean. Also included are activities guidelines to educate anyone who is or will be associated with activities that have a potential to impact storm water runoff quality, and provide a menu of BMPs to effectively reduce the generation of storm water runoff pollutants from a variety of activities. The educational materials that may be used for the proposed project are included in Appendix C of this WQMP and are listed below.

EDUCATION MATERIALS			
Residential Materials (http://www.ocwatersheds.com)	**Check If Applicable**	**Business Materials (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 Materials (http://www.ocwatersheds.com) (http://www.cabmphandbooks.com)**	**Check If Attached**
Proper Disposal of Household Hazardous Waste	☐		
Recycle at Your Local Used Oil Collection Center (North County)	☐	DF-1 Drainage System Operation & Maintenance	☒
Recycle at Your Local Used Oil Collection Center (Central County)	☐	R-1 Automobile Repair & Maintenance	☐
Recycle at Your Local Used Oil Collection Center (South County)	☐	R-2 Automobile Washing	☐
Tips for Maintaining Septic Tank Systems	☐	R-3 Automobile Parking	☐
Responsible Pest Control	☐	R-4 Home & Garden Care Activities	☐
Sewer Spill	☐	R-5 Disposal of Pet Waste	☐
Tips for the Home Improvement Projects	☐	R-6 Disposal of Green Waste	☐
Tips for Horse Care	☐	R-7 Household Hazardous Waste	☐
Tips for Landscaping and Gardening	☐	R-8 Water Conservation	☐
Tips for Pet Care	☐	SD-10 Site Design & Landscape Planning	☒
Tips for Pool Maintenance	☐	SD-11 Roof Runoff Controls	☐
Tips for Residential Pool, Landscape and Hardscape Drains	☐	SD-12 Efficient Irrigation	☒
Tips for Projects Using Paint	☐	SD-13 Storm Drain Signage	☒

Other: FF-1 Bay Harbor Activities	☒	SD-31 Maintenance Bays & Docks	☒
Other:	☐	SD-32 Trash Storage Areas	☒

ATTACHMENTS

ATTACHMENT A

SUPPORTING CALCULATIONS

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.

0.9 0.9 0.95 0.7 0.75 0.8 0.85 0.9 0.95 1 1.05 0.75 0.7 0.65

LOS ANGELES COUNTY
ORANGE COUNTY
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
Riverside County
San Diego County

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

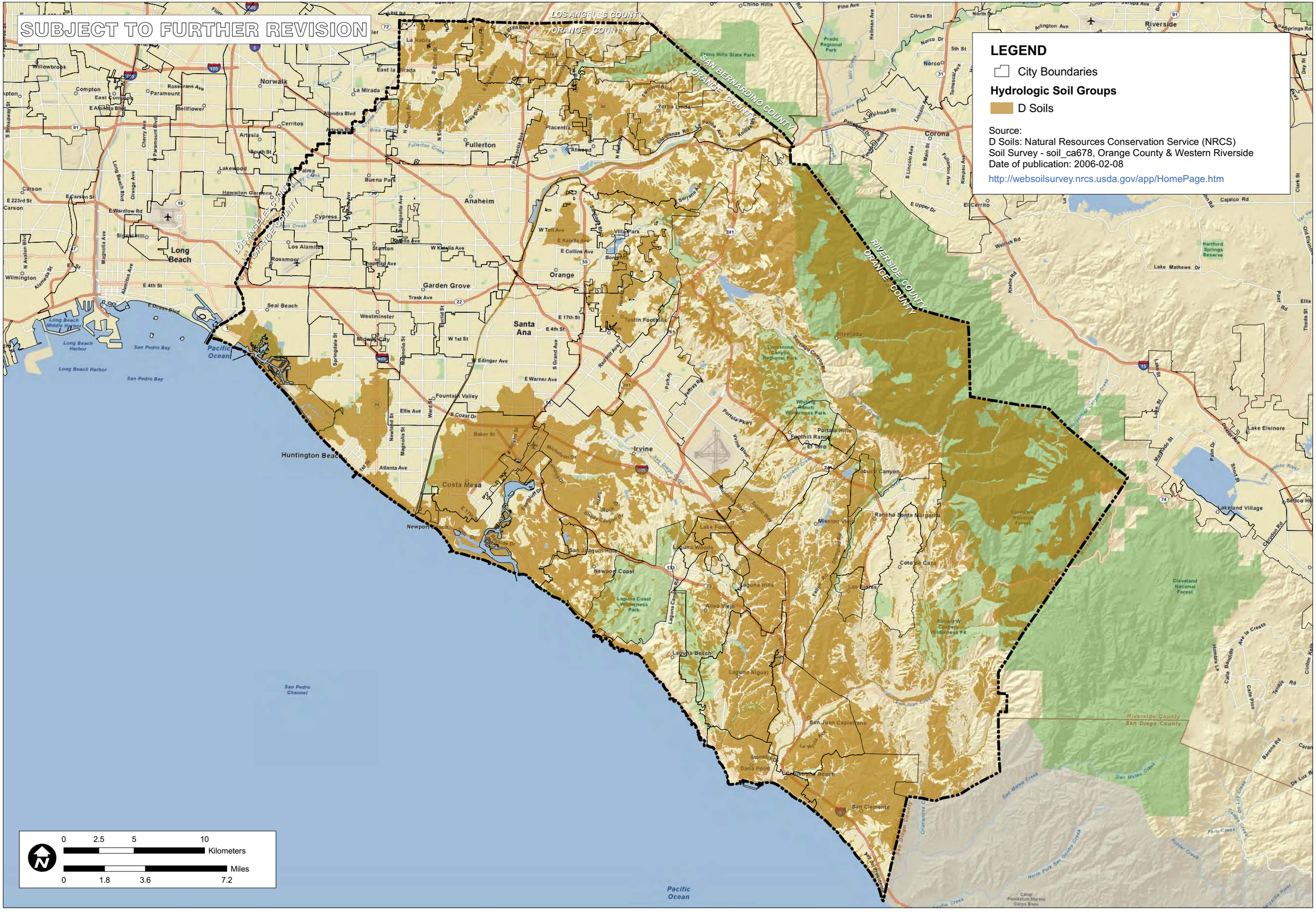
JOB: ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT — ORANGE CO., CA

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

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

TITLE
HYDROLOGIC SOIL GROUP
TYPE D NRCS SOIL SURVEY

JOB
ORANGE COUNTY
INFILTRATION STUDY
CA
ORANGE CO.

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

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Stormwater Quality LID BMP Simple Design Capture Calculations

DATE: 14-Mar-14

PROJECT: DANA POINT HARBOR REVITALIZATION

												Infiltration		
												LID BMP Storage Volume		
BMP or Drainage Area Name	Planning Area	Total Drainage Area (ft^2)	Total Drainage Area (acres)	Assumed % impervious	Runoff Coefficient	Design Storm Depth (in)	Average or Estimated Tc (min)	Rainfall Intensity (in/hr)	DCV (ft^3)	Q (cfs)	Porosity	Reservoir Depth (ft)	Footprint Needed (ft2)2
1	PA 2	56,192.4	1.29	90%	0.8250	0.8	5	0.26	**3,091**	**0.277**	40%	1.6	**4,829.0**
2	PA 2	26,571.6	0.61	90%	0.8250	0.8	5	0.26	**1,461**	**0.131**	40%	2.0	**1,826.8**
3	PA 2	37,897.2	0.87	90%	0.8250	0.8	5	0.26	**2,084**	**0.187**	40%	2.0	**2,605.4**
4	PA 2	8,276.4	0.19	90%	0.8250	0.8	5	0.26	**455**	**0.041**	40%	1.6	**711.3**
5	PA 3	34,412.4	0.79	90%	0.8250	0.8	5	0.26	**1,893**	**0.169**	40%	2.0	**2,365.9**
6	PA 3	33,976.8	0.78	90%	0.8250	0.8	5	0.26	**1,869**	**0.167**	40%	2.0	**2,335.9**
7	PA 3	14,374.8	0.33	90%	0.8250	0.8	5	0.26	**791**	**0.071**	40%	3.8	**520.1**
8	PA 3	19,166.4	0.44	90%	0.8250	0.8	5	0.26	**1,054**	**0.094**	40%	3.8	**693.5**
9	PA 2	14,810.4	0.34	90%	0.8250	0.8	5	0.26	**815**	**0.073**	40%	2.4	**848.5**
10	PA 2	42,253.2	0.97	90%	0.8250	0.8	5	0.26	**2,324**	**0.208**	40%	2.0	**2,904.9**
11	PA 2	46,173.6	1.06	90%	0.8250	0.8	5	0.26	**2,540**	**0.227**	40%	2.0	**3,174.4**
12	PA 2	30,492.0	0.70	90%	0.8250	0.8	5	0.26	**1,677**	**0.150**	40%	3.8	**1,103.3**
13	PA 2	11,761.2	0.27	90%	0.8250	0.8	5	0.26	**647**	**0.058**	40%	1.6	**1,010.7**
14	PA 2	3,484.8	0.08	90%	0.8250	0.8	5	0.26	**192**	**0.017**	40%	1.6	**299.5**
15	PA 2	3,484.8	0.08	90%	0.8250	0.8	5	0.26	**192**	**0.017**	40%	1.6	**299.5**
16	PA 2	13,503.6	0.31	90%	0.8250	0.8	5	0.26	**743**	**0.066**	40%	1.6	**1,160.5**
17	PA 2	40,946.4	0.94	90%	0.8250	0.8	5	0.26	**2,252**	**0.202**	40%	3.8	**1,481.6**
18	PA 2	33,541.2	0.77	90%	0.8250	0.8	5	0.26	**1,845**	**0.165**	40%	3.0	**1,537.3**
19	PA 2	18,730.8	0.43	90%	0.8250	0.8	5	0.26	**1,030**	**0.092**	40%	3.0	**858.5**
20	PA 2	129,373.2	2.97	90%	0.8250	0.8	5	0.26	**7,116**	**0.637**	40%	2.9	**6,134.1**
21	PA 2	20,473.2	0.47	90%	0.8250	0.8	5	0.26	**1,126**	**0.101**	40%	2.0	**1,407.5**
22	PA 2	31,363.2	0.72	90%	0.8250	0.8	5	0.26	**1,725**	**0.154**	40%	3.6	**1,197.9**
23	PA 2	55,321.2	1.27	90%	0.8250	0.8	5	0.26	**3,043**	**0.272**	40%	3.6	**2,113.0**
24	PA 2	12,632.4	0.29	90%	0.8250	0.8	5	0.26	**695**	**0.062**	40%	3.8	**457.1**
25	PA 2	33,541.2	0.77	90%	0.8250	0.8	5	0.26	**1,845**	**0.165**	40%	2.0	**2,306.0**
26	PA 2	13,939.2	0.32	90%	0.8250	0.8	5	0.26	**767**	**0.069**			
27	PA 2	172,062.0	3.95	90%	0.8250	0.8	5	0.26	**9,463**	**0.847**	40%	2.0	**11,829.3**
28	PA 2	52,707.6	1.21	0%	0.1500	0.8	5	0.26	**527**	**0.047**	40%	2.0	**658.8**
29	PA 2	18,730.8	0.43	90%	0.8250	0.8	5	0.26	**1,030**	**0.092**	40%	2.0	**1,287.7**
30	PA 2	21,344.4	0.49	90%	0.8250	0.8	5	0.26	**1,174**	**0.105**	40%	1.0	**2,934.9**
31	PA 1	6,098.4	0.14	90%	0.8250	0.8	5	0.26	**335**	**0.030**	40%	2.0	**419.3**
32	PA 1	15,681.6	0.36	90%	0.8250	0.8	5	0.26	**862**	**0.077**	40%	2.0	**1,078.1**
33	PA 1	22,215.6	0.51	90%	0.8250	0.8	5	0.26	**1,222**	**0.109**	40%	2.0	**1,527.3**
34	PA 1	23,958.0	0.55	90%	0.8250	0.8	5	0.26	**1,318**	**0.118**	40%	2.0	**1,647.1**
35	PA 1	19,602.0	0.45	90%	0.8250	0.8	5	0.26	**1,078**	**0.097**	40%	2.0	**1,347.6**
36	PA 1	14,810.4	0.34	90%	0.8250	0.8	5	0.26	**815**	**0.073**	40%	2.0	**1,018.2**
37	PA 1	50,094.0	1.15	90%	0.8250	0.8	5	0.26	**2,755**	**0.247**	40%	2.4	**2,870.0**
38	PA 1	9,583.2	0.22	90%	0.8250	0.8	5	0.26	**527**	**0.047**	40%	2.0	**658.8**
39	PA 1	47,916.0	1.10	90%	0.8250	0.8	5	0.26	**2,635**	**0.236**	40%	1.25	**5,270.8**
40	PA 1	18,730.8	0.43	90%	0.8250	0.8	5	0.26	**1,030**	**0.092**	40%	2.3	**1,119.8**
41	PA 1	15,681.6	0.36	90%	0.8250	0.8	5	0.26	**862**	**0.077**	40%	2.3	**937.5**
42	PA 1	27,442.8	0.63	90%	0.8250	0.8	5	0.26	**1,509**	**0.135**	40%	3.6	**1,048.2**
43	PA 1	5,227.2	0.12	90%	0.8250	0.8	5	0.26	**287**	**0.026**	40%	3.6	**199.7**
44	PA 1	13,939.2	0.32	90%	0.8250	0.8	5	0.26	**767**	**0.069**	40%	2.0	**958.3**

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs

Project: Dana Point Harbor Revitalization - Planning Areas 1 and 2

Date: 14-Mar-2014

			DRAINAGE MANAGEMENT AREA (DMA):	1	2	3	4	5	6	7	8	9	10	11	12	13
Step 1: Determine the design capture storm depth used for calculating volume																
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=		0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
2	Enter calculated drawdown time of the proposed BMP based on equation provided in applicable BMP Fact Sheet, *T* (hours)	T=		20.2	25.3	25.3	20.2	25.3	25.3	48.0	48.0	30.3	25.3	25.3	48.0	20.2
3	Using Figure III.2, determine the "fraction of design capture storm depth" at which the BMP drawdown time (T) line achieves 80% capture efficiency, X_1	X_1=		0.72	0.80	0.80	0.72	0.80	0.80	1.00	1.00	0.88	0.80	0.80	1.00	0.72
4	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Enter capture efficiency corresponding to d_{HSC}, $Y_{2\ (Worksheet\ A)}$	Y_2=		0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	Using Figure III.2, determine the fraction of "design capture storm depth" at which the drawdown time (T) achieves the equivalent of the upstream capture efficiency(Y_2), X_2	X_2=		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Calculate the fraction of design volume that must be provided by BMP, *fraction* = X_1 - X_2	fraction=		0.72	0.80	0.80	0.72	0.80	0.80	1.00	1.00	0.88	0.80	0.80	1.00	0.72
8	Calculate the resultant design capture storm depth (inches), $d_{fraction}$ = *fraction* × *d*	$d_{fraction}$=		0.58	0.64	0.64	0.58	0.64	0.64	0.80	0.80	0.70	0.64	0.64	0.80	0.58
Step 2: Calculate the DCV																
1	Enter Project area tributary to BMP(s), *A* (acres)	A=		1.29	0.61	0.87	0.19	0.79	0.78	0.33	0.44	0.34	0.97	1.06	0.70	0.27
2	Enter Project Imperviousness, *imp* (unitless)	imp=		90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=		0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250
4	Calculate runoff volume, V_{design} = (C x $d_{rfraction}$ x A x 43560 x (1/12))	V_{design}=		2,225.2	1,169.2	1,667.5	327.7	1,514.1	1,495.0	790.6	1,054.2	716.8	1,859.1	2,031.6	1,677.1	465.7
Supporting Calculations																
Describe system:																
	Permeable Pavement (PP) or Underground Infiltration Gallery (UIG)			UIG 1	PP	PP	UIG 1	PP	PP	UIG 3	UIG 3	PP	PP	PP	UIG 3	UIG 1
	gravel reservoir depth at 40% porosity:			1.6	2.0	2.0	1.6	2.0	2.0	3.8	3.8	2.4	2.0	2.0	3.8	1.6
	Effective Depth:			0.64	0.8	0.8	0.64	0.8	0.8	1.52	1.52	0.96	0.8	0.8	1.52	0.64
	Surface Area Needed (ft^2):			3,477	1,461	2,084	512	1,893	1,869	520	694	747	2,324	2,540	1,103	728
	Surface Area Provided (ft^2):			7,872*	2,220	3,078	7,872*	2,865	3,143	5,790*	5,790*	1,973	3,404	4,010	5,790*	7,872*
	**Total Area for UIG that have multiple DMAs*															
Provide drawdown calculations per equations in applicable BMP Fact Sheet: *Drawdown = (ponding depth / K_{design}) x 12* *Kdesign = 0.38 in/hr (includes 2.19 safety factor)*				20.2	25.3	25.3	20.2	25.3	25.3	48.0	48.0	30.3	25.3	25.3	48.0	20.2

14	15	16	17	18	19	20	21	22	23	24	25	27	28	29	30	31	32	33	34
0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
20.2	20.2	20.2	48.0	37.9	37.9	36.6	25.3	45.5	45.5	48.0	25.3	25.3	25.3	25.3	12.6	25.3	25.3	25.3	25.3
0.72	0.72	0.72	1.00	0.95	0.95	0.95	0.80	0.98	0.98	1.00	0.80	0.80	0.80	0.80	0.55	0.80	0.80	0.80	0.80
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.72	0.72	0.72	1.00	0.95	0.95	0.95	0.80	0.98	0.98	1.00	0.80	0.80	0.80	0.80	0.55	0.80	0.80	0.80	0.80
0.58	0.58	0.58	0.80	0.76	0.76	0.76	0.64	0.78	0.78	0.80	0.64	0.64	0.64	0.64	0.44	0.64	0.64	0.64	0.64

0.08	0.08	0.31	0.94	0.77	0.43	2.97	0.47	0.72	1.27	0.29	0.77	3.95	1.21	0.43	0.49	0.14	0.36	0.51	0.55
90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%
0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250
138.0	138.0	534.7	2,252.1	1,752.5	978.7	6,759.7	900.8	1,690.5	2,981.8	694.8	1,475.8	7,570.7	2,319.1	824.2	645.7	268.3	690.0	977.5	1,054.2

UIG 1	UIG 1	UIG 1	UIG 3	UIG 4	UIG 4	UIG 5	PP	PP	PP	UIG 3	PP	PP	PP	PP	PP	PP	PP	PP	PP
1.6	1.6	1.6	3.8	3.0	3.0	2.9	2.0	3.6	3.6	3.8	2.0	2.0	2.0	2.0	1.0	2.0	2.0	2.0	2.0
0.64	0.64	0.64	1.52	1.2	1.2	1.16	0.8	1.44	1.44	1.52	0.8	0.8	0.8	0.8	0.4	0.8	0.8	0.8	0.8
216	216	836	1,482	1,460	816	5,827	1,126	1,174	2,071	457	1,845	9,463	2,899	1,030	1,614	335	862	1,222	1,318
7,872*	7,872*	7,872*	5,790*	2,690*	2,690*	6,180	11,970	5,260	5,260	5,790*	4,196	13,532	2,961	1,228	1,688	529	1,287	1,888	1,901
20.2	20.2	20.2	48.0	37.9	37.9	36.6	25.3	45.5	45.5	48.0	25.3	25.3	25.3	25.3	12.6	25.3	25.3	25.3	25.3

35	36	37	38	39	40	41	42	43	44	
0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	inches
25.3	25.3	30.3	25.3	15.8	29.1	29.1	45.5	45.5	25.3	hours
0.80	0.80	0.88	0.80	0.62	0.80	0.80	0.98	0.98	0.80	
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	%
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
0.80	0.80	0.88	0.80	0.62	0.80	0.80	0.98	0.98	0.80	
0.64	0.64	0.70	0.64	0.50	0.64	0.64	0.78	0.78	0.6400	inches
0.45	0.34	1.15	0.22	1.10	0.43	0.36	0.63	0.12	0.32	acres
90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	%
0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	
862.5	651.7	2,424.5	421.7	1,633.9	824.2	690.0	1,479.2	281.7	613.3	cu-ft
PP	PP	PP	UIG 6	PP	UIG 7	UIG 7	PP	PP	PP	
2.0	2.0	2.4	2.0	1.25	2.3	2.3	3.6	3.6	2.0	ft
0.8	0.8	0.96	0.8	0.5	0.92	0.92	1.44	1.44	0.8	ft
1,078	815	2,526	527	3,268	896	750	1,027	196	767	sq-ft
1,690	1,332	2,880	721	6,908	1,653*	1,653*	5,260	5,260	888	sq-ft
25.3	25.3	30.3	25.3	15.8	29.1	29.1	45.5	45.5	25.3	hours

Worksheet J: Summary of Harvested Water Demand and Feasibility

1	What demands for harvested water exist in the tributary area (check all that apply):			
2	Toilet and urinal flushing		**X**	
3	Landscape irrigation		X	
4	Other:_____			
5	What is the design capture storm depth? (Figure III.1)	d	0.80	inches
6	What is the project size?	A	37.7	ac
7	What is the acreage of impervious area?	IA	33.9	ac
	For projects with multiple types of demand (toilet flushing, irrigation demand, and/or other demand)			
8	What is the minimum use required for partial capture? (Table X.6)	650		gpd
9	What is the project estimated wet season total daily use (Section X.2)?	Irrigation = 77.6 Toilet Flushing = 34.3 Total = 111.9		gpd
10	Is partial capture potentially feasible? (Line 9 > Line 8?)	NO		
	For projects with only toilet flushing demand			
11	What is the minimum TUTIA for partial capture? (Table X.7)	130		
12	What is the project estimated TUTIA?	4.9		
13	Is partial capture potentially feasible? (Line 12 > Line 11?)	NO		
	For projects with only irrigation demand			
14	What is the minimum irrigation area required based on conservation landscape design? (Table X.8)	0.96		ac
15	What is the proposed project irrigated area? (multiply conservation landscaping by 1; multiply active turf by 2)	EIATA = 0.04		ac
16	Is partial capture potentially feasible? (Line 15 > Line 14?)	NO		

Provide supporting assumptions and citations for controlling demand calculation:

TUTIA ONLY

Employee Type	Number	Total Use	Total GPD
Restaurant (retail)	96	7	672
Office	24	7	168
Retail	46	7	322
Total	*166*		*1,162*

166 TU/33.9 IA = ***4.9 TUTIA***

1,162 gpd/33.9 IA = ***34.3 gpd***

IRRIGATION DEMAND ONLY

See Harvest and Reuse Irrigation Demand Worksheet

Harvest & Reuse Irrigation Demand Calculations

Project: Dana Point Harbor Revitalization - Planning Areas 1 and 2
Date: 20-Aug-13

Drainage Area / Land Use Type	% impervious	Runoff Coefficient	Rainfall Intensity (in)	Drainage Area (acres)	DCV (ft^3)	DCV (gal)
PA 1 & 2	90%	0.8250	0.8	31.0900	**74,485.4**	**557,151**

	Eto
Irvine	3.00
Laguna Beach	2.75
Santa Ana	2.93

$$\text{Modified EAWU} = \frac{(\text{Eto} \times \text{KL} \times \text{LA} \times 0.015)}{\text{IE}}$$

$$\text{EIATA} = \frac{\text{LA} \times \text{KL}}{(\text{IE} \times \text{Tributary Imp. Area})}$$

High-use Turf Landscaping

Drainage Area / Land Use Type	Total Area (ac)	Total Area (sf)	% Impervious	Impervious (sf)	Pervious / LA (sf)	Eto	KL	Modified EAWU	EAWU/ Impervious Acre	Minimum EAWU/ Impervious Acre (Table X.6)	Feasible?	EIATA	Minimum EIATA (Table X.8)	Drawdown (days)	Drawdown (hours)	% Capture (Fig. III.2)
PA 1 & 2	31.0900	1,354,280	90%	1,218,852	135,428	2.75	0.7	4,344.98	**155.28**	**650**	NO	0.09	0.48	**128.2**	3,077	

Low Water Use Landscaping

Drainage Area / Land Use Type	Total Area (ac)	Total Area (sf)	% Impervious	Impervious (sf)	Pervious / LA (sf)	Eto	KL	Modified EAWU	EAWU/ Impervious Acre	Minimum EAWU/ Impervious Acre (Table X.6)	Feasible?	EIATA	Minimum EIATA (Table X.8)	Drawdown (days)	Drawdown (hours)	% Capture (Fig. III.2)
PA 1 & 2	31.090	1,354,280	90%	1,218,852	135,428	2.75	0.35	2,172.49	**77.64**	**650**	NO	0.04	0.96	**256.5**	6,155	

Blend of High-Use and Low-Use Landscaping

Drainage Area / Land Use Type	Total Area (ac)	Total Area (sf)	% Impervious	Impervious (sf)	Pervious / LA (sf)	Eto	KL	Modified EAWU	EAWU/ Impervious Acre	Minimum EAWU/ Impervious Acre (Table X.6)	Feasible?	EIATA	Minimum EIATA (interpo-lated)	Drawdown (days)	Drawdown (hours)	% Capture (Fig. III.2)
PA 1 & 2	31.090	1,354,280	90%	1,218,852	135,428	2.75	0.55	3,413.92	**122.01**	**650**	NO	0.07	0.72	**163.2**	3,917	

TABLE X.6: HARVESTED WATER DEMAND THRESHOLDS FOR MINIMUM PARTIAL CAPTURE

Design Capture Storm Depth, inches	Wet Season Demand Required for Minimum Partial Capture, gpd per impervious acre
0.60	490
0.65	530
0.70	570
0.75	610
0.80	650
0.85	690
0.90	730
0.95	770
1.00	810

TABLE X.8: MINIMUM IRRIGATED AREA FOR POTENTIAL PARTIAL CAPTURE FEASIBILITY

General Landscape Type	Conservation Design: KL = 0.35			Active Turf Areas: KL = 0.7		
Closest ET Station	Irvine	Santa Ana	Laguna	Irvine	Santa Ana	Laguna
Design Capture Storm Depth, inches	Minimum Required Irrigated Area per Tributary Impervious Acre for Potential Partial Capture, ac/ac					
0.60	0.66	0.68	0.72	0.33	0.34	0.36
0.65	0.72	0.73	0.78	0.36	0.37	0.39
0.70	0.77	0.79	0.84	0.39	0.39	0.42
0.75	0.83	0.84	0.9	0.41	0.42	0.45
0.80	0.88	0.9	0.96	0.44	0.45	0.48
0.85	0.93	0.95	1.02	0.47	0.48	0.51
0.90	0.99	1.01	1.08	0.49	0.51	0.54
0.95	1.04	1.07	1.14	0.52	0.53	0.57
1.00	1.1	1.12	1.2	0.55	0.56	0.6

Source: Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs). March 22, 2011. Appendix X.

Figure III.4. Capture Efficiency Nomograph for Off-line Flow-based Systems in Orange County

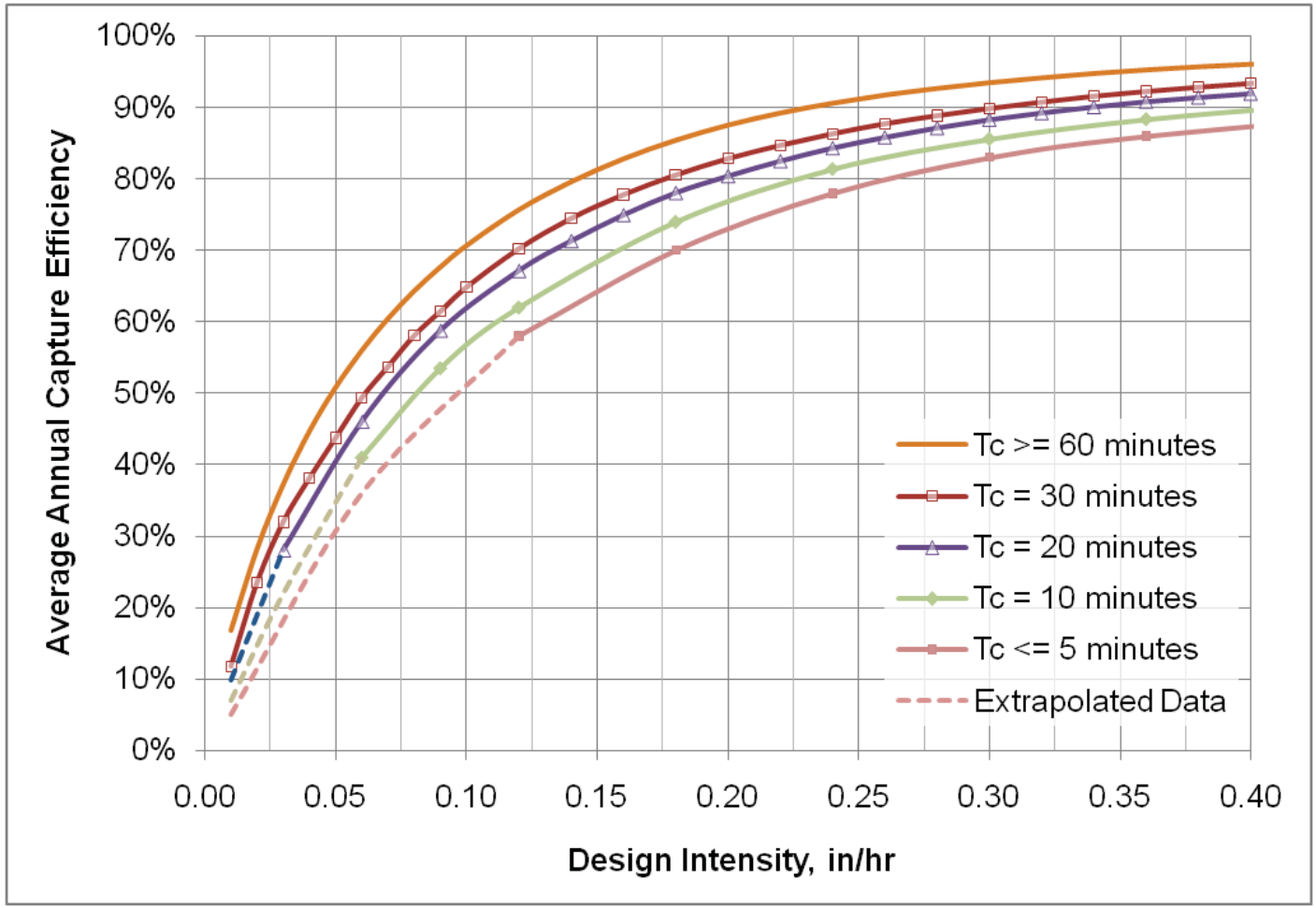
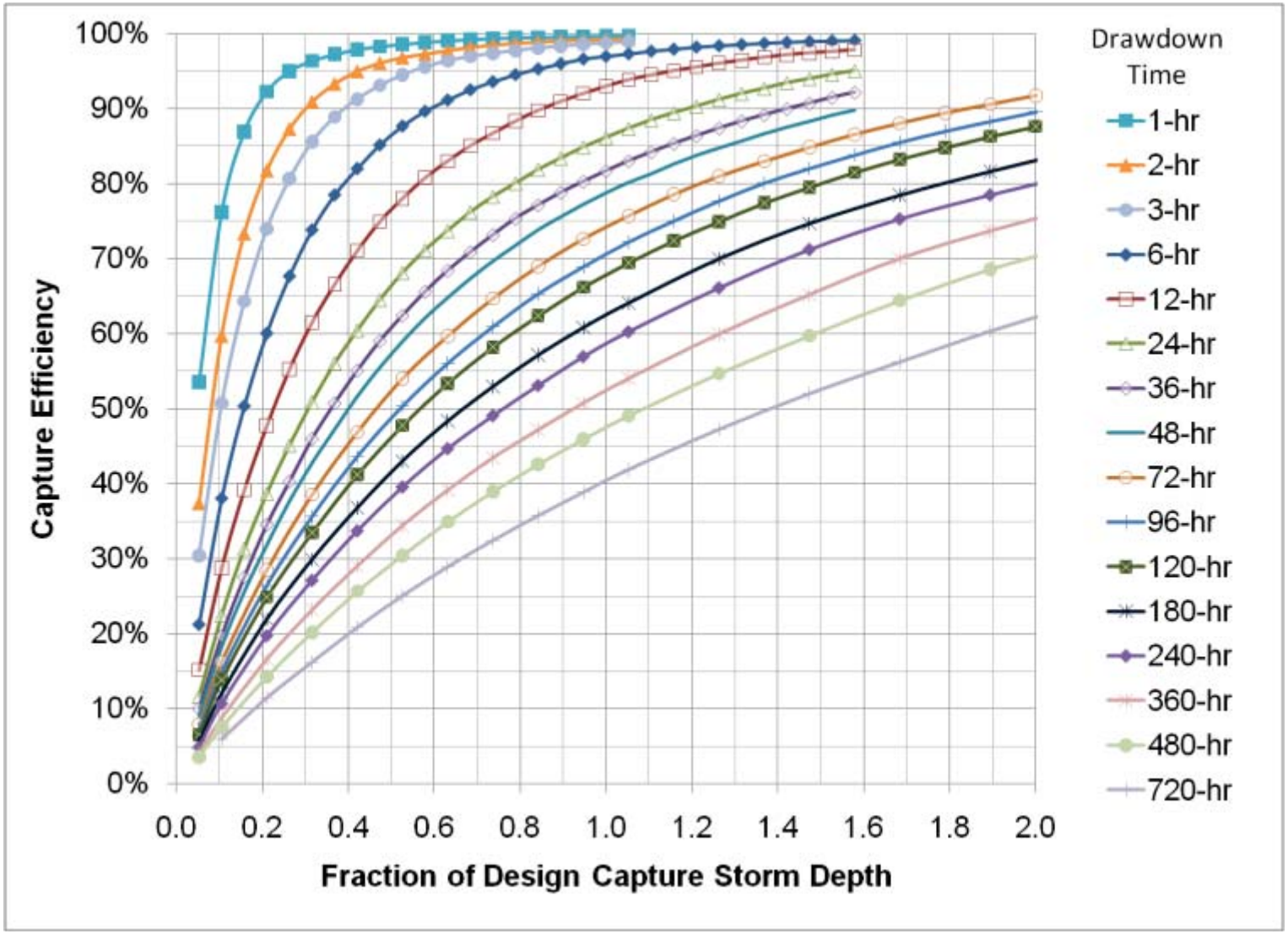


Figure III.2. Capture Efficiency Nomograph for Constant Drawdown Systems in Orange County



ATTACHMENT B

BMP OPERATION AND MAINTENANCE PLAN

OPERATIONS AND MAINTENANCE (O&M) PLAN

Water Quality Management Plan

For

Dana Point Harbor Revitalization Plan
Planning Areas 1 and 2

24650 Dana Point Harbor Drive, Dana Point, CA 92629

APNs: 682-022-07, -09, -12, -16, -17, -20, -22

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	**BMP Name and BMP Implementation, Maintenance and Inspection Procedures**	**Implementation, Maintenance, and Inspection Frequency and Schedule**	**Person or Entity with Operation & Maintenance Responsibility**
NON-STRUCTURAL SOURCE CONTROL BMPs			
Yes	N1. Education for Property Owners, Tenants and Occupants Tenants within shall be provided education materials specified in Section VII of this WQMP upon first occupancy of the lease space and annually thereafter.	Tenants within shall be provided education materials upon first occupancy of the lease space and annually thereafter. Frequency: Annually	OC Dana Point Harbor Department
Yes	N2. Activity Restrictions The Owner shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair and maintenance in non-designated areas, as well as any other activities that may potentially contribute to water pollution.	The Owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property. Frequency: Ongoing	OC Dana Point Harbor Department
Yes	N3. Common Area Landscape Management The Owner shall be responsible for ongoing maintenance and management of all landscaped areas on their property, consistent with OC DAMP Section 5.5, Management Guidelines for Use of Fertilizers as well as City standards and City AB 1881 Landscape Ordinance. Program includes how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices, ongoing trimming and other landscape maintenance activities and proper disposal of landscape wastes by	Maintenance shall be consistent with City AB 1881requirements, plus fertilizer and/or pesticide usage shall be consistent with County guidelines for use of fertilizers and pesticides (OC DAMP Section 5.5). Includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting and replacement of mulch shall be performed on an as-needed basis. Trimmings, clippings, and other waste shall be properly disposed of	OC Dana Point Harbor Department

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	**BMP Name and BMP Implementation, Maintenance and Inspection Procedures**	**Implementation, Maintenance, and Inspection Frequency and Schedule**	**Person or Entity with Operation & Maintenance Responsibility**
	the owner / contractors.	off-site in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and drain inlets. Frequency: Monthly	
Yes	N4. BMP Maintenance The Owner will be responsible for the implementation and maintenance of each applicable non-structural BMP, as well as scheduling inspections and maintenance of all applicable structural BMP facilities through its staff, landscape contractor, and/or any other necessary maintenance contractors. Details on BMP Maintenance are provided in Section V of this WQMP, and the O&M Plan is included in Attachment B. The Owner shall incorporate maintenance activities as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.	Maintenance of BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be maintained by the Owner and documented with the WQMP, and shall be available for review upon request. Frequency: Ongoing	OC Dana Point Harbor Department
Yes	N5. Title 22 CCR Compliance (How development will comply) Hazardous waste management will conform to Title 22 CCR, Division 4.5, for any hazardous waste generated at the Marine Services area in Planning Area 1, should no management program currently exist. The Owner shall incorporate maintenance activities as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.	Frequency: Ongoing	OC Dana Point Harbor Department

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	**BMP Name and BMP Implementation, Maintenance and Inspection Procedures**	**Implementation, Maintenance, and Inspection Frequency and Schedule**	**Person or Entity with Operation & Maintenance Responsibility**
No	N6. Local Industrial Permit Compliance	Not Applicable	
Yes	N7. Spill Contingency Plan The Owner will develop a spill contingency plan for the Marine Services area to prepare and respond to spills of hazardous materials, should none currently exist. The Owner shall incorporate maintenance activities as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.	Frequency: Ongoing	OC Dana Point Harbor Department
No	N8. Underground Storage Tank Compliance	Not Applicable	
Yes	N9. Hazardous Materials Disclosure Compliance The Owner shall comply with hazardous materials disclosure requirements, should none currently exist for the Marine Services area. The Owner shall incorporate maintenance activities as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.	Frequency: Ongoing	OC Dana Point Harbor Department
Yes	N10. Uniform Fire Code Implementation The Owner shall comply with Article 80 of the Uniform Fire Code for hazardous materials management, should none currently exist for the Marine Services area. The Owner shall incorporate maintenance activities as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.	Frequency: Ongoing	OC Dana Point Harbor Department
Yes	N11. Common Area Litter Control The Owner will be responsible for performing trash pick-up and sweeping of littered common areas on a weekly basis or whenever necessary, and proper	Litter patrol, violations investigation, reporting and other litter control activities shall be performed in conjunction with	OC Dana Point Harbor Department

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	**BMP Name and BMP Implementation, Maintenance and Inspection Procedures**	**Implementation, Maintenance, and Inspection Frequency and Schedule**	**Person or Entity with Operation & Maintenance Responsibility**
	disposal of waste collected. Responsibilities will also include investigating, noting and documenting improper disposal materials by the public. The Owner shall incorporate maintenance activities as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.	maintenance activities. Litter collection and removal shall be performed on a weekly basis. Frequency: Weekly	
Yes	N12. Employee Training All employees and any contractors will require training to ensure that employees are aware of maintenance activities that may result in pollutants reaching the storm drain. Training will include, but not be limited to, spill cleanup procedures, proper waste disposal, housekeeping practices, etc. The Owner shall incorporate training activities as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.	The Owner shall educate all new employees/managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis. Materials that may be used are attached to this WQMP. Frequency: Annually	OC Dana Point Harbor Department
No	N13. Housekeeping of Loading Docks	Not Applicable	
Yes	N14. Common Area Catch Basin Inspection All on-site catch basin inlets, area drains, ribbon gutters, curb and gutters, swales and other drainage systems shall be inspected and cleaned out by the Owner in accordance with BMP Fact Sheet DF1 in Attachment C. The Owner shall incorporate this activity as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.	Catch basin inlets, area drains, swales, curb-and-gutter systems and other drainage systems shall be inspected after each storm event and, if necessary, cleaned prior to the storm season by October 1st each year. Frequency: Annually	OC Dana Point Harbor Department
Yes	N15. Street Sweeping Private Streets and Parking Lots	Parking lots and drive aisles must be	OC Dana Point Harbor

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	**BMP Name and BMP Implementation, Maintenance and Inspection Procedures**	**Implementation, Maintenance, and Inspection Frequency and Schedule**	**Person or Entity with Operation & Maintenance Responsibility**
	Parking lots shall be swept quarterly at a minimum and prior to the rainy season, no later than October 1st each year. The Owner shall incorporate this activity as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.	swept at least monthly, including prior to the start of the rainy season (October 1st). Frequency: Monthly	Department
No	N16. Retail Gasoline Outlets	Not Applicable	
STRUCTURAL SOURCE CONTROL BMPs			
Yes	S1. Provide storm drain system stenciling and signage The Owner will be responsible for the stenciling of all catch basins to include a legible message such as "No Dumping - Drains to Ocean". The Owner will be responsible for maintaining and replacement of signage when necessary. The Owner shall incorporate this activity as part of the County's Local Implementation Plan, Municipal Activities Program, as the Dana Point Harbor property is currently managed.	Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be re-stenciled as soon as possible. Frequency: Annually	OC Dana Point Harbor Department
No	S2. Design and construct outdoor material storage areas to reduce pollution introduction	Not Applicable	
Yes	S3. Design and construct trash and waste storage areas to reduce pollution introduction All outdoor trash storage areas will be designed to County/City standards, and will be walled, roofed, and proper drainage plumbed to sewer.	Sweep trash area at least once per week and before October 1st each year. Maintain area clean of trash and debris at all times. Frequency: Weekly	OC Dana Point Harbor Department
Yes	S4. Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control The Owner will be responsible for the installation and	In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray	OC Dana Point Harbor Department

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
	maintenance of all common landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff. The developer will be responsible for implementing all efficient irrigation systems for common area landscaping including but not limited to provisions for water sensors and programmable irrigation cycles. The irrigation systems shall be in conformance with water use efficiency guidelines.	to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, day or nighttime temperatures based on system specifications and local climate patterns. Frequency: Monthly	
No	S5. Protect slopes and channels and provide energy dissipation	Not Applicable	
No	S6. Dock areas	Not Applicable	
Yes	S7. Maintenance bays The proposed dry boat storage building will include one (1) canopied maintenance area. The canopy will preclude urban run-on and runoff from draining into the maintenance area. All non-stormwater discharges generated from the maintenance area will be drained to the sewer.	In conjunction with routine maintenance activities, conduct good housekeeping practices to ensure area is properly maintained. Frequency: Weekly	OC Dana Point Harbor Department
Yes	S8. Vehicle wash areas There currently is an existing boat wash down area in Planning Area 1 that will be redeveloped. The wash down area will be self-contained and drainage will be plumbed to the sewer.	In conjunction with routine maintenance activities, conduct good housekeeping practices to ensure area is properly maintained. Frequency: Weekly	OC Dana Point Harbor Department
No	S9. Outdoor processing areas	Not Applicable	
No	S10. Equipment wash areas	Not Applicable	
No	S11. Fueling areas	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
BMP Applicable? Yes/No	**BMP Name and BMP Implementation, Maintenance and Inspection Procedures**	**Implementation, Maintenance, and Inspection Frequency and Schedule**	**Person or Entity with Operation & Maintenance Responsibility**
No	S12. Hillside landscaping	Not Applicable	
Yes	S13. Wash water control for food preparation areas All wash water from food prep areas will be controlled and use proper disposal methods. Food preparation facilities shall meet all health and safety, building and safety and any other applicable regulations, codes requirements, including installation of a grease interceptor where required. Sinks shall be contained with sanitary sewer connections for disposal of wash waters containing kitchen and food wastes.	Inspection / maintenance shall occur a least once in the late summer / early fall, prior to the start of the rainy season. Maintenance includes using dry cleanup methods for cleaning (i.e., sweeping), keeping spill kits on-site and stocked in accordance with BMP N7, use of drip pans, properly storing and hauling used oil and grease, using secondary containment or elevating stored materials, and disposing wash water to sanitary sewer. Wash water shall not discharge to storm drain system. Mats shall be cleaned indoors or with dry cleaning methods only. Frequency: Annually	OC Dana Point Harbor Department
No	S14. Community car wash racks	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
BMP Name and BMP Implementation, Maintenance and Inspection Procedures	**Implementation, Maintenance, and Inspection Frequency and Schedule**	**Person or Entity with Operation & Maintenance Responsibility**
LOW IMPACT DEVELOPMENT BMPs		
Infiltration BMP # 1 Permeable Pavers/Porous Concrete (INF-6) The primary goal of pervious pavement maintenance is to prevent the pavement surface and/or underlying infiltration bed from becoming clogged with fine sediments. Superficial dirt does not necessarily clog pavement voids, but dirt that is ground in repeatedly by tires can lead to clogging. To keep the system clean throughout the year and prolong its lifespan, the pavement surface should be vacuumed twice per year with a commercial cleaning unit. Inlet structures within or draining to the area should also be cleaned on a biannual basis. With minimal maintenance, pervious pavement can function effectively for well over 20 years, a comparable lifespan as with standard pavement.	Prevent Clogging of Pavement Surface ▪ Vacuum pavement twice per year ▪ Maintain planted areas adjacent to pavement ▪ Immediately clean soil deposited on pavement ▪ Do not allow construction staging, soil/mulch storage, etc. on unprotected pavement surface ▪ Clean inlets located in pervious pavement area twice per year Repairs ▪ Surface should never be seal-coated ▪ Inspect for pavement rutting/raveling on an annual basis ▪ Damaged areas less than 50 ft^2 can be patched with pervious or standard pavement ▪ Larger areas should be patched with an approved pervious pavement	OC Dana Point Harbor Department

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
BMP Name and BMP Implementation, Maintenance and Inspection Procedures	**Implementation, Maintenance, and Inspection Frequency and Schedule**	**Person or Entity with Operation & Maintenance Responsibility**
Infiltration BMP # 2 Underground Infiltration Gallery (INF-7) The primary goal of UIG maintenance is to prevent the underlying infiltration bed or inlet pipes from becoming clogged with fine sediments. To keep the system clean throughout the year and prolong its lifespan, pre-treatment devices such as storm drain inserts and downspout filters should be inspected and cleaned twice per year. Inlet structures within or draining to the area should also be cleaned on a biannual basis.	Inspection ▪ Inspect biannually, and observation wells after major storm events to ensure that infiltration rates are maintained. ▪ Inspect pre-treatment devices twice per year, before the rainy season and after. Clean if necessary. Maintenance ▪ Remove trash & debris from pretreatment devices, as needed. ▪ Clean-out inlets and storm drains annually.	OC Dana Point Harbor Department

Required Permits

None.

Forms to Record BMP Implementation, Maintenance, and Inspection

The form that will be used to record implementation, maintenance, and inspection of BMPs is attached. The attached inspection form "Record of BMP Implementation, Maintenance, and Inspection" will be updated or supplemented to coincide with forms presently being developed by the County of Orange to assess structural BMP operations and maintenance. These forms will be incorporated into the Final WQMP upon their completion.

Recordkeeping

All records must be maintained for at least five (5) years and must be made available for review upon request.

Wastes & Materials Management

Any waste generated from maintenance activities will be disposed of properly. Wash water and other waste from maintenance activities is not to be discharged or disposed of into the storm drain system. Clippings from landscape maintenance (i.e. prunings) will be collected and disposed of properly off-site, and will not be washed into the streets, local area drains/conveyances, or catch basin inlets.

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

Figure 59. Water on Porous Asphalt.
Source: Fishbeck, Thompson, Carr & Huber, Inc.

Maintenance Considerations

- Prevent Clogging of Pavement Surface with Sediment
  - Vacuum pavement twice per year
  - Maintain planted areas adjacent to pavement
  - Immediately clean soil deposited on pavement
  - Do not allow construction staging, soil/mulch storage, etc. on unprotected pavement surface
  - Clean inlets draining to the subsurface bed twice per year

- Repairs
  - Surface should never be seal-coated
  - Inspect for pavement rutting/raveling on an annual basis (some minor ruts may occur in the pervious pavement from stationary wheel rotation)
  - Damaged areas less than 50 square feet can be patched with pervious or standard pavement
  - Larger areas should be patched with an approved pervious pavement

Properly installed and maintained pervious pavement has a lifespan comparable to impervious pavement types, and existing systems that are more than twenty years in age continue to function (Adams, 2003). Because water drains through the surface course and into the subsurface bed, freeze-thaw cycles do not tend to adversely affect pervious pavement.

The primary goal of pervious pavement maintenance is to prevent the pavement surface and/or underlying infiltration bed from becoming clogged with fine sediments. To keep the system clean throughout the year and prolong its lifespan, the pavement surface should be vacuumed twice per year with a commercial cleaning unit. Inlet structures within or draining to the infiltration beds should also be cleaned out on a biannual basis.

Planted areas adjacent to pervious pavement should be well maintained to prevent soil washout onto the pavement. If washout does occur it should be cleaned off the pavement immediately to prevent further clogging of the pores. Furthermore, if bare spots or eroded areas are observed within the planted areas,

they should be replanted and/or stabilized at once. Planted areas should be inspected on a semi-annual basis. Trash and other litter that is observed during these inspections should be removed.

Superficial dirt does not necessarily clog the pavement voids. However, dirt that is ground in repeatedly by tires can lead to clogging. Therefore, vehicles should be discouraged from tracking or spilling excessive dirt onto the pavement. Furthermore, construction vehicles and hazardous materials carriers should be prohibited from entering a pervious pavement lot. Descriptive signage is recommended to maintain institutional memory of pervious pavement.

The use of pervious pavement must be carefully considered in areas where the pavement may be seal coated or paved over due to lack of awareness, such as individual home driveways. In those situations, a system that is not easily altered by the property owner may be more appropriate. Educational signage at pervious pavement installations may guarantee its prolonged use.

Vacuuming

Pervious pavement should be cleaned with a vacuum sweeper two times per year. Acceptable types of vacuum sweepers include the Elgin Whirlwind and the Allianz Model 650. Though much less effective than “pure” vacuum sweepers, regenerative air sweepers, such as the Tymco Model 210, Schwarze 348, Victory, and others, are sometimes used. These units contain a blower system that generates a high velocity air column, which forces the air against the pavement at an angle, creating a 'peeling’ or 'knifing' effect. The high volume air blast loosens the debris from the pavement surface, then transports it across the width of the sweeping head and lifts it into the containment hopper via a suction tube. Thus, sediment and debris are loosened from the pavement and sucked into the unit. (Note: simple broom sweepers are not recommended for pervious pavement maintenance.)

If the pavement surface has become significantly clogged such that routine vacuum sweeping does not restore permeability, then a more intensive level of treatment may be required. Recent studies have proven the usefulness of washing pervious pavements with clean, low pressure water, followed by immediate vacuuming. Combinations of washing and vacuuming techniques have proved effective in cleaning both organic clogging as well as sandy clogging. Research in Florida found that a “power head cone nozzle” that “concentrated the water in a narrowly rotating cone” worked best. (Note: if the pressure of the washing nozzle is too great, contaminants may be driven further into the pervious surface.) Maintenance crews are encouraged to determine the most effective strategy of cleaning their pervious pavement installations.

For smaller installations, such as sidewalks, plazas, or small parking lots, “walk behind” vacuum units may prove most effective. Though these units can be loud and somewhat deleterious to the operator due to the lack of dust suppression, they are also relatively easy to operate and inexpensive. Examples of acceptable “walk behind” units include the Billy Goat models, the 5700 industrial-strength Scrubber by Tennant, and the sidewalk class vacuum sweepers made by Nilfisk, Advance, and Hako. If “walk behind” units are used, it is recommended that the scrub pressure be kept relatively low. The dirtiest areas may need to be power washed after scrubbing to get out the dirt that has been deeply ground in.

Restoration / Repairs

Because pervious pavement drains rapidly, potholes are extremely unlikely to occur, though settling might occur if a soft spot in the subgrade is not removed during construction. For damaged areas of less than 50 square feet, a declivity could be patched by any means suitable with standard pavement, with the loss of porosity of that area being insignificant. The declivity can also be filled with pervious mix or paver units. If an area greater than 50 SF is in need of repair, approval of patch type must be sought from either the engineer or owner. Under no circumstance is the pavement surface to ever be seal-coated. Required repair of drainage structures should be done promptly to ensure continued proper functioning of the system.

With minimal maintenance, pervious pavement can function effectively for well over 20 years. However, in the event that maintenance of the pervious pavement is neglected and it becomes clogged over time, the owner should vacuum the lot until permeability is restored. (If the permeability of the lot cannot be

restored, the pavement should be removed and replaced with a new pervious mix or pervious units.) Recent research has shown that one of the most effective ways of restoring pervious pavement is applying a pressurized dose of a non-toxic detergent cleaning solution, allowing adequate soak time, and then vacuuming with a high performance unit. Once again, it is important to note that high pressure washing may drive contaminants further into the pervious surface and even into the underlying aggregate. It is therefore recommended that, prior to vacuum sweeping, a low performance pressure washer is used to get the solution to break the surface tension and reach into the pores.

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ATTACHMENT C

EDUCATIONAL MATERIALS

Preventing water pollution at your commercial/industrial site

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many landscape and building maintenance activities can lead to water pollution if you're not careful. Paint, chemicals, plant clippings and other materials can be blown or washed into storm drains that flow to the ocean. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour soap or fertilizers into the ocean, so why would you let them enter the storm drains? Follow these easy tips to help prevent water pollution.

Some types of industrial facilities are required to obtain coverage under the State General Industrial Permit. For more information visit: **www.swrcb.ca.gov/stormwater/industrial.html**

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL** (1-877-897-7455) or visit **www.ocwatersheds.com**

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline** at **1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

RECYCLE USED OIL

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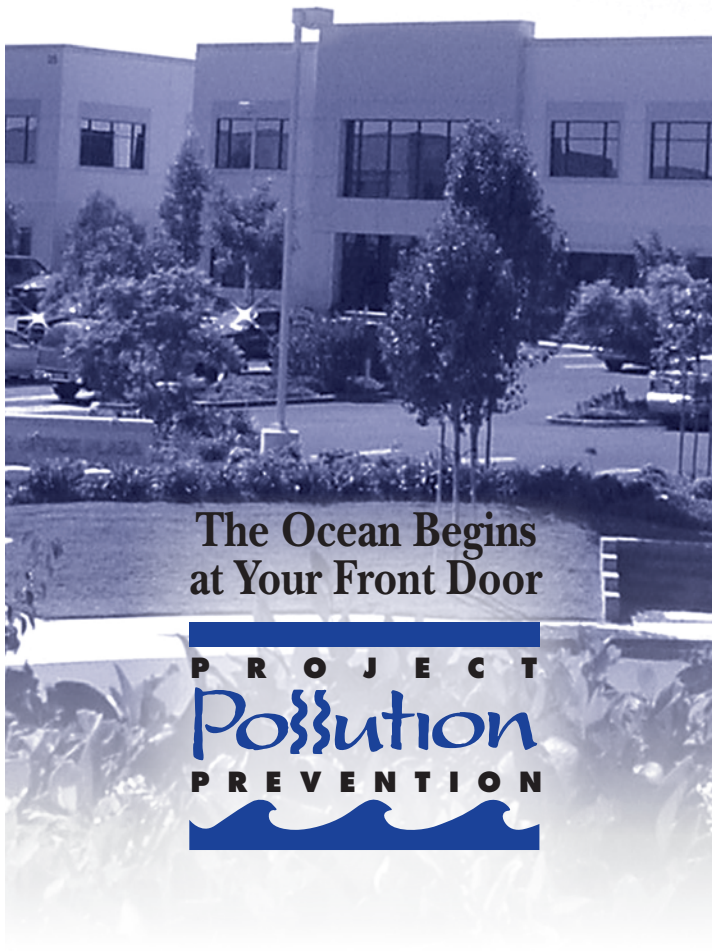
Help Prevent Ocean Pollution:

Proper Maintenance Practices for Your Business



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Proper Maintenance Practices for your Business

Landscape Maintenance

- Compost grass clippings, leaves, sticks and other vegetation, or dispose of it at a permitted landfill or in green waste containers. Do not dispose of these materials in the street, gutter or storm drain.
- Irrigate slowly and inspect the system for leaks, overspraying and runoff. Adjust automatic timers to avoid overwatering.
- Follow label directions for the use and disposal of fertilizers and pesticides.
- Do not apply pesticides or fertilizers if rain is expected within 48 hours or if wind speeds are above 5 mph.
- Do not spray pesticides within 100 feet of waterways.
- Fertilizers should be worked into the soil rather than dumped onto the surface.
- If fertilizer is spilled on the pavement or sidewalk, sweep it up immediately and place it back in the container.

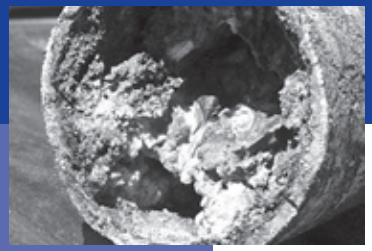
Building Maintenance

- Never allow washwater, sweepings or sediment to enter the storm drain.
- Sweep up dry spills and use cat litter, towels or similar materials to absorb wet spills. Dispose of it in the trash.
- If you wash your building, sidewalk or parking lot, you **must** contain the water. Use a shop vac to collect the water and contact your city or sanitation agency for proper disposal information. Do not let water enter the street, gutter or storm drain.
- Use drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of materials in the trash.
- Use a ground cloth or oversized tub for mixing paint and cleaning tools.
- Use a damp mop or broom to clean floors.
- Cover dumpsters to keep insects, animals, rainwater and sand from entering. Keep the area around the dumpster clear of trash and debris. Do not overfill the dumpster.
- Call your trash hauler to replace leaking dumpsters.
- Do not dump any toxic substance or liquid waste on the pavement, the ground, or near a storm drain. Even materials that seem harmless such as latex paint or biodegradable cleaners can damage the environment.

Never Dispose of Anything in the Storm Drain.

- Recycle paints, solvents and other materials. For more information about recycling and collection centers, visit **www.oclandfills.com**.
- Store materials indoors or under cover and away from storm drains.
- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry, carpet, plastic, pipes, drywall, rocks, dirt, and green waste. For a listing of construction and demolition recycling locations in your area, visit **www.ciwmb.ca.gov/recycle.**
- Properly label materials. Familiarize employees with Material Safety Data Sheets.

PROJECT Pollution PREVENTION



Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. Fats, oils and grease from restaurants and food service facilities can cause sewer line blockages that may result in sewage overflow into your facility and into storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways and should never contain washwater, trash, grease or other materials.

You would never dump oil and trash into the ocean, so don't let it enter the storm drains. Follow these tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

Report sewage spills and
discharges that are not
contained to your site to the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
at **1-877-89-SPILL** (1-877-897-7455)

For emergencies, dial 911.

CALIFORNIA Restaurant ASSOCIATION SINCE 1906

Printed on Recycled Paper

Help Prevent Ocean Pollution:

Tips for the Food Service Industry

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

Best Kitchen Practices

Food Waste Disposal

- Scrape food waste off of plates, utensils, pots, food preparation and cooking areas and dispose of it in the trash.
- Never put food waste down the drain. Food scraps often contain grease, which can clog sewer pipes and result in sewage backups and overflows.

Grease & Oil Disposal

- Never put oil or grease down the drain. Contain grease and oil by using covered grease storage containers or installing a grease interceptor.
- Never overfill your grease storage container or transport it without a cover.
- Grease control devices must be emptied and cleaned by permitted companies.
- Keep maintenance records on site.

- For a list of oil/grease recycling companies, contact the CIWMB at **www.ciwmb.ca.gov/foodwaste/render.htm** or contact your local sanitation district.

Minor Spill Cleanup

- Always use dry cleanup methods, such as a rag, damp mop or broom.
- Never hose a spill into the street, gutter or storm drain.

Major Spill Cleanup

- Have spill containment and clean-up kits readily available, and train all employees on how to use them.
- Immediately contain and clean the spill using dry methods.
- If the spill leaves your site, call **(714) 567-6363**.

Dumpster Cleanup

- Pick up all debris around the dumpster.
- Always keep the lid on the dumpster closed.

- Never pour liquids into the dumpster or hose it out.

Floor Mat Cleaning

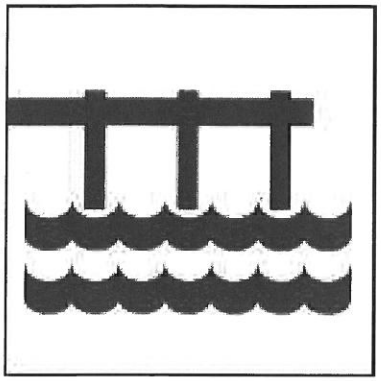
- Sweep the floor mats regularly, discarding the debris into the trash.
- Hose off the mats in a mop sink, at a floor drain, or in an outdoor area that can contain the water.

- Never hose the mats in an area where the wastewater can flow to the street, gutter or storm drain.

Washwater Disposal

- Dispose of washwater in a mop sink or an area with a floor drain.
- Never dispose of washwater in the street, gutter or storm drain.

PROJECT Pollution PREVENTION



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BAY/HARBOR ACTIVITIES

Bay/Harbor activities typically occur at boat and ship repair yards and marinas. The discharge of pollutants to receiving waters during these activities can be prevented or reduced by minimizing maintenance, keeping wastes out of the water, cleaning up spills and wastes immediately, and educating employees. Activities may include one or more of the following:

1. **On Board and General Maintenance**
2. **Disposal of Wastewater and Ballast Water**
3. **Cleaning, Chipping, and Painting**

POLLUTION PREVENTION:

Pollution prevention measures have been considered and incorporated in the model procedures. Implementation of these measures may be more effective and reduce or eliminate the need to implement other more complicated or costly procedures. Possible pollution prevention measures for bay/harbor activities include:

- Move maintenance and repair activities on-shore if possible.
- Perform paint and solvent mixing, fuel mixing, and similar handling of liquids on-shore, to avoid spillage directly in surface water bodies.
- Once per year, educate municipal staff on pollution prevention measures.

MODEL PROCEDURES:

1. On Board and General Maintenance

- ✓ Post signs to indicate proper use and disposal of residual paints, rags, used oil, and other engine fluids.
- ✓ Used antifreeze should be stored in a separate, labeled drum and recycled.
- ✓ Fuel tank vents should have valves to prevent fuel overflows or spills.
- ✓ Boats with inboard engines should have oil absorption pads in bilge areas and they should be changed when no longer useful or at least once a year.

- ✓ Carefully fueling boat engines, recycling used oil, and discarding worn motor parts into proper receptacles can prevent needless petroleum spills.
- ✓ Draining water out of all waterlines and tanks during winter freezes eliminates the possibility of bursting pipes.
- ✓ Keep boat motors well-tuned to prevent fuel and lubricant leaks and improves fuel efficiency.
- ✓ Immediately clean up spills on docks or boats. Have spill containment and cleanup materials readily available and educate employees on spill prevention and cleanup and responsibilities

2. Disposal of Wastewater and Ballast Water

- ✓ Properly dispose of domestic wastewater and ballast water. DO NOT ALLOW discharge of treated or untreated sewage from vessels to harbors.
- ✓ Fecal matter and other solid waste should be contained in a U.S. Coast Guard-approved marine sanitation device (MSD).
- ✓ Portable toilets should be emptied into approved shoreside waste handling facilities and MSDs should be discharged into approved pump out stations.

3. Cleaning, Chipping, and Painting

- ✓ Use secondary containment on paint cans.
- ✓ Limit over-water hull surface maintenance to sanding and minor painting. Use sanders that have dust-containment bags.
- ✓ Major hull resurfacing should occur on land.
- ✓ Use ground cloths when painting boats on land.
- ✓ Paint mixing should not occur on the dock.
- ✓ Replace paints containing lead or tributyltin with less toxic alternatives.
- ✓ Shelter any blasting and spray painting activities by hanging wind blocking tarps to prevent dust and overspray from escaping.
- ✓ A tarp should be placed above the water surface underneath the work area on boats or docks to collect drips, spills, paint chips, and loose solids when work is performed over water.
- ✓ Vacuuming up loose paint chips and paint dust can help to prevent paint and other chemical substances from entering waters.
- ✓ Properly dispose of surface chips, used blasting sand, residual paints, and other materials. Use temporary storage containment that is not exposed to rain.
- ✓ Use phosphate-free and biodegradable detergents for hull washing. No soaps or detergents of any kind should be used to wash the topsides of

boats where the wash water will enter a lake or the ocean.

✓ Select nontoxic cleaning products that do not harm humans or aquatic life.

LIMITATIONS:

Even biodegradable cleaning agents have been found to be toxic to fish. Air authority policies on fugitive dust and outside painting may apply.

REFERENCES:

California Storm Water Best Management Practice Handbooks. Municipal Best Management Practice Handbook. Prepared by Camp Dresser & McKee, Larry Walker Associates, Uribe and Associates, Resources Planning Associates for Stormwater Quality Task Force. March 1993.

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.

DF-1
DRAINAGE FACILITY OPERATION AND MAINTENANCE

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and storm water that may contain certain pollutants. Consequently these pollutants may accumulate in the system and must be removed periodically. In addition, the systems must also be maintained to function properly hydraulically to avoid flooding. Maintaining the system may involve the following activities:

1. Inspection and Cleaning of Stormwater Conveyance Structures
2. Controlling Illicit Connections and Discharges
3. Controlling Illegal Dumping

This list of Model Maintenance Procedures can be utilized as an inspection checklist to determine where better compliance with Designated Minimum Best Management Practices (notated with checkmarks and capital letters) is needed, and to recommend Additional Best Management Practices (notated with bullet points and lower case letters) that may be applicable under certain circumstances, especially where there are certain Pollutant Constituents of Concern. BMPs applicable to certain constituents are notated as:

Bacteria (BACT) *Sediment (SED)* *Nutrients (NUT)* *Oil and Grease (O&G)* *Pesticides (PEST)*
OtherToxic Compounds (TOX) *Trash (TRASH)* *Hydrological Impacts (HYD)* *Any/All or General (ANY)*

Program/Facility Being Inspected: _____

Date: _____ Inspector Name: _____

When completed, the checklist should be attached to the General Inspection Form Cover Sheet and copies should be provided to the Supervisor of the Facility/Program being inspected.

MAINTENANCE PROCEDURES:

1. Inspection and Cleaning of Drainage Facilities

Unsatisfactory	OK
☐ _____	☐
☐ _____	☐
☐ _____	☐
☐ _____	☐
☐ _____	☐
☐ _____	☐
☐ _____	☐

General Guidelines

- T 1A. Annually inspect and clean drainage structures as needed.
- T 1B. Maintain appropriate records of cleaning and inspections.
- T 1C. Properly dispose of removed materials at a landfill or recycling facility.
- T 1D. Conduct intermittent supplemental visual inspections during the wet season to determine if there are problem inlets where sediment/trash or other pollutants accumulate, and provide for additional cleanouts as appropriate.
- T 1E. Prevent or clean up any discharges that may occur during the course of maintenance and cleaning procedures.
- T 1F. Verify that appropriate employees or subcontractors are trained in proper conductance of maintenance activities, including record keeping and disposal.
- T 1G. Annually inspect and clean v-ditches as needed, prior to the wet season. On shrub-covered slopes, vegetative debris may be placed on the downhill side of the ditch. Trash should be bagged and disposed at a landfill.

Unsatisfactory	OK
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐
☐	☐

General Guidelines (cont.)

- 1a. Remove trash or debris as needed from open channels. It should be noted that major vegetative debris removal may require other regulatory permits prior to completing the work. (TRASH)
- 1b. Consider retrofitting energy dissipaters (e.g. riprap) below culvert outfalls to minimize potential for erosion. (SED)
- 1c. Repair any v-ditches that have cracked or displaced in a manner that accelerates erosion. (SED)
- 1d. If suspicious conditions appear to exist, test selected samples of the removed wastes for compliance with hazardous waste regulations prior to disposal. (TOX)
- 1e. Consider more frequent regular cleaning of selected drainage structures to help address ongoing specific impairments. (SED, BACT, NUT, TRASH)
- 1f. Consider structural retrofits to the MS4 to help address ongoing specific impairments (SED, BACT, NUT, TRASH, O&G)
- 1g. Consider cleaning out pipes at gradient breaks or other in-pipe debris accumulation points as identified/needed. (ANY, BACT, NUT, TRASH)

Storm Drain Flushing

- 1h. Flushing of storm drains or storm drain inlets should only be done when critically necessary and no other solution is practical. (SED, BACT, TRASH).
- 1i. If flushed, to the extent practical the material should be collected (vacuumed), treated with an appropriate filtering device to remove sand and debris and disposed of properly. (SED)

Waste Management

T 1H. Store wastes collected from cleaning activities of the drainage facilities in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.

- 1j. Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device to remove the sand and debris prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not permitted, water should be pumped or vacuumed to a tank and properly disposed of. Do not dewater near a storm drain or stream. (SED, TRASH)
- 1k. Provide for laboratory analysis of at least one randomly collected sediment (less the debris) sample per year from the storm drain inlet leaning program to ensure that it does not meet the EPA criteria for hazardous waste. If the sample is determined to be hazardous, the sediment must be disposed of as hazardous waste and the source should be investigated. (TOX).

2. Controlling Illicit Connections and Discharges

Unsatisfactory	OK	General Guidelines
☐	☐	T 2A. Report prohibited discharges such as dumping, paint spills, abandoned oil containers, etc. observed during the course of normal daily activities so they can be investigated, contained, and cleaned up.
☐	☐	T 2B. Where field observations and/or monitoring data indicate significant problems, conduct field investigations to detect and eliminate existing illicit connections and improper disposal of pollutants into the storm drain (i.e. identify problem areas where discharges or illegal connections may occur and follow up stream to determine the source(s)). (Refer to Appendices A-10 and A-11.)
☐	☐	T 2C. Report all observed illicit connections and discharges to the 24-hour water pollution problem reporting hotline (714) 567-6363.
☐	☐	T 2D. Encourage public reporting of improper waste disposal by distributing public education materials and advertising the 24-hour water pollution problem reporting hotline.
		Storm Drain Stenciling ("No Dumping—Drains to Ocean")
☐	☐	T 2E. Implement and maintain a storm drain stenciling program.
☐	☐	• 2a. Consider adding the hotline number to the storm drain stencils (BACT, TOX, TRASH).

3. Controlling Illegal Dumping

		Field Investigation
☐	☐	T 3A. Report prohibited discharges such as dumpings observed during the course of normal daily activities so they can be investigated, contained and cleaned up.
☐	☐	T 3B. Conduct field investigations to detect and eliminate improper disposal of pollutants into the storm drain (i.e. identify problem areas where discharges or illegal connections may occur and follow up stream to determine the source(s)).
☐	☐	T 3C. Report all observed illegal dumping to the 24-hour water pollution problem reporting hotline (714) 567-6363.
☐	☐	T 3D. Encourage public reporting of improper waste disposal by distributing public education materials and advertising the 24-hour water pollution problem reporting hotline.
☐	☐	T 3E. If perpetrator can be identified, take appropriate enforcement action.
☐	☐	• 3a. Consider posting "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs could also indicate fines and penalties for illegal dumping. (ANY)

Unsatisfactory	OK	Training/Education/Outreach
☐ _____	☐	T 3F. Verify that appropriate employees and subcontractors are trained to recognize and report illegal dumping.
☐ _____	☐	T 3G. Encourage public reporting of illegal dumping by advertising the 24-hour water pollution problem reporting hotline (714) 567-6363.
☐ _____	☐	• 3b. Take extra steps to educate the public in neighborhoods where illegal dumping has occurred to inform them why illegal dumping is a problem, and that illegal dumping carries a significant financial penalty. (ANY)

LIMITATIONS:

Clean-up 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.

Site Design & Landscape Planning SD-10

Design Objectives

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

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.
- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.
- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Promote natural vegetation by using parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and

regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

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. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

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

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

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.

Efficient Irrigation SD-12

Design Objectives

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

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

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- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

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. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

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.

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 –

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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.

Maintenance Bays & Docks SD-31

Design Objectives

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

Description

Several measures can be taken to prevent operations at maintenance bays and loading docks from contributing a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the stormwater conveyance system.

Approach

In designs for maintenance bays and loading docks, containment is encouraged. Preventative measures include overflow containment structures and dead-end sumps. However, in the case of loading docks from grocery stores and warehouse/distribution centers, engineered infiltration systems may be considered.

Suitable Applications

Appropriate applications include commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for vehicle maintenance and repair are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code requirements.

Designing New Installations

Designs of maintenance bays should consider the following:

- Repair/maintenance bays and vehicle parts with fluids should be indoors; or designed to preclude urban run-on and runoff.
- Repair/maintenance floor areas should be paved with Portland cement concrete (or equivalent smooth impervious surface).

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- Repair/maintenance bays should be designed to capture all wash water leaks and spills. Provide impermeable berms, drop inlets, trench catch basins, or overflow containment structures around repair bays to prevent spilled materials and wash-down waters form entering the storm drain system. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.
- Other features may be comparable and equally effective.

The following designs of loading/unloading dock areas should be considered:

- Loading dock areas should be covered, or drainage should be designed to preclude urban run-on and runoff.
- Direct connections into storm drains from depressed loading docks (truck wells) are prohibited.
- Below-grade loading docks from grocery stores and warehouse/distribution centers of fresh food items should drain through water quality inlets, or to an engineered infiltration system, or an equally effective alternative. Pre-treatment may also be required.
- Other features may be comparable and equally effective.

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. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

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.

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Design Objectives

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

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

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- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

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. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

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.

ATTACHMENT D

RESOLUTIONS/CONDITIONS OF APPROVAL (PLACEHOLDER)

ATTACHMENT E

INFILTRATION TEST RESULTS

Table 2.7: Infiltration BMP Feasibility Worksheet

	Infeasibility Criteria	*Yes*	*No*
1	**Would Infiltration BMPs pose significant risk for groundwater related concerns?** Refer to Appendix VII (Worksheet I) for guidance on groundwater-related infiltration feasibility criteria.		X
Provide basis: Groundwater beneath project site is primarily seawater from Pacific Ocean. Will not affect drinking water quality.			
2	Would Infiltration BMPs **pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level**? (Yes if the answer to any of the following questions is yes, as established by a geotechnical expert): • The BMP can only be located less than 50 feet away from slopes steeper than 15 percent • The BMP can only be located less than eight feet from building foundations or an alternative setback. • A study prepared by a geotechnical professional or an available watershed study substantiates that stormwater infiltration would potentially result in significantly increased risks of geotechnical hazards that cannot be mitigated to an acceptable level.		X
Provide basis:			
3	Would infiltration of the DCV from drainage area **violate downstream water rights**?		X
Provide basis:			

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

	Partial Infeasibility Criteria	*Yes*	*No*
4	Is proposed infiltration facility **located on HSG D soils** or the site geotechnical investigation identifies presence of soil characteristics which support categorization as D soils?		X
Provide basis: Bedrock was encountered approximately 15 to 20 feet below existing engineered fill. Soil above is suitable for infiltration.			
5	Is **measured infiltration rate below proposed facility less than 0.3 inches per hour**? This calculation shall be based on the methods described in Appendix VII.		X
Provide basis:			
6	Would **reduction of over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?**		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:			
7	Would **an increase in infiltration over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?**		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:			

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

Infiltration Screening Results (check box corresponding to result):		
8	Is there substantial evidence that infiltration from the project would result in a significant increase in I&I to the sanitary sewer that cannot be sufficiently mitigated? (See Appendix XVII) Provide narrative discussion and supporting evidence: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.	
9	If any answer from row 1-3 is yes: infiltration of any volume is **not feasible** within the DMA or equivalent. Provide basis: Summarize findings of infeasibility screening	
10	If any answer from row 4-7 is yes, infiltration is **permissible but is not presumed to be feasible for the entire DCV.** Criteria for designing biotreatment BMPs to achieve the maximum feasible infiltration and ET shall apply. Provide basis:	
11	If all answers to rows 1 through 11 are no, infiltration of the full DCV is potentially feasible, BMPs must be designed to infiltrate the full DCV to the maximum extent practicable.	X

Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	2	0.50
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.25
B	Design	Tributary area size	0.25	2	0.5
		Level of pretreatment/ expected sediment loads	0.25	2	0.5
		Redundancy	0.25	1	0.25
		Compaction during construction	0.25	2	0.5
		Design Safety Factor, $S_B = \Sigma p$			1.75

Combined Safety Factor, $S_{Total} = S_A \times S_B$	2.19
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)	0.83 in/hr
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_{observed} / S_{Total}$	0.38 in/hr

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Report of Geotechnical Investigation, Dana Point Harbor Revitalization Project, Phase 1, Dana Point Harbor, County of Orange, California. GMU Geotechnical, Inc. July 19, 2013.

"Infiltration testing was performed in general accordance with the Santa Ana Regional Water Quality Control Board Technical Guidance Document (TGD) Appendices dated March 2011, utilizing the shallow percolation test procedure contained in Section VII.3.8. To comply with the requirements of the TGD, five (5) 10-inch-diameter test holes were excavated adjacent to drill holes DH-5, DH-7, DH-10, DH-11, and DH-16 to depths of approximately 3 to 4 feet using a hollow stem auger drill rig. The infiltration test hole locations are shown for ease of reference on the attached Geotechnical Map, Plate 2."

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

DANA POINT HARBOR REVITALIZATION PROJECT

GROUNDWATER MOUNDING MODELING USING HANTUSH EQUATION (USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins")

DATE: March 14, 2013

DMA	Infiltration Rate (in/hr)	Infiltration with Safety Factor (in/hr)	R Infiltration Rate (ft/day)	Sy Specific Yield	K Horizontal Hydraulic Conductivity (ft/day)	t Drawdown Time (days)	Basin Length (ft)	x Half Basin Length (ft)	Basin Width (ft)	y Half Basin Width (ft)	hi(0) Initial Thickness of Saturated Zone (ft)	Δh(max) Groundwater Mounding (ft)
2	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	150	**75**	18	**9**	**40**	**0.557**
3	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	130	**65**	18	**9**	**40**	**0.531**
5	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	155	**77.5**	18	**9**	**40**	**0.563**
6	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	230	**115**	18	**9**	**40**	**0.613**
10	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	95	**47.5**	17	**8.5**	**40**	**0.444**
11	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	125	**62.5**	36	**18**	**40**	**0.963**
21	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	260	**130**	40	**20**	**40**	**1.267**
25	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	56	**28**	30	**15**	**40**	**0.545**
27	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	310	**155**	45	**22.5**	**40**	**1.419**
28	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	250	**125**	18	**9**	**40**	**0.620**
29	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	80	**40**	8	**4**	**40**	**0.202**
30	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	140	**70**	16	**8**	**40**	**0.489**
31	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	86	**43**	8	**4**	**40**	**0.209**
32	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	140	**70**	18	**9**	**40**	**0.545**
33	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	100	**50**	10	**5**	**40**	**0.277**
34	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	190	**95**	10	**5**	**40**	**0.341**
35	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	220	**110**	10	**5**	**40**	**0.350**
36	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.05**	215	**107.5**	8	**4**	**40**	**0.281**
1, 4,13,14,15,16 (UIG 1)	0.83	0.38	**0.76**	**0.20**	**16.6**	**0.74**	238	**119**	35	**17.5**	**40**	**0.934**
40,41 (UIG 7)	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.06**	50	**25**	29	**14.5**	**40**	**0.494**
7,8,12,17,24 (UIG 3)	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.75**	142	**71**	30	**15**	**40**	**1.042**
18,19 (UIG 4)	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.38**	80	**40**	31	**15.5**	**40**	**0.748**
20 (UIG 5)	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.34**	68	**34**	68	**34**	**40**	**1.224**
9	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.11**	40	**20**	22	**11**	**40**	**0.342**
22,23,42,43	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.66**	270	**135**	20	**10**	**40**	**0.853**
37	0.83	0.38	**0.76**	**0.20**	**16.6**	**1.11**	72	**36**	40	**20**	**40**	**0.813**
39, 28(part)	0.83	0.38	**0.76**	**0.20**	**16.6**	**0.66**	252	**126**	26	**13**	**40**	**0.685**
38 (UIG 6)	1.83	0.84	**1.67**	**1.20**	**36.6**	**1.05**	36	**18**	24	**12**	**40**	**0.337**

(1) Basin length and width refers to LID BMP dimensions.

(2) Drawdown time derived from LID BMP drawdown of the DCV.

(3) hi(0) is a conservative estimate based on boring logs for the project and estimates provided by Municipal Water District of Orange County in the Doheny Ocean Desalination Project Reports (http://www.mwdoc.com/services/dohenydesal).

Example: DMA 38

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.

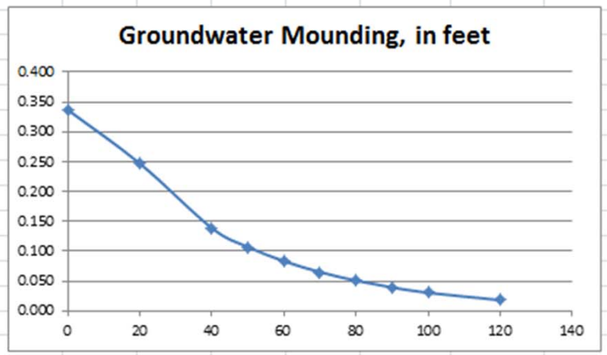
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values

use consistent units (e.g. feet & days **or** inches & hours)

Input Values			Conversion Table inch/hour	feet/day	
0.7600	*R*	Recharge (infiltration) rate (feet/day)	0.67	1.33	
0.200	Sy	Specific yield, Sy (dimensionless, between 0 and 1)			
16.60	K	Horizontal hydraulic conductivity, Kh (feet/day)*	2.00	4.00	In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).
18.000	x	1/2 length of basin (x direction, in feet)			
12.000	y	1/2 width of basin (y direction, in feet)	hours	days	
1.050	t	duration of infiltration period (days)	36	1.50	
40.000	hi(0)	initial thickness of saturated zone (feet)			
40.337	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)			
0.337	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)			

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.337	0
0.247	20
0.139	40
0.107	50
0.083	60
0.065	70
0.051	80
0.040	90
0.031	100
0.018	120

Re-Calculate Now



Disclaimer

DANA POINT HARBOR REVITALIZATION PROJECT

LID BMP GROUNDWATER MOUNDING CLEARANCE

DATE: March 14, 2013

Underground Infiltration Gallery Groundwater Mounding Assessment

LID BMP	DMAs	Tributary Area (sf)	DCV (2) (ft^3)	LID BMP Footprint L x W (sf)	Bottom of FC Elevation	LID BMP Reservoir Depth	Bottom LID BMP Elevation	GW Elevation	Δ to GW (ft)	GW Mounding (ft)	Δ to GW Mounding (ft)
UIG 1	4, 13, 14, 15, 16, 1	96,704	5,320	35'x238'	9.3	1.60	7.70	DH-5	1.70	0.93	0.77
			13,300	8,313				6.0			
UIG 3	7, 8, 12, 17, 24	103,237	6,469	30'x142'	5.8	3.80	2.00	DH-13	1.50	1.04	0.46
			16,173	4,256 (1)				0.5			
PP at Bldg 9/10	9	14,810	815	22'x40'	-	2.40	2.60	DH-17	6.60	0.34	6.25
			2,038	870				-4.0			
UIG 4	18, 19	52,272	2,875	31'x80'	7.5	3.00	4.50	DH-6	5.00	0.75	4.25
			7,188	2,488				-0.5 (3)			
UIG 5	20	129,373	7,116	68'x68'	-	2.90	6.85	DH-2	2.35	1.22	1.13
			17,790	4,682				4.5 (4)			
PP at Wharf	22, 23, 42, 43	88,863	7,735	20'x270'	-	3.60	1.65	B-1	1.15	0.85	0.30
			19,338	5,400				0.5			
PP at Boat Launch Ramp	37	50,074	2,754	40'x72'	-	2.40	3.55	B-2	5.35	0.81	4.54
			6,885	2,880				-1.8			
PP at Dry Boat Northeast	28 (part), 39	59,259	3,260	26'x252'	-	1.25	6.20	DH-8	1.20	0.69	0.52
			8,150	6,520				5.0			
UIG 7	40, 41	24,188	1,331	29'x57'	-	2.30	4.05	DH-9	5.05	0.49	4.56
			3,328	1,653				-1.0			
UIG 6	38	12,389	681	24'x36'	-	2.00	4.75	CPT-2	5.75	0.34	5.41
			1,703	864				-1.0			

PP = Pervious Pavement UIG = Underground Infiltration Gallery FC = Flood Control Facility (Detention)

(1) LID footprint is larger than FC footprint

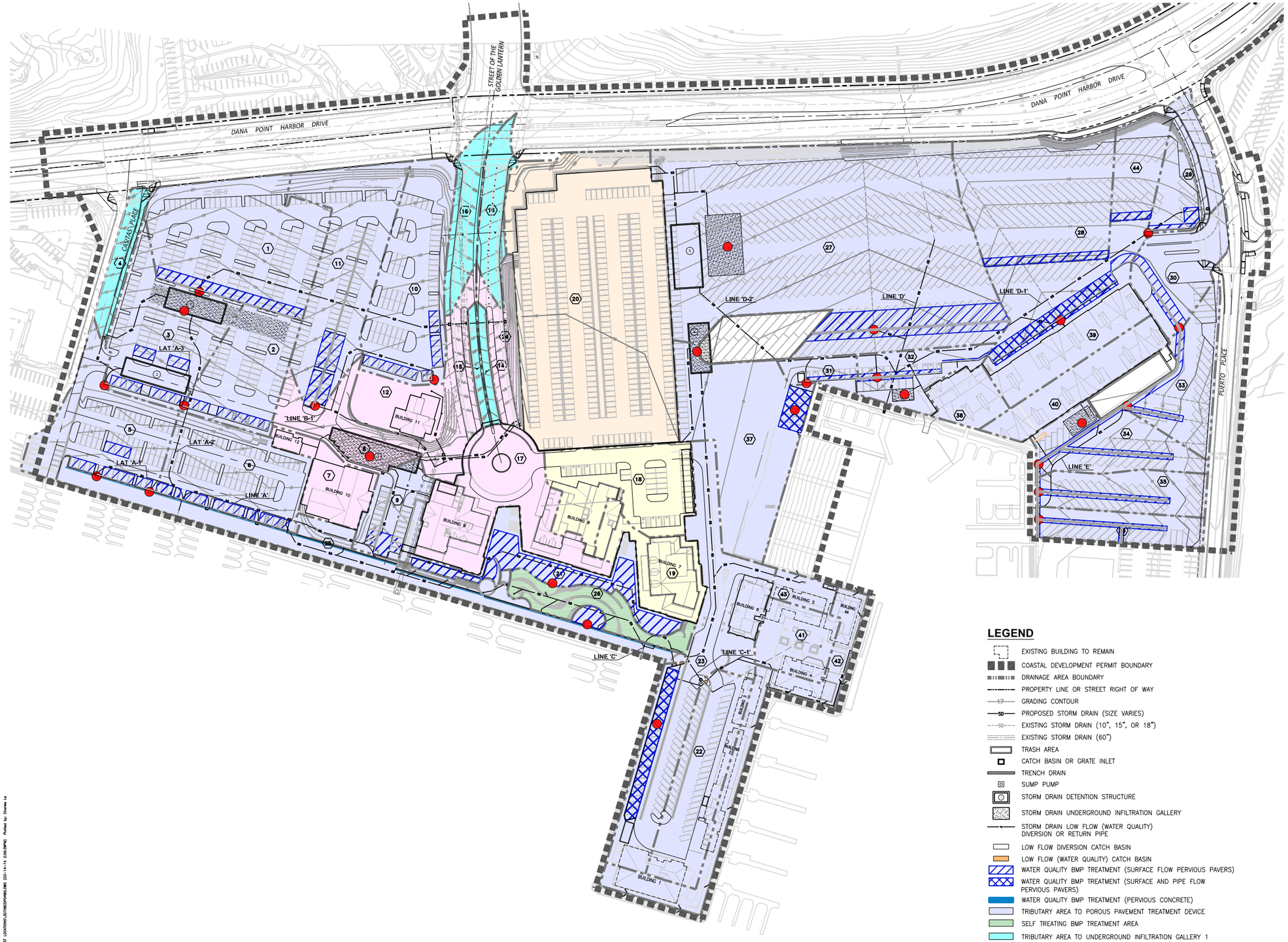
(2) 100% DCV/Reservoir volume with gravel (0.4 Porosity)

(3) Boring DH-6

(4) Boring DH-2

Permeable Pavement Groundwater Mounding Assessment

DMA	FG	Bottom of Reservoir	Existing FG	Water Depth	Drill Hole	GW Elevation	Δ to GW (ft)	GW Mounding (ft)	Δ to GW Mounding (ft
1	15.90	12.40	20.00	10.00	DH-4	10	2.40	0.873	**1.53**
2	12.16	8.66	16.00	10.00	DH-5	6	2.66	0.557	**2.10**
3	11.36	7.86	16.00	10.00	DH-5	6	1.86	0.531	**1.33**
5	6.12	2.62	7.00	10.00	DH-16	-3	5.62	0.563	**5.06**
6	6.00	2.50	7.00	10.00	DH-16	-3	5.50	0.613	**4.89**
10	14.65	11.15	16.00	10.00	DH-5	6	5.15	0.444	**4.71**
11	13.25	9.75	16.00	10.00	DH-5	6	3.75	0.963	**2.79**
21	6.50	3.00	7.30	9.00	DH-19	-1.7	4.70	1.267	**3.43**
25	6.00	2.50	8.00	10.50	DH-18	-2.5	5.00	0.545	**4.46**
27	8.00	4.50	9.80	10.50	DH-7	-0.7	5.20	1.419	**3.78**
28	10.50	7.00	13.00	8.00	DH-8	5	2.00	0.620	**1.38**
29	11.00	7.50	15.40	10.00	DH-3	5.4	2.10	0.202	**1.90**
30	8.76	6.26	13.00	8.00	DH-8	5	1.26	0.489	**0.77**
31	7.40	3.90	10.00	10.00	DH-10		3.90	0.209	**3.69**
32	7.70	4.20	9.80	10.50	DH-7	-0.7	4.90	0.545	**4.36**
33	7.37	3.87	9.00	10.00	DH-9	-1	4.87	0.277	**4.59**
34	6.60	3.10	7.50	10.00	DH-11	-2.5	5.60	0.341	**5.26**
35	6.50	3.00	7.50	10.00	DH-11	-2.5	5.50	0.350	**5.15**
36	6.40	2.90	7.50	10.00	DH-11	-2.5	5.40	0.281	**5.12**



LEGEND

- EXISTING BUILDING TO REMAIN
- COASTAL DEVELOPMENT PERMIT BOUNDARY
- DRAINAGE AREA BOUNDARY
- PROPERTY LINE OR STREET RIGHT OF WAY
- 17 GRADING CONTOUR
- 50 PROPOSED STORM DRAIN (SIZE VARIES)
- 50 EXISTING STORM DRAIN (10", 15", OR 18")
- EXISTING STORM DRAIN (60")
- TRASH AREA
- CATCH BASIN OR GRATE INLET
- TRENCH DRAIN
- SUMP PUMP
- STORM DRAIN DETENTION STRUCTURE
- STORM DRAIN UNDERGROUND INFILTRATION GALLERY
- STORM DRAIN LOW FLOW (WATER QUALITY) DIVERSION OR RETURN PIPE
- LOW FLOW DIVERSION CATCH BASIN
- LOW FLOW (WATER QUALITY) CATCH BASIN
- WATER QUALITY BMP TREATMENT (SURFACE FLOW PERVIOUS PAVERS)
- WATER QUALITY BMP TREATMENT (SURFACE AND PIPE FLOW PERVIOUS PAVERS)
- WATER QUALITY BMP TREATMENT (PERVIOUS CONCRETE)
- TRIBUTARY AREA TO POROUS PAVEMENT TREATMENT DEVICE
- SELF TREATING BMP TREATMENT AREA
- TRIBUTARY AREA TO UNDERGROUND INFILTRATION GALLERY 1
- TRIBUTARY AREA TO UNDERGROUND INFILTRATION GALLERY 3
- TRIBUTARY AREA TO UNDERGROUND INFILTRATION GALLERY 4
- TRIBUTARY AREA TO UNDERGROUND INFILTRATION GALLERY 5
- MOUNDING SAMPLING LOCATION

50' 0' 25' 50'
SCALE: 1" = 50'

DANA POINT HARBOR REVITALIZATION
COMMERCIAL CORE PROJECT

COUNTY OF ORANGE
DANA POINT HARBOR DRIVE
DANA POINT, CALIFORNIA

PROJECT DIMENSIONS

DATE:	3/17/14
PROJECT #:	307.08.01
SCALE:	1"=50'
0	
NORTH	
SHEET #:	C-4

GROUNDWATER MOUNDING TEST LOCATIONS EXHIBIT

FUSCOE ENGINEERING
16795 Von Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 ▼ fax 949.474.5315
www.fuscoe.com

P:\PROJECTS\307\GRAPHICS\MOUNDING TEST LOCATIONS\307MOUNDING.DWG (3/14/14 2:58:36PM) Plotted by: Charles Le

SUBSURFACE EXPLORATION

Our recent subsurface investigation consisted of the drilling of nineteen (19) hollow-stem auger drill holes (DH-1 through DH-19) to depths of 10 to 50.5 feet, the drilling of one (1) hand-augered drill hole (DH-20) to a depth of 4.5 feet, and the excavation of four (4) shallow pavement core holes (C-1 through C-4) to depths of 1.5 to 3 feet to obtain bulk and drive samples for geotechnical testing, to observe depths to groundwater, and to observe the thicknesses of the existing pavement sections. We also advanced six (6) CPT soundings (CPT-1 through CPT-6) to depths of 16 to 30 feet to obtain continuous geotechnical information on the subsurface soil and bedrock materials. Due to the very dense/hard condition of the bedrock materials underling the site, we were only able to advance one of the CPT soundings (CPT-2) more than 1 to 2 feet into the bedrock. Secondary shallow drill holes were drilled adjacent to drill holes DH-5, DH-7, DH-10, DH-11, and DH-16 in order to perform infiltration tests.

All of the drill holes were logged by a Certified Engineering Geologist and bulk and undisturbed samples of the excavated soil and bedrock materials were collected for laboratory testing. "Undisturbed" drive samples were taken using a 3.0-inch outside diameter split spoon sampler which contained 2.416-inch-diameter brass sample sleeves 6 inches in length. Standard Penetration Tests (SPT) using a 2.0-inch outside diameter split spoon sampler without liners were also taken in drill holes below a depth of 10 feet in DH-1 through DH-19, at selected depths in between the relatively undisturbed samples. Blow counts recorded during sampling from the drive samplers are shown on the drill hole logs including uncorrected SPT blow counts (i.e., "N" values). The logs of each boring are contained in Appendix A-1 and the Legend to Logs is presented as Plate A-1. CPT soundings were performed with a 30-ton CPT rig and a 15-cm^2 cone with readings taken every 2 cm. The CPT logs and data are contained in Appendix A-2. The previous borings and CPT soundings performed by Leighton and Diaz-Yourman are contained in Appendix A-3.

The approximate locations of the drill holes, pavement core holes, and CPTs are shown on Plate 2 – Geotechnical Map. The locations of the previous borings and CPT soundings by Leighton and Diaz-Yourman are also shown on Plate 2.

INFILTRATION TESTING

Infiltration testing was performed in general accordance with the Santa Ana Regional Water Quality Control Board Technical Guidance Document (TGD) Appendices dated March 2011, utilizing the shallow percolation test procedure contained in Section VII.3.8. To comply with the requirements of the TGD, five (5) 10-inch-diameter test holes were excavated adjacent to drill holes DH-5, DH-7,

DH-10, DH-11, and DH-16 to depths of approximately 3 to 4 feet using a hollow stem auger drill rig. The infiltration test hole locations are shown for ease of reference on the attached Geotechnical Map, Plate 2.

Logs for DH-5, DH-7, DH-10, DH-11, and DH-16 are contained within Appendix A-1 and indicate that the site is underlain by approximately 15 to 20 feet of engineered fill overlying bedrock materials of the Capistrano Formation. The fill materials are highly variable and consist of intermixed layers of silts, clays, silty sands and clayey sands while the bedrock materials consist of hard to very hard and massive sandstones with occasional thick layers of moderately hard to hard claystones and siltstones. The holes were drilled to depths of 3 to 4 feet and infiltration was monitored from depths ranging from approximately 2 to 4 feet below grade which correspond to the infiltration zone of a potential infiltration system.

LABORATORY TESTING

Laboratory testing for the subject investigation was performed to determine soil engineering classifications and properties. Recent and previous testing included the following: in-place moisture and dry density, maximum dry density and optimum moisture content, particle size distribution, Atterberg limits, chemical corrosion suite, consolidation characteristics, undisturbed and remolded shear strengths, subgrade R-Values, and expansion index tests. Laboratory procedures and recent test results are presented in our Appendix B-1 – GMU Geotechnical Laboratory Procedures and Test Results. Previous laboratory test results from Leighton and Diaz-Yourman are presented in Appendices B-2 and B-3. Pertinent laboratory test data is also shown on our recent drill hole logs and previous boring logs.

Laboratory test results on samples collected at the site indicate that very low to medium expansive soils are present. Visual descriptions indicate that the on-site engineered fill materials consist of clayey sands, sandy clays, and sandy silts while the underlying bedrock materials consist primarily of hard to very hard sandstones with occasional thick and moderately hard to hard claystone and siltstone layers. Given the exploration and laboratory data, it is our opinion that the proposed improvements should be designed assuming a medium expansion potential.

The results of chemical testing indicate that the on-site soils will be severely corrosive to ferrous metals. The results of sulfate tests indicate that the site will have a negligible to moderate sulfate exposure to concrete as defined by the CBC.

GEOLOGIC FINDINGS

REGIONAL GEOLOGIC SETTING

The project area is contained within the northwestern portion of California's Peninsular Ranges

To evaluate the corrosion potential of the on-site soils to both ferrous metals and concrete, representative samples were tested for pH, minimum resistivity, soluble chlorides, and soluble sulfates and combined with existing results from previous investigations. The results of chemical testing contained in Appendix B indicate that the on-site soils should be considered corrosive to severely corrosive to ferrous metals and possess a negligible to moderate sulfate exposure to concrete. In addition, the proposed building and structures will be exposed to seawater. Therefore, a moderate exposure to sulfates should be anticipated for concrete placed in contact with on-site soils.

SOIL INFILTRATION RESULTS

As described previously, infiltration testing was performed within the site in general accordance with the Santa Ana Regional Water Quality Control Board Technical Guidance Document (TGD) Appendices dated March 2011, utilizing the shallow percolation test procedure contained in Section VII.3.8. The results of the infiltration testing indicate infiltration rates ranging from 0.57 to 1.18 inches per hour with an average rate of 0.83 inches per hour.

EXCAVATION CHARACTERISTICS

Rippability

The artificial fill materials underlying the site can be easily excavated with conventional grading equipment such as dozers, loaders, excavators, and backhoes. Shallow bedrock materials within the northeast and northwest corners of the site, if encountered, may require ripping with dozers.

Trenching

We expect that excavation of new utility trenches can be accomplished utilizing conventional trenching machines and backhoes. Trench support requirements will be limited to those required by safety laws or other locations where trench slopes will need to be flattened or supported by shoring designed to suit the specific conditions exposed.

Volume Change

In order to aid planning for the anticipated grading, we estimate that the change in volume of on-site disturbed surficial fills that are excavated and placed as new compacted fill at an average relative compaction of 92% will result in volume losses that will range from approximately 5 to 10 percent. For rough planning purposes only, an average volume loss of 7.5 percent may be assumed.

CONCLUSIONS

- Day 3 – Curing FDR base layer. Closed to heavy truck traffic but light traffic can typically drive on FDR base.
- Day 4 – Micro crack FDR place base 4-inch-thick conventional Hot Mix Asphalt (HMA) AC layer and compact to 95% relative compaction. Light traffic can drive on base pavement section at the end of the same day.
- Day 5 – Place final HMA AC cap layer and compact.
- Day 6 - Heavier truck traffic can now be placed on new pavement section.

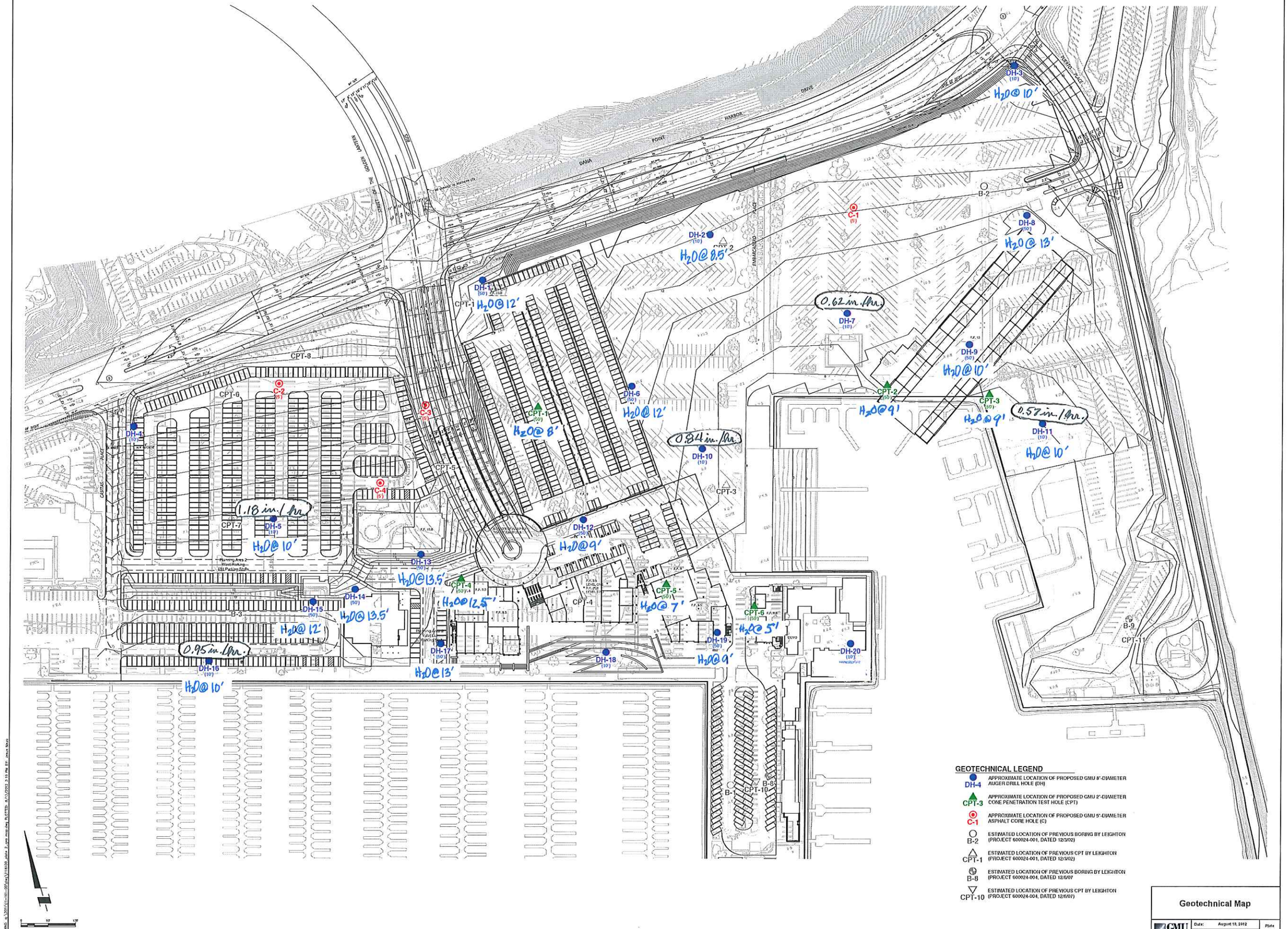
PERMEABLE INTERLOCKING CONCRETE PAVEMENT (PICP)

We understand that Permeable Interlocking Concrete Pavement (PICP) in the designated parking areas of Planning Area 1 may utilize a permeable interlocking concrete pavers such as "Eco-Stone") and will assume subgrade soil conditions (R-value of at least 10) according to the "Design Manual for Permeable Interlocking Concrete Pavements" by ICPI (2011). The structural base thickness will need to be designed by the project civil engineer in order to meet storage requirements. This minimum section assumes a T.I. of up to 6.3 (GMU assumes a T.I. of 5.5 for the mixed use of parking and drives in this parking lot) and calls for a 3 1/8" (80 mm) concrete paver, over compacted layers of 2" of bedding course sand (ASTM No. 8 aggregate), over 4" of ASTM No. 57 stone as open-graded base, over 6" of ASTM No. 2 stone as open-graded sub base, over a Class 1 geotextile fabric* (highest strength) per AASHTO M-288.

*Due to the presence of gravel and some rock in the existing fill soils that will likely function as subgrade support for the PICP, GMU recommends using a Class 1 geotextile fabric (highest strength) placed both vertically at the sides of all PICP excavations and on top of the compacted subgrade soil below the stone sub base layer in order to protect the bottom and sides of the open-graded base and sub base. This geotextile fabric must meet AASHTO M-288 Class 1 geotextile strength property and subsurface drainage requirements (see attached Table 3-3 and Table 3-4 from page 31 of the ICPI Design Manual (2011) for AASHTO M-288 requirements).

CONCRETE INTERLOCKING VEHICULAR AND PEDESTRIAN PAVERS

We understand that portions of the project site will utilize 3 1/8-inch-thick (80 mm.) vehicular concrete interlocking pavers placed on a section of at least 1-inch-thick bedding sand. These vehicular pavers are also planned as a part of the subject project in order to provide fire department vehicle access capable of supporting 72,000 pounds of imposed loading. GMU recommends that the on-site soil subgrade in these site vehicular areas be scarified to a depth of 6 inches, moisture conditioned to at least 2% above the optimum moisture content, and compacted to at least 90% relative compaction. A geotextile fabric such as Mirafi 600X or equivalent should be placed on top of the compacted subgrade across the entire vehicular interlocking paver area. Based upon the on-site soils having an estimated R-value of 10, a 15-inch-thick layer of Class 2 crushed aggregate base (CAB), crushed miscellaneous base (CMB), or equivalent should be moisture conditioned to at least optimum moisture and compacted to at least 95% relative compaction in order to support the



GEOTECHNICAL LEGEND

- DH-4 — APPROXIMATE LOCATION OF PROPOSED GMU 8"-DIAMETER AUGER DRILL HOLE (DH)
- CPT-3 — APPROXIMATE LOCATION OF PROPOSED GMU 2"-DIAMETER CONE PENETRATION TEST HOLE (CPT)
- C-1 — APPROXIMATE LOCATION OF PROPOSED GMU 5"-DIAMETER ASPHALT CORE HOLE (C)
- B-2 — ESTIMATED LOCATION OF PREVIOUS BORING BY LEIGHTON (PROJECT 600024-001, DATED 12/3/02)
- CPT-1 — ESTIMATED LOCATION OF PREVIOUS CPT BY LEIGHTON (PROJECT 600024-001, DATED 12/3/02)
- B-8 — ESTIMATED LOCATION OF PREVIOUS BORING BY LEIGHTON (PROJECT 600024-004, DATED 12/6/07)
- CPT-10 — ESTIMATED LOCATION OF PREVIOUS CPT BY LEIGHTON (PROJECT 600024-004, DATED 12/6/07)

Geotechnical Map

GMU GEOTECHNICAL INC. | Date: August 19, 2012 | Project No.: 11-161-03 | Plate 2