

APPENDIX L

**HYDROLOGY/HYDROMODIFICATION/
UTILITIES TECHNICAL MEMORANDUM**



TECHNICAL MEMORANDUM

Back Bay Landing Hydrology / Hydromodification / Utilities

PREPARED FOR: Gordon Craig, Back Bay Landing Manager
PREPARED BY: Ian Adam, CPSWQ & Puneet Comar, P.E.
DATE: July 3, 2012

PURPOSE

The purpose of this memorandum is to provide technical documentation related to hydrology, hydromodification and utilities (storm drain, sewer, water) for the proposed Back Bay Landing Planned Community project (herein referred to as "project"). The analysis will focus on the impacts of the proposed land use conversions between existing and proposed conditions for CEQA and EIR purposes. Engineering design details are conceptual in nature at this time but impacts related to changes in hydrology and utility demands are analyzed in this memorandum to provide sufficient detail to determine environmental impacts and mitigation measures.

PROJECT DESCRIPTION

Location

The project is located within the City of Newport Beach; specifically it resides on the north side of East Pacific Coast Highway, west of North Bayside Drive and south of the Bayside Village Mobile Home Park, the Upper Newport Bay is just to the west of the site. A portion of the project is beneath and just south of the Pacific Coast Highway (PCH) Bridge that spans over the Newport Back Bay (see *Attachment 1 – Vicinity Map*).

Existing Use

The entire property APN 440-132-60 is approximately 31 acres (31.127) of which the majority of the site is submerged (21 acres). Approximately 3.6 acres of non-submerged area makes up the De Anza Bayside Marsh Peninsula, which has environmental constraints and considered to be unusable. The remaining usable portions offer several types of operational features consisting of marina docks, walkways, fish market, recreational rentals, a launching site, and storage space for RVs and small boats on trailers. The usable land which will be the focus of the proposed projects is approximately 5.86 acres that currently provides for the storage space as well as parking and restrooms, which support the Bayside Village Mobile Home Park. A narrow strip of land east of Bayside Village Mobile Home Park and abutting the western edge of Newport Dunes is also included in the project. This portion of the site is currently being used for

public storage and parking spaces. Future use for this strip may include the removal of the existing storage garages for additional parking spaces.

Proposed Use

As shown in the attached *Conceptual Site Plan*, 4.86 acres just north of PCH, combined with 0.6 acres beneath the bridge and 0.4 acres south of the bridge make up the 5.86 acres of development for this project. The proposed development will be a mixed use water front development providing coastal dependent and coastal related uses, such as retail and marine service commercial facilities, attached residential, boat storage, and a parking structure. The anticipated square footages include approximately 80,000 square feet of residential, 65,000 square feet of commercial/ retail and approximately 35,000 square feet of boat storage. The *Conceptual Grading Exhibit* utilized for EIR analysis is included as Attachment 3.

HYDROLOGY

Existing Condition Hydrology

The combined 5.86 acres of the overall property as described in the "Proposed Use" section above will be the focal point of the project (see attached *Conceptual Grading Plan*). The remaining portion of the project is either submerged as part of the Upper Newport Bay or it will maintain its existing use.

Currently, the entire site generally drains into the Upper Newport Bay at three main locations. As defined in the *Existing Hydrology Map* (Attachment 4), Area A1 combines with existing off-site flows emanating from PCH and North Bayside Drive, which are then conveyed to a local low point just adjacent to the existing sewer pump station. These flows are tied into an existing 30-inch storm drain within PCH that flows westerly through the project site before discharging into the Upper Newport Bay.

Area A2 sheet flows to a low point within this sub area, which collects flows utilizing two grate inlets that convey the on-site run off into the Back Bay via an 8" high-density polyethylene (HDPE) Pipe.

Area A3 is the portion of the project beneath PCH, and currently sheet flows into the Upper Newport Bay. Based upon field surveys and site inspections, drainage facilities do not appear to exist within this area.

Proposed Condition Hydrology

The proposed condition will be designed to maintain the overall existing drainage pattern in which the entire site will convey its runoff directly into the Upper Newport Bay. The off-site flows as described in the existing condition will be routed around the project and tied into the existing 30-inch storm drain within PCH, approximately 350 feet upstream of the current tie in location.

Generally, the proposed project will be designed to convey storm flows in general conformance to the existing drainage patterns. However, all on-site flows will be directed to on-site areas where water quality measures will be provided to encourage filtration and treatment of the low flows. Curb and gutter, grate inlets, and storm drain pipe will be proposed to help convey flows to areas of treatment and discharge (see *Proposed Hydrology Map*, included as Attachment 5).

The proposed site will implement a design to protect against a 100-year storm event. The attached *Proposed Hydrology Exhibit* conceptually demonstrates the location for the proposed storm drain facilities and models the post project condition for a 25- and 100-year storm event. Flow rates and discharge points are defined on this conceptual exhibit as well, and summarized in the following tables.

25-year Q (cfs)				
Drainage ID	Existing Conditions		Proposed Conditions	
	Acres	CFS	Acres	CFS
A1	1.3	4.6	1.1	3.7
A2	2.7	9.5	2.4	8.4
A3	1.7	6	2.4	8.4
Total	5.7 acres	20.1 cfs	5.9 acres	20.5 cfs
Net Change			<1 cfs	

100-year Q (cfs)				
Drainage ID	Existing Conditions		Proposed Conditions	
	Acres	CFS	Acres	CFS
A1	1.3	7	1.1	5.7
A2	2.7	14.6	2.4	12.9
A3	1.7	9	2.4	12.7
Total	5.7 acres	30.9 cfs	5.9 acres	31.3 cfs
Net Change			<1 cfs	

Under the proposed conditions, the drainage patterns and discharge rates will be largely preserved. The south eastern portion of the site will continue to discharge into the existing 30-inch storm drain system via a new on-site storm drain collection system. The middle interior portion of the site will be collected in a new on-site system and continue to discharge into the Bay via a new outlet through the bulkhead in a similar location as the existing 8-inch HDPE pipe outlet. The western portion of the site will be picked up in a new storm drain system and either tie into the existing 30-inch reinforced concrete pipe (RCP) under PCH, or discharge via a new outlet into the Bay through the proposed bulkhead along the western portion of the site.

UTILITIES

Sewer Service

Currently the existing restroom facility is served by a small service line running northerly into the existing single family development adjacent to the project. In approximately 1966, an existing 8-inch lateral serving the site from North Bayside Drive was removed during a sewer construction project in North Bayside Drive. At that time, an 18-inch sewer line was removed and replaced with a 36-inch sewer line. This line flows to the existing pump station adjacent to the project. The project will require a new lateral connection to the existing 36-inch line in North Bayside Drive. This connection will occur south of the existing connection associated with the Bayside Village Mobile Home Park. Both the 36-inch sewer line and pump station are owned and operated by the Orange County Sanitation District.

The *Composite Utility Map* is attached (Attachment 6). Implementation of the proposed land use will result in an increase in sewer demand based on the increased densities and users of the site.

Sewer Demand

To determine sewer flow generated from the site, generation rates were obtained from Orange County Sanitation District (See Table 3-6 below reference from the Strategic Plan Update, April 2006 & Attachment 7). The following is an analysis of existing and proposed flows generated from the site for existing condition and proposed condition.

Table 3-6
Buildout Land Uses and Flow Projections

Land Use Category	Acres	Unit Flow Rate (gpd/ac)	Dry Weather Flow (mgd)
Estate Residential	35,051	727	25.5
Low Density Residential	48,886	1488	72.7
Medium Density Residential	27,672	3451	95.5
Medium High Density Residential	8,317	5474	45.5
High Density Residential	5,624	7516	42.3
Commercial/Office	26,958	2262	61.0
Industrial	19,485	3167	61.7
Institutional	18,556	2715	50.4
High Density Industrial/Commercial	87	5429	0.5
Open Space	43,537	0	0
Total	234,173		455

Source: Acres by land use category processed from Consolidated General Plan Land Use Map produced by CDR in 2004, based on latest available city general plans. Unit flow rates from OCSD 1999 Strategic Plan.

Existing Sewer Generation

Existing Land Use	Description	Land Use Designation	Flow Coefficient	Acreage	Projected Flow
Parking Lot	Dry RV Storage and under-utilized Lot	Estate Residential*	727 gpd/ac	4.9 acres	3,562 gpd

Existing Sewer Flow: 3,562 gal/day

* Estate Residential is the lowest generation factor in Table 3-6 and provides the best comparison for the under-utilized parking lot of the project site for the existing condition.

Proposed Sewer Generation – Table 3-6 Buildout Land Uses and Flow Projections

Proposed Land Use	Description	Land Use Designation	Flow Coefficient	Acreage	Projected Flow
Residential Units	49 Units/1.84 ac = 27 DU/ac	High Density Residential	7516 gpd/ac	1.84	13,829 gpd
Commercial Shops	1.5 ac/4.9 ac FAR < 0.53	Commercial/Office	2262 gpd/ac	1.50	3,393 gpd
Boat Storage	0.8 ac/4.9 ac FAR < 0.53	Industrial	3167 gpd/ac	0.80	2,533 gpd

Total Proposed Sewer Flow: 19,755 gal/day

The proposed sewer flow estimates were submitted to the Orange County Sanitation District (OCSD) in May 2012 for review and to determine if there is capacity to accept the increased flows. The 2006 Strategic Plan Update for OCSD that covers this portion of the District's sewer system identified capacity exists within the 36-inch line to accommodate the proposed project. In June 2012, OCSD confirmed there is capacity in the line to accommodate the proposed project (see Attachment 7).

Water Service

The existing site is served by an existing 12-inch water line in North Bayside Drive which is owned and operated by the City of Newport Beach. Under the proposed conditions, an 8-inch water line will serve the proposed project and tie into the existing 12-inch water line in North Bayside Drive. The demand on this line due to the project will be consistent with the proposed sewer generation rates. A will-serve letter will be obtained for the proposed project through the EIR process to ensure available water capacity. Water capacity is not anticipated to be an issue based on the redundant water transmission lines that surround the project site.

Water Transmission Line Relocation

An existing 30-inch water transmission lines traverses the project site from the southeast corner to the northwest corner and joins within an existing vault on the property before crossing the Upper Newport Bay. This transmission line was installed in 1926 and is on the priority list for replacement. Based on the age of the line, replacement of the line will provide a significant regional benefit to the City of Newport Beach's water supply system.

In order to develop the project, the line will be either abandoned or removed to minimize conflicts between the line and the proposed land uses. Three alternatives are currently proposed to replace the capacity of the line and continue to provide reliable water services in case of an emergency to the western region of Newport Beach. Alternative #1 would split the existing 24-inch transmission line in PCH and connect a new 30-inch line to the existing vault along the western portion of the project site. This alignment would require encasement of the line under certain portions of the project. This alignment minimizes conflicts with the proposed land uses

and has the smallest construction impact within PCH. However, it reduces the redundancy of the water system within this area which may prohibit this alternative. Alternative #2 would implement a 30-inch line within PCH starting at the intersection of PCH and North Bayside Drive, head westerly within PCH and then connect to the existing vault along the western portion of the site similar to Alternative #1. This alternative would result in the greatest construction impacts within PCH and would require encasement of the line under portions of the proposed project. Alternative #3 would implement a new 30-inch line starting in North Bayside Drive, head north in North Bayside Drive, turn westerly along the new entrance road to the project and then run westerly along the northern boundary of the project to the existing vault. Alternative #3 results in the least impacts to the site plan and is currently undergoing analysis to determine potential hydraulic impacts to the water system. Upon completion, the analysis will be provided to City of Newport Beach Public Works with a preferred alignment.

WATER QUALITY AND HYDROMODIFICATION

A Preliminary Water Quality Management Plan (WQMP) has been prepared separately for this project which addresses sources control, site design, and treatment control Best Management Practices (BMPs) at the current conceptual design level. A final WQMP shall be prepared for this project in order to address water quality compliance on a project specific basis for the final design.

Due to the proximity of the project to the Pacific Ocean, all on-site storm flows discharge into drainage facilities that discharge directly into Upper Newport Bay, a tidally influenced waterbody. Tidally influenced water bodies are considered not susceptible to hydromodification impacts and therefore, the project is exempt from hydromodification.

ATTACHMENTS

Attachment 1	Vicinity Map
Attachment 2	Conceptual Site Plan
Attachment 3	Conceptual Grading Exhibit
Attachment 4	Existing Hydrology Map
Attachment 5	Proposed Hydrology Map
Attachment 6	Composite Utility Map
Attachment 7	OCS D Correspondence and Sewer Flow Generation Factors

ATTACHMENT 1

VICINITY MAP

EXHIBIT 1 LOCATION MAP

Back Bay Landing is located immediately north east of Pacific Coast Highway in Newport Beach, California. The site is bounded by Coast Highway and Newport Harbor on the south and west, Bayside Drive to the south, the Newport Back Bay channel to the west and Bayside Village Mobile Home Park to the southeast.

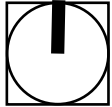


Legend

- Project Area (Parcel 3)
- Back Bay Landing Mixed-use Project Area
- PC-9 Boundary

Source: Mapquest

LOCATION MAP



N.T.S.
5-30-2012

BACK BAY LANDING NEWPORT BEACH, CALIFORNIA

ATTACHMENT 2

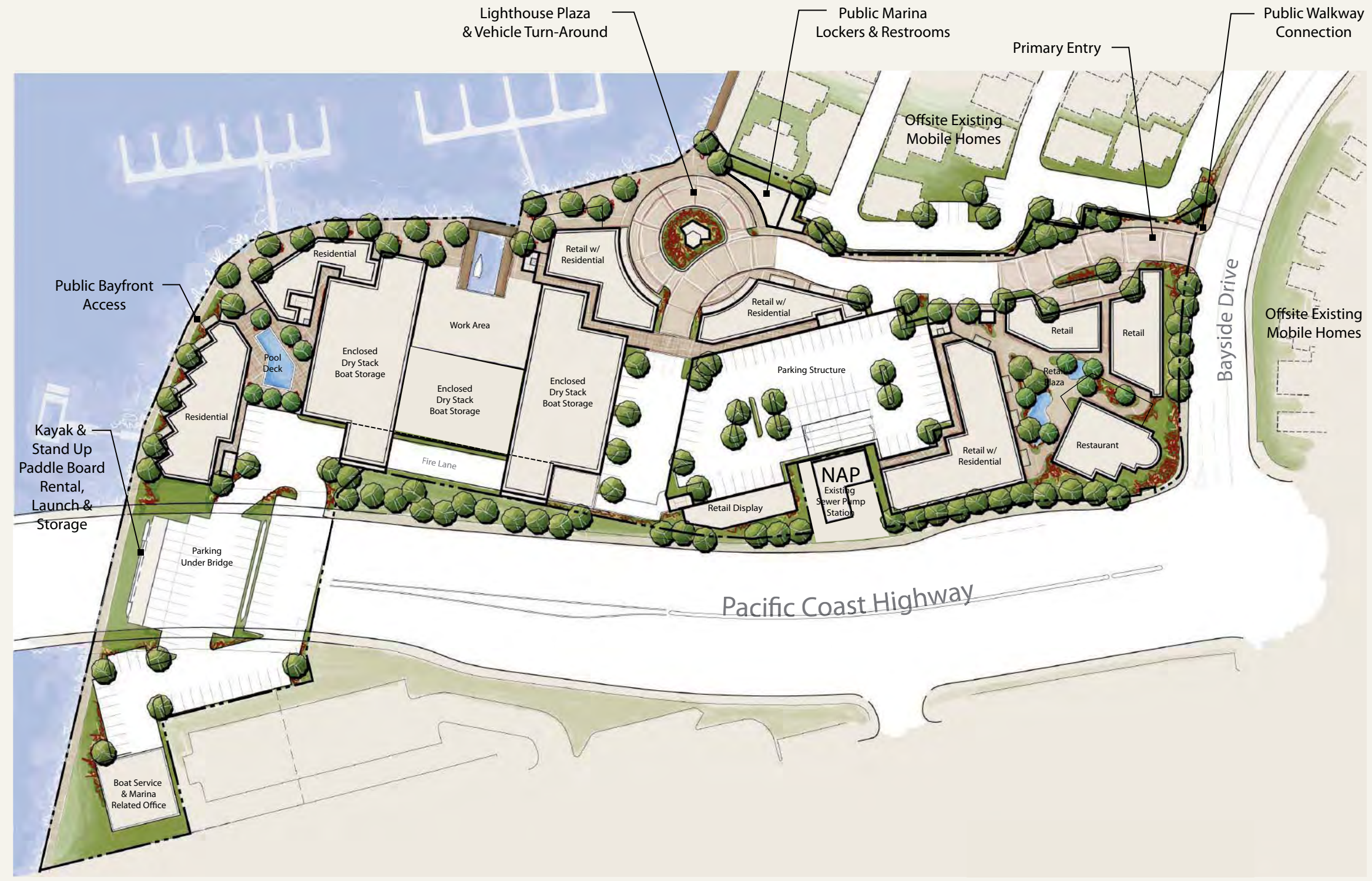
CONCEPTUAL SITE PLAN

**EXHIBIT 8
CONCEPTUAL SITE &
LANDSCAPE PLAN**

DESIGN GUIDELINES

Back Bay Landing is an integrated, mixed-use waterfront village with visitor serving retail and marine service commercial facilities, as well as a limited amount of attached residential uses.

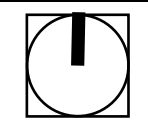
It is designed to evoke a seaside village and has a strong focus on the pedestrian experience.



Note: Site and landscape plan provided for conceptual purposes only and is subject to change.

Source: Stoutenborough Inc., Architects & Planners

CONCEPTUAL SITE PLAN



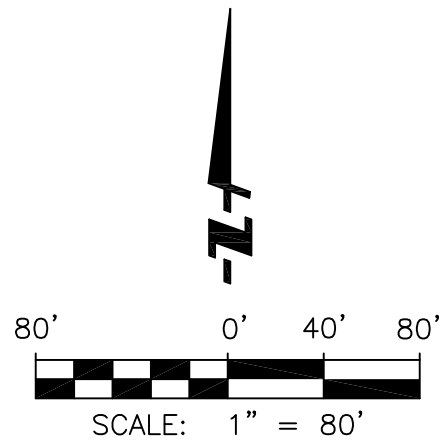
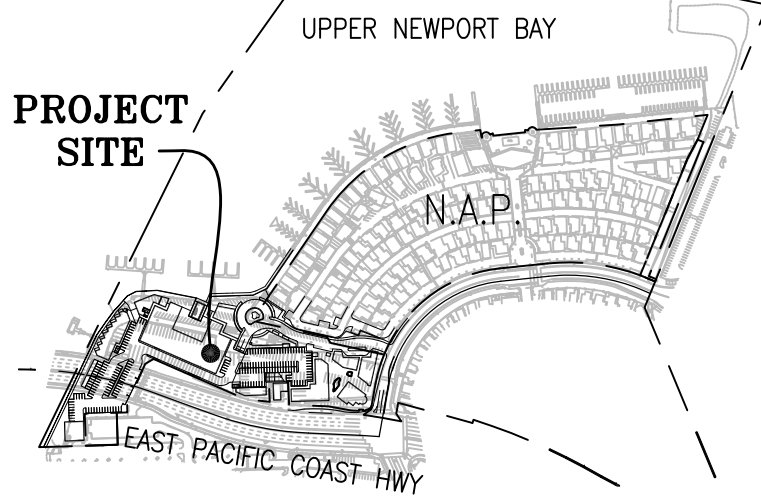
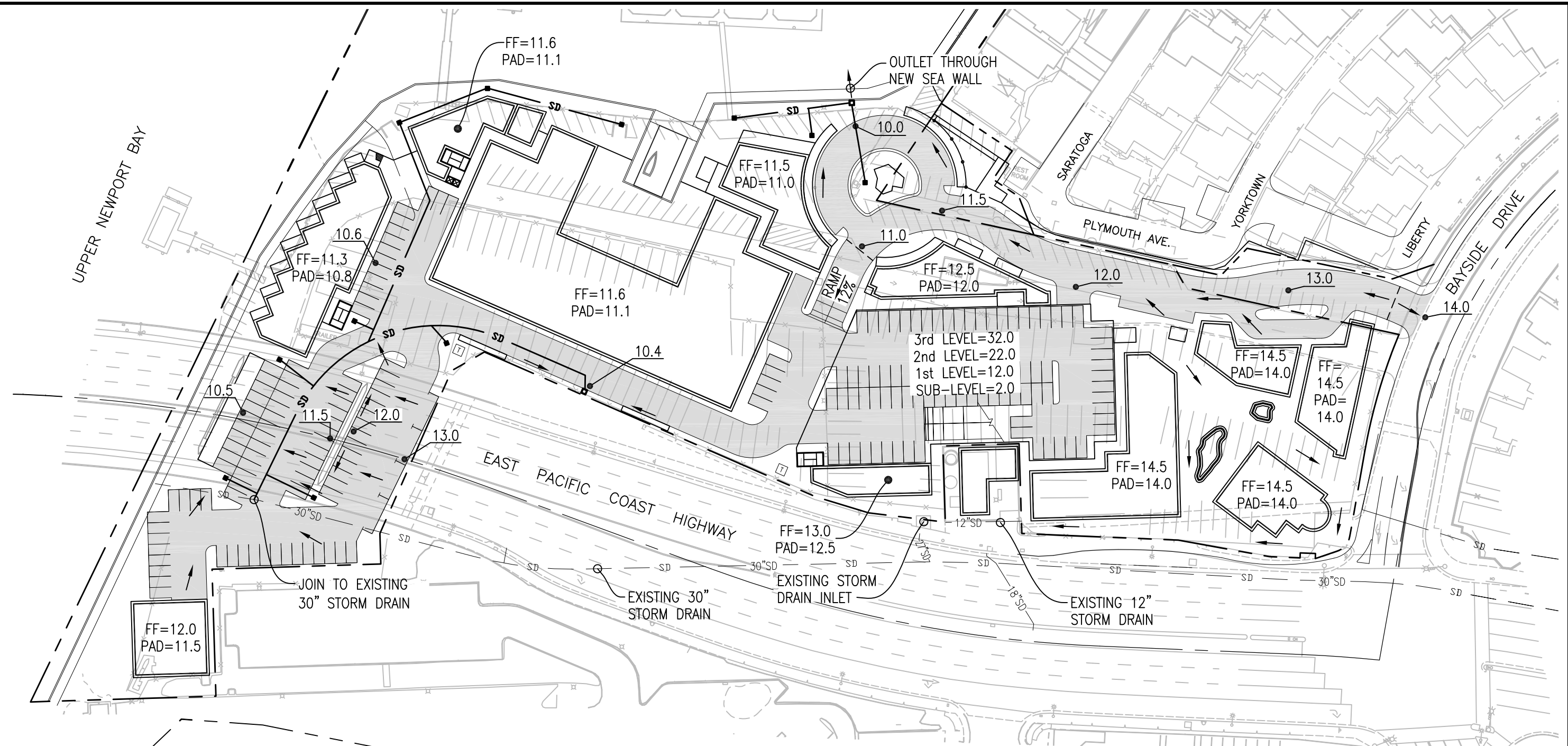
5-30-2012

BACK BAY LANDING
NEWPORT BEACH, CALIFORNIA

ATTACHMENT 3

CONCEPTUAL GRADING EXHIBIT

P:\PROJECTS\1048\01\ENG\FILE CABINET\REPORTS\HYDROLOGY\104801XH-CONCEPT GRADING 11X17.DWG (07-03-12)



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

CONCEPTUAL GRADING EXHIBIT

of: BACK BAY LANDING - NEWPORT BEACH
PARCEL 3 OF PARCEL MAP NO. 93-111
P.M.B. 278/40-45

for: BAYSIDE MARINA VILLAGE LLC
TERRA VISTA MANAGEMENT, INC.
6310 SAN VICENTE BLVD. SUITE 560
LOS ANGELES, CA. 90048

DATE: 07/03/2012

DRAWN BY: DB

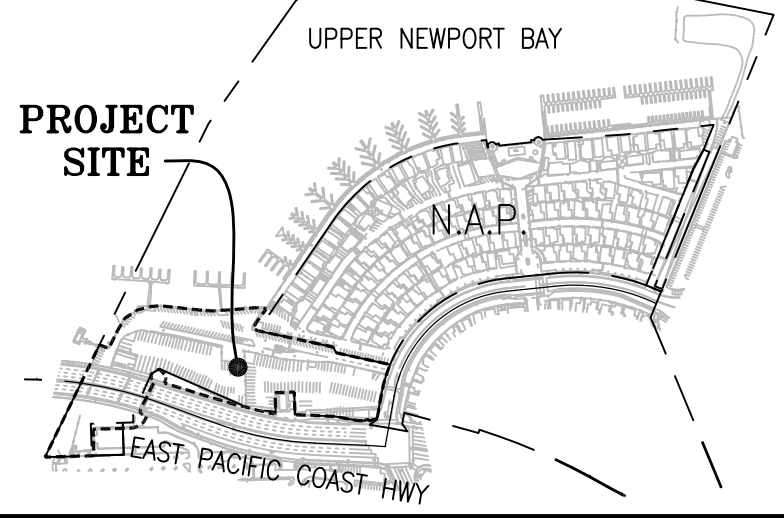
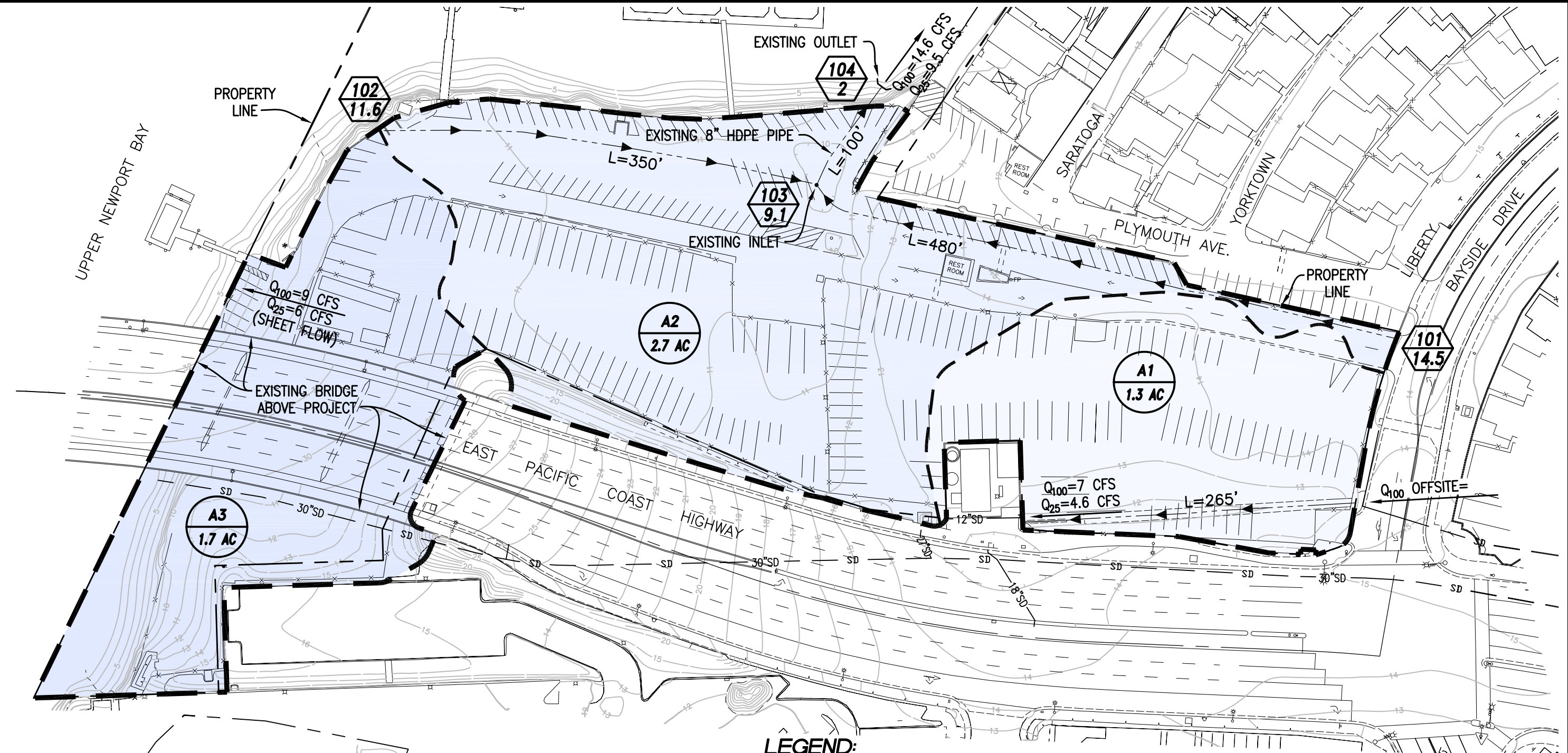
CHECKED BY: PC

SHEET 1 OF 1

ATTACHMENT 4

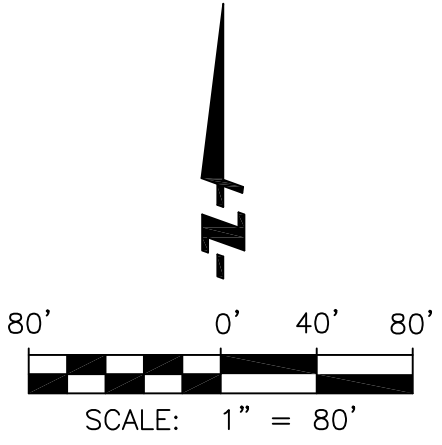
EXISTING HYDROLOGY MAP

P:\PROJECTS\1048\01\ENG\FILE CABINET\REPORTS\HYDROLOGY\104801XH-EXIST HYDROLOGY 11X17.DWG (06-01-12)



LEGEND:

- MAIN WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION
- FLOW LENGTH
- COMPONENT AREA NUMBER
- COMPONENT AREA ACREAGE
- HYDROLOGY NODE
- ELEVATION

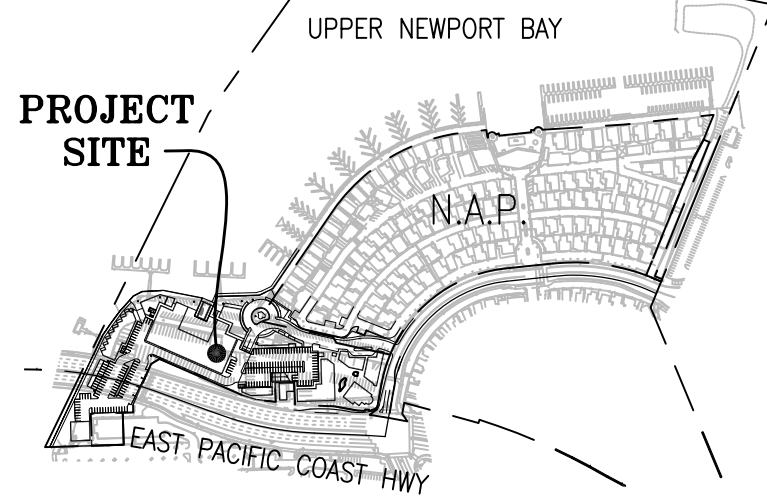
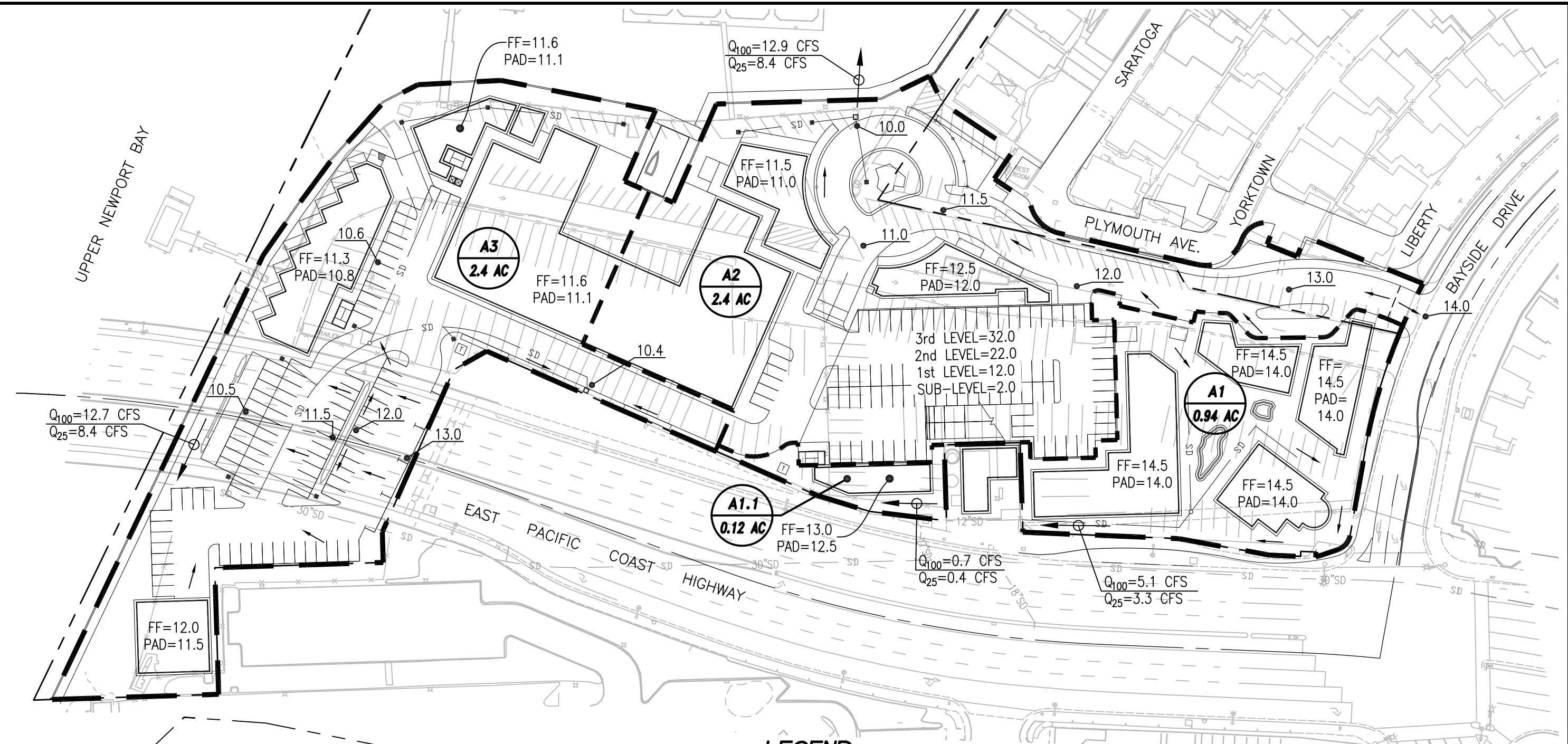


<p>FUSCOE ENGINEERING</p> <p>16795 Von Karman, Suite 100 Irvine, California 92606 tel 949.474.1960 • fax 949.474.5315 www.fuscoe.com</p>	<p>EXISTING HYDROLOGY EXHIBIT</p>	DATE: 06/01/2012
	<p>of: BACK BAY LANDING - NEWPORT BEACH PARCEL 3 OF PARCEL MAP NO. 93-111 P.M.B. 278/40-45</p> <p>for: BAYSIDE MARINA VILLAGE LLC TERRA VISTA MANAGEMENT, INC. 6310 SAN VICENTE BLVD. SUITE 560 LOS ANGELES, CA. 90048</p>	<p>DRAWN BY: DB</p> <p>CHECKED BY: PC</p> <p>SHEET 1 OF 1</p>

ATTACHMENT 5

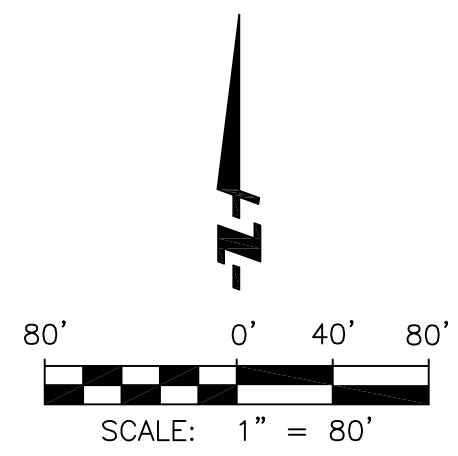
PROPOSED HYDROLOGY MAP

P:\PROJECTS\1048\01\ENG\FILE CABINET\REPORTS\HYDROLOGY\104801XH-PROP HYDROLOGY 11X17.DWG (07-03-12)



LEGEND:

- MAIN WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- PROPOSED STORM DRAIN
- FLOW DIRECTION
- FLOW LENGTH
- COMPONENT AREA NUMBER
- COMPONENT AREA ACREAGE
- HYDROLOGY NODE
- ELEVATION

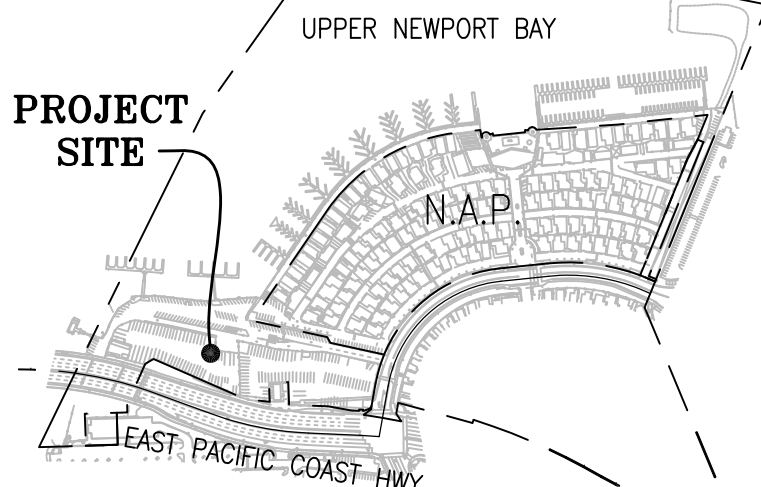
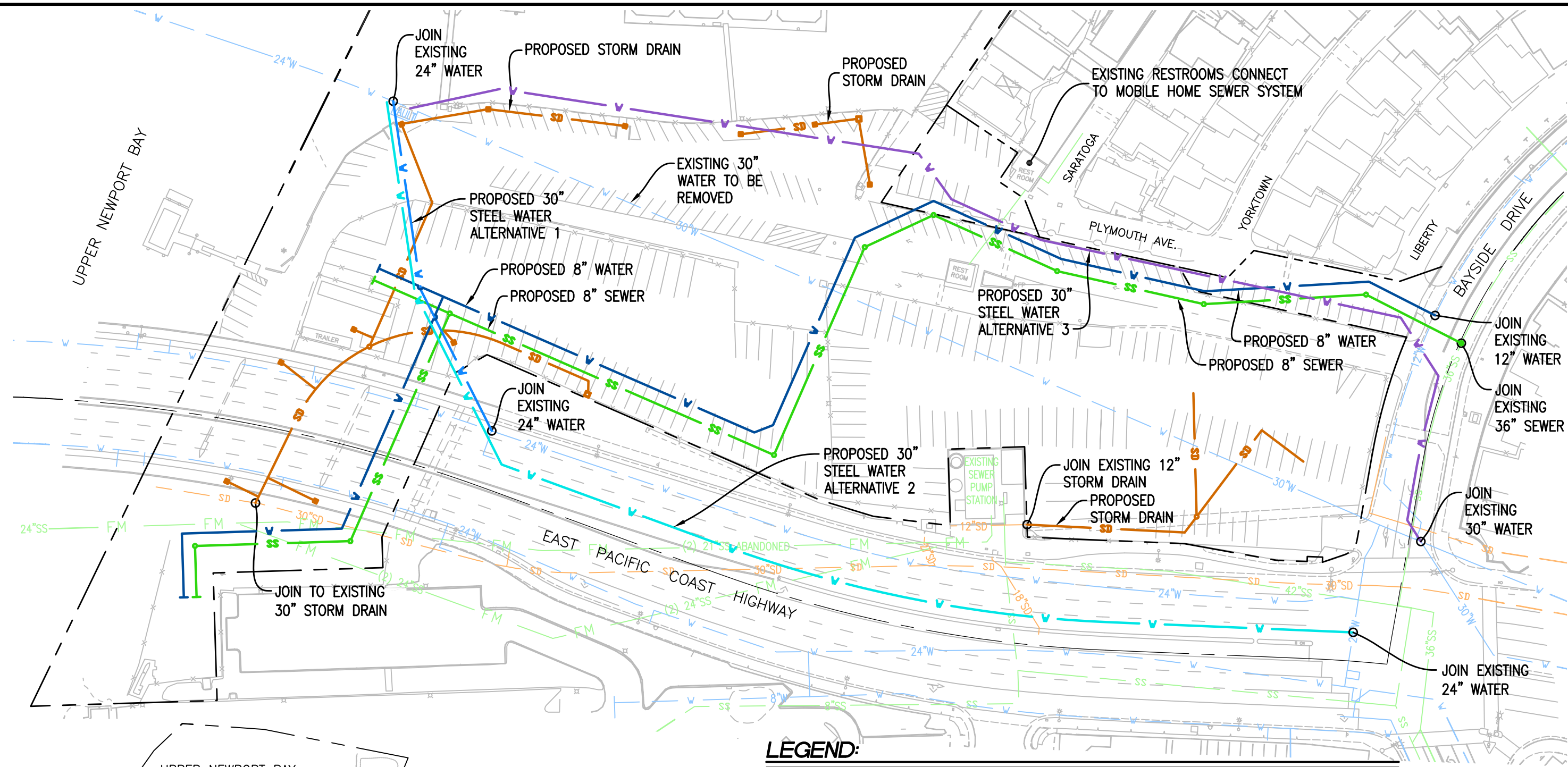


 FUSCOE ENGINEERING 16795 Von Karman, Suite 100 Irvine, California 92606 tel 949.474.1960 • fax 949.474.5315 www.fuscoe.com	PROPOSED HYDROLOGY EXHIBIT		DATE: 07/03/2012
	of: BACK BAY LANDING - NEWPORT BEACH PARCEL 3 OF PARCEL MAP NO. 93-111 P.M.B. 278/40-45	for: BAYSIDE MARINA VILLAGE LLC TERRA VISTA MANAGEMENT, INC. 6310 SAN VICENTE BLVD. SUITE 560 LOS ANGELES, CA. 90048	DRAWN BY: DB CHECKED BY: PC

ATTACHMENT 6

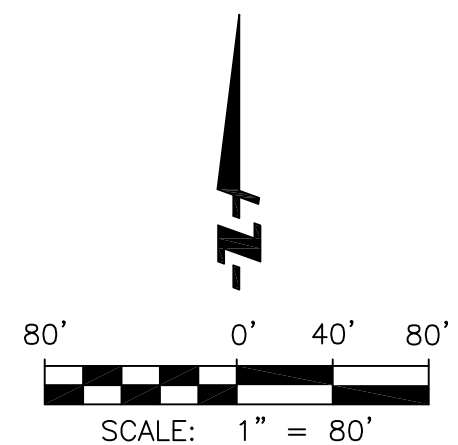
COMPOSITE UTILITY MAP

P:\PROJECTS\1048\01\ENG\FILE CABINET\REPORTS\HYDROLOGY\104801XH-CONCEPT UTILITY 11X17.DWG (07-03-12)



LEGEND:

	PROPOSED WATER		EXISTING WATER
	30" STEEL-ALTERNATIVE 1		EXISTING SEWER
	30" STEEL-ALTERNATIVE 2		EXISTING STORM DRAIN
	PROPOSED SEWER		
	PROPOSED STORM DRAIN		



FUSCOE
ENGINEERING

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

CONCEPTUAL UTILITY EXHIBIT

of: BACK BAY LANDING - NEWPORT BEACH
PARCEL 3 OF PARCEL MAP NO. 93-111
P.M.B. 278/40-45

for: BAYSIDE MARINA VILLAGE LLC
TERRA VISTA MANAGEMENT, INC.
6310 SAN VICENTE BLVD. SUITE 560
LOS ANGELES, CA. 90048

DATE: 07/03/2012

DRAWN BY: DB

CHECKED BY: IA

SHEET 1 OF 1

ATTACHMENT 7

OCSD CORRESPONDENCE & SEWER FLOW GENERATION FACTORS

Ian Adam

From: Smith, Wendy <WSmith@OCSD.COM>
Sent: Thursday, June 14, 2012 3:26 PM
To: Ian Adam
Cc: Puneet Comar; Smith, Wendy
Subject: RE: Bay Bridge Pump Station and Proposed Land Uses Changes Adjacent to Pump Station
Attachments: OCSD Standard Detail S-056.pdf; OCSD Standard Detail S-057.pdf
Categories: Filed by Newforma

There is enough capacity in the existing 36-inch VCP located in Bayside Drive.

When prepared, please submit a plan and profile of the proposed connection to the OCSD facility. When possible please try to connect to an existing manhole. The crown of the proposed connection should match the crown of the trunk sewer. I've attached some applicable standards that may be helpful in your effort.

Thank you,

Wendy Smith, P.E.
Orange County Sanitation District | Planning Division
Engineer
714.593.7880 ph
wsmith@ocsd.com



From: Ian Adam [mailto:iadam@fuscoe.com]
Sent: Thursday, June 14, 2012 2:05 PM
To: Smith, Wendy
Cc: Puneet Comar
Subject: RE: Bay Bridge Pump Station and Proposed Land Uses Changes Adjacent to Pump Station

Hi Wendy,

Thank you for the feedback and the additional information. It was very helpful. We have reviewed the additional land use designations and calculations provided and concur this is the most accurate assessment of the proposed project based on the available information. I went ahead and updated our small memo attachment so we take responsibility for the existing and proposed demands. Please note I did select a flow generation factor for the existing use and revised that number. There was not a specific land use designation for an under-utilized parking lot so please review my selection.

Based on your concurrence with the numbers, we request the model be checked for capacity of the projected flows.

Thanks,

ian

Ian Adam, CPSWQ / LEED AP / QSD

Principal / Stormwater Manager

iadam@fuscoe.com

Follow us on Twitter: <http://twitter.com/FuscoeFCT>

FUSCOE ENGINEERING, INC

full circle thinking®

16795 Von Karman, Suite 100

Irvine, CA 92606

tel 949.474.1960

direct 949.271.4318

cell 714.655.5835

fax 949.474.5315

www.fuscoe.com

IRVINE . SAN DIEGO . ONTARIO . LOS ANGELES . EL CENTRO

WARNING: This e-mail and any files transmitted with it are confidential and intended solely for the use of the individual or entity to whom they are addressed. This information is not to be reproduced or forwarded without permission from the sender. If you have received this e-mail in error, please notify the sender or system manager. From time to time, our spam filters eliminate or block legitimate email. If your email contains important attachments or instructions, please ensure that we acknowledge receipt of those attachments or instructions.

From: Smith, Wendy [<mailto:WSmith@OCSD.COM>]

Sent: Wednesday, June 13, 2012 3:46 PM

To: Ian Adam

Cc: Puneet Comar; Smith, Wendy

Subject: RE: Bay Bridge Pump Station and Proposed Land Uses Changes Adjacent to Pump Station

Hi Ian and Puneet,

Thank you for your patience, I'm simply swamped; however you are in luck as modeling is one of my interests so I always look for opportunities to research or use the model. In reviewing your flow projections, it occurred to me that I did not provide you with (nor did I know myself) the origins of the land use descriptions. I had to look it up in a Master Plan we completed in 1989 (excerpt attached). Although I admittedly may not be able to determine the best applicable proposed land use from your descriptions, I believe the flow projections should look something like the following table:

Proposed Land Use	Description	Land Use Designation	Flow Coefficient	Acreage	Projected Flow
Residential Units	49 Units/1.84 ac = 27 DU/ac	High Density Residential	7516 gpd/ac	1.84	13,829 gpd
Commercial Shops	1.5 ac/4.9 ac FAR < 0.53	Commercial/Office	2262 gpd/ac	1.50	3,393 gpd
Boat Storage	0.8 ac/4.9 ac FAR <0.53	Industrial	3167 gpd/ac	0.80	2,533 gpd

Total = 19,755 gpd

I'm assuming that the existing flows from the on-site bathroom will no longer be applicable.

Please review the land use descriptions in the attached document and recalculate your projected flows accordingly. The above table is my best effort to assist you.

Once we agree on the projected flows I'll check the model.

Thank you,

Wendy Smith, P.E.
Orange County Sanitation District | Planning Division
Engineer
714.593.7880 ph
wsmith@ocsd.com



From: Ian Adam [<mailto:iadam@fuscoe.com>]
Sent: Monday, June 11, 2012 10:51 AM
To: Smith, Wendy
Subject: RE: Bay Bridge Pump Station and Proposed Land Uses Changes Adjacent to Pump Station

Hi Wendy,

I just wanted to check in on our little Back Bay project and see if you had a chance to review our demands and capacity within the 36" line in N. Bayside Drive. I know Puneet followed up with you after the first email didn't go through.

Thanks for any updates!

Regards,

Ian

Ian Adam, CPSWQ / LEED AP / QSD
Principal / Stormwater Manager
iadam@fuscoe.com

Follow us on Twitter: <http://twitter.com/FuscoeFCT>

FUSCOE ENGINEERING, INC
full circle thinking®

16795 Von Karman, Suite 100
Irvine, CA 92606
tel 949.474.1960
direct 949.271.4318
cell 714.655.5835
fax 949.474.5315
www.fuscoe.com

IRVINE . SAN DIEGO . ONTARIO . LOS ANGELES . EL CENTRO

WARNING: This e-mail and any files transmitted with it are confidential and intended solely for the use of the individual or entity to whom they are addressed. This information is not to be reproduced or forwarded without permission from the sender. If you have received this e-mail in error, please notify the sender or system manager. From time to time, our spam filters eliminate or block legitimate email. If your email contains important attachments or instructions, please ensure that we acknowledge receipt of those attachments or instructions.

Buildout flows from each sewershed were computed using a completely different methodology, based on land use and per-acre unit flow factors. As noted earlier, CDR created a land use map by consolidating the information on general plan maps created by each city in Orange County, under contract to the Southern California Association of Governments (SCAG). In creating this map, CDR retained the land use categories used by each of the cities, rather than consolidating to a smaller number of general categories. For the purposes of computing buildout flows, MWH consolidated the land uses to ten categories, corresponding to the categories used in computing buildout flows in the 1999 Strategic Plan. Mixed land uses were generally designated as commercial. The resulting land use map is shown as Figure 3-7, and the acres in each category are shown on Table 3-6.

**Table 3-6
Buildout Land Uses and Flow Projections**

Land Use Category	Acres	Unit Flow Rate (gpd/ac)	Dry Weather Flow (mgd)
Estate Residential	35,051	727	25.5
Low Density Residential	48,886	1488	72.7
Medium Density Residential	27,672	3451	95.5
Medium High Density Residential	8,317	5474	45.5
High Density Residential	5,624	7516	42.3
Commercial/Office	26,958	2262	61.0
Industrial	19,485	3167	61.7
Institutional	18,556	2715	50.4
High Density Industrial/Commercial	87	5429	0.5
Open Space	43,537	0	0
Total	234,173		455
Source: Acres by land use category processed from Consolidated General Plan Land Use Map produced by CDR in 2004, based on latest available city general plans. Unit flow rates from OCSD 1999 Strategic Plan.			

CHAPTER 2

TRUNK SYSTEM EVALUATION

2.1 INTRODUCTION

Evaluation of the trunk system is a multiple-step process, beginning with a study of land use, followed by estimations of average and peak flows from tributary service areas and by a mathematical model simulating the conveyance of these flows through the trunk system. The following chapter discusses these major steps and the intermediate steps involved in the trunk system analysis which lead to final recommendations for operation and needed system improvements. Figure 2-1 shows the current CSDOC trunk sewer system. Note that the trunk system wastewater flow projections are based upon ultimate land use, whereas wastewater projections for sizing of treatment facilities, as in Volume 2 of this Master Plan, are based upon population projections and per capita generation. Further discussion of population projections are found at the end of this chapter.

2.2 LAND USE

An in-depth land use study was performed resulting in the creation of a uniform land use classification system for the County Sanitation Districts' service area (Land Use Map which is located in the CSDOC office). The study involved collection and compilation of the latest available land use plans, reports, maps and studies from the 23 member cities and the County of Orange. After review of collected information, interviews were conducted with individual planning directors or key staff to refine the understanding of land use elements within each city. Memorandums of these discussions are included in Appendix 2-A. Land use planning and amendments are ongoing processes at the individual cities, and formal land use plans are adopted every four to eight years depending on the city. However, it is found that these plans do not differ dramatically from year to year, and a consensus of planning personnel indicates that radical changes in land use which would significantly impact the trunk system are not foreseen. This is due to the fact that the Sanitation Districts' service area is largely "built out" and that undeveloped land is extremely limited (with the exception of Districts Nos. 13 and 14).

Specific study of the possible densification of residential areas and intensification of commercial properties (high-rise) has identified a relatively small number of sites or small areas slated for such development and are further discussed in the text. The County of Orange is projected to retain its predominant characteristic of single-family residences and neighborhoods.

Residential Land Use Classifications

Table 2-1 is a compilation of various residential land use types for each of the 23 member cities. It is apparent that there is much disparity between the individual city nomenclature and their respectively allowable density ranges.

For this reason, a uniform classification of five residential use categories, representing the range of 0-35 dwelling units per acre (DU/Ac) was developed and is summarized in the following table:

<u>Residential Land Use Designation</u>	<u>Density (DU/Ac)</u>	<u>Typical Development</u>
Estate	0-3	Single-Family Residences on large lots
Low	4-7	Single-Family Residences
Medium	8-16	Multiple-Family Residences
Medium-High	17-25	Apartments/Condominiums
High	26-35	Multi-Story Apts/Condominiums

Figure 2-2 is a graphical compilation of the data in Table 2-1 and of the five classifications developed above. This figure is also the color key used in preparation of the composite land use map.

In some isolated specific cases, proposed development densities greater than 35 DU/AC were identified in the study. Flow projections for these sites were studied individually and are explained in subsequent discussions. However, it must be noted that it is very difficult for developers to meet zoning requirements for parking, site setback, etc., in order to develop residential densities greater than 35 DU/Ac which is defined above as the upper limit of typical high density residential development.

Other Land Use Classifications

Other land use categories which cover the remainder of land usage types within the service area are commercial, industrial, high density industrial/commercial, institutional and open space. The following Table 2-2 summarizes the typical developments characterizing each of these classifications.

TABLE 2-2

COMMERCIAL/INDUSTRIAL LAND USE CATEGORIES

<u>Land Use Designation</u>	<u>Floor-to-Area Ratio (FAR)</u>	<u>Typical Development</u>
Commercial/Office	Less than 0.53	Neighborhood Retail Offices, Motels, Restaurants, Medical, Professional
Industrial	Less than 0.53	Manufacturing Warehouses
High Intensity	Greater than 0.53	Regional Retail, High Rise
Industrial/Commercial	Less than 1.0	Offices, Hotels, Manufacturing Large Hospitals, Regional Amusement
Institutional	N/A	High Schools, Government Offices, Colleges and Universities, Military Bases
Open Space	N/A	Parks/Recreation Areas, Cemeteries

The Floor-to-Area Ratio (FAR) indicated above is the ratio of floor space utilized to the total area of the site. Floor-to-area ratios greater than 0.53 are generally achieved when the building "foot print" occupies more than one-half of the site or when multiple-story development is greater than four or five stories. Again, where specific development details are known to exceed the typical flow characteristics of the categories, special flow projections and coefficients are used.