C.6 HYDROLOGY AND WATER QUALITY

This section addresses the environmental setting and impacts relating to hydrology, water quality, and groundwater resources. The project area is located within the Santa Ana Region (Region 8) of the Regional Water Quality Control Board (RWQCB) jurisdiction. It is located within the Perris South III groundwater basin, and hydrologic unit 801.11 (RWQCB, 1995). There are no natural rivers located within the project area.

The project area surface waters are managed by several administrative groups within Orange County. The information presented in this section was obtained primarily through the water quality, hydrology, and environmental resources departments of Orange County.

The Proposed Project relates to groundwater in two ways. First, impacts may occur where construction directly intersects groundwater and potable aquifers. Second, local groundwater is a possible alternate source of water and is currently proposed as a supplemental water source for the Bolsa Chica Planned Community project.

C.6.1 ENVIRONMENTAL BASELINE AND REGULATORY SETTING

C.6.1.1 Environmental Baseline

Precipitation

The Orange County Public Facilities and Resources Department (PFRD)/Environmental Resources Department maintains the rainfall and streamflow records of Orange County dating back as far as the late 1800s. New data are added each year from 66 reporting (via radio telemetry) rain gauges, 14 recording, non-reporting (non-telemetry) rain gauges, 33 non-recording, cooperative observer (maintained by volunteers) rain gauges, and 36 reporting water level stations. Orange County daily rainfall tables are available for the current year (1998-1999) from various stations, including a Santa Ana station (closest to the project area). The Santa Ana rainfall station collects rainfall data obtained from cooperative observers. Daily rainfall data obtained from the County's web site (http://www.oc.ca.gov/pfrd/envres/envstudies/data/stn121.htm) is provided in Table C.6-1.

The 24-hour peak rainfall for 25-year, 50-year, and 100-year events is 4.49 inches, 5.07 inches, and 5.63 inches, respectively.

Flood Zones

Flood zone mapping within the project area is administered by city departments, including: Huntington Beach Planning, Seal Beach Public Works, Westminster Engineering, and Cypress Engineering

Departments. However, all of these city departments rely on Federal Emergency Management Agency (FEMA) maps for flood zone information. Based on an overview map provided by Huntington Beach Planning Department (see Figure C.6-1), as well as the large scale FEMA maps (FEMA, 1989; 1997a; 1997b), the project area is located primarily in Zone X, but there is also a small area in Zone A. Zone X has areas with designated 100- and 500-year flood zones. Zone A has no base flood elevation.

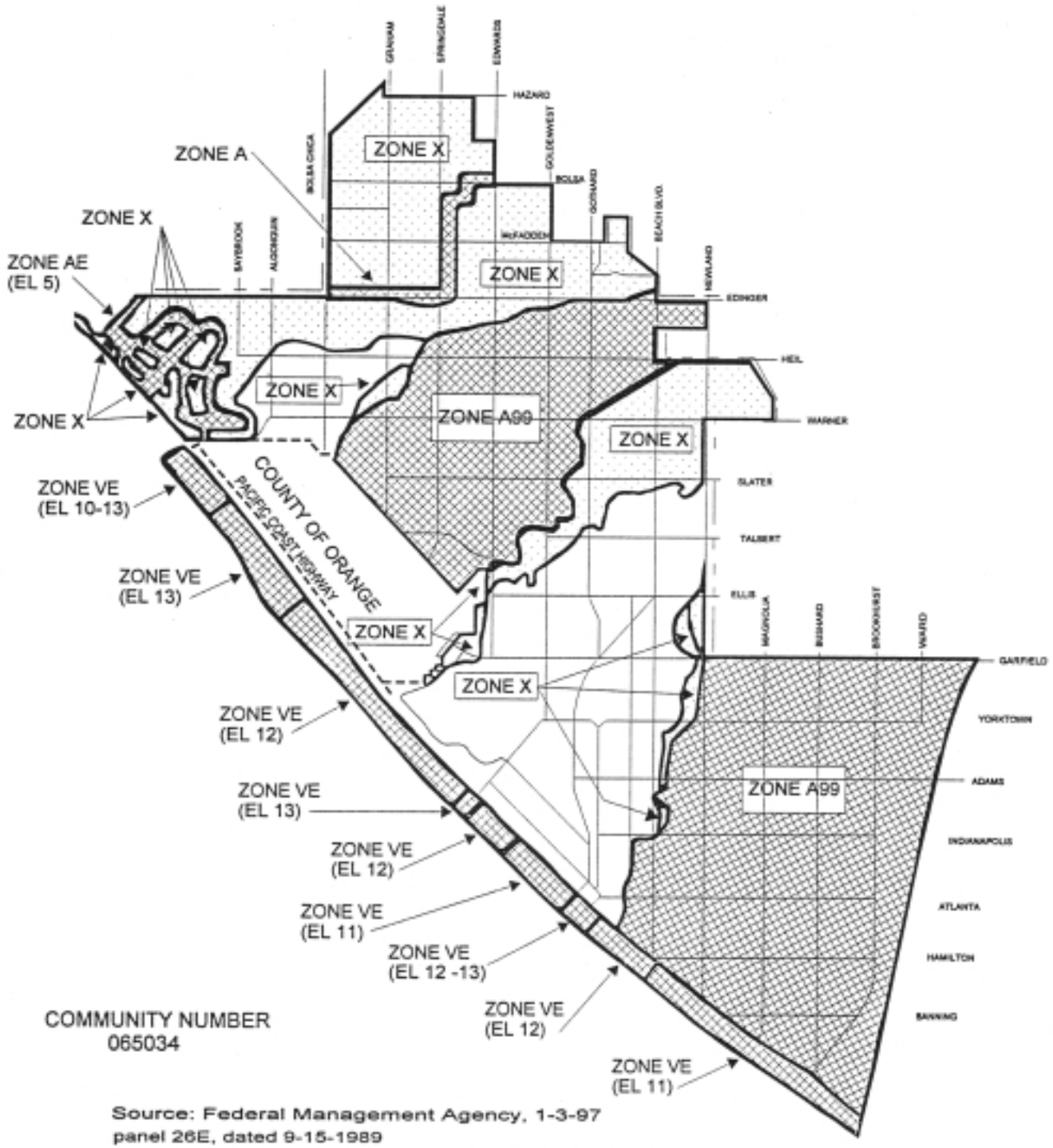
Table C.6-1 Daily Precipitation Data from Santa Ana, PRFD Station #121
July 1, 1998-June 30, 1999

DAY	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
1								0.45				
2						0.42						0.04
3												
4						0.07			T			
5						0.20		0.18				
6						0.24		0.13				
7										0.58		
8					1.05					0.11		
9					0.03					0.06		
10								0.14	0.02			
11												
12					0.05				0.07	0.89		
13												
14												
15												
16									0.31			
17												
18												
19												
20						0.15	0.21					
21							0.05		0.06			
22												
23												
24												
25							0.46					
26							0.02		0.60			
27							0.51					
28					0.34							
29					0.05							
30												
31												
Totals	0	0	0	0	1.52	1.08	1.25	0.90	1.06	1.64	0	0.04

Notes: Units are in inches. Last updated on June 10, 1999.
T – Trace

Drainage

According to a search conducted by the Orange County PFRD hydrology group in 1999, the Proposed Project is located within watersheds that drain into three major facilities, Bolsa Chica Channel (C02), Anaheim-Barber City Channel (C03), and Westminster Channel (C04) (refer to Figure C.6-2 for illustration of Westminster boundaries). The Westminster Channel and the Anaheim-Barber City Channel are tributaries to the Bolsa Chica Channel. Figures C.6-2 and C.6-3 show the boundaries of the watersheds and flood control facilities mentioned above.



Source: Federal Management Agency, 1-3-97
panel 26E, dated 9-15-1989
panel 27F, 35F, 36F, 37F, 45F, 46F, 54F, dated 1-3-1997

Source: City of Huntington Beach

FLOOD ZONES

- A - No Base Flood Elevation
- AE - Base Flood Elevation
- A 99 - Protected by Federal Project under construction
- VE - Coastal Flood with velocity hazard
- X - Areas of 500 year Floods; Areas of 100 year Flood with average depth < 1 foot and protected by 100 year Flood Levels
- ▭ - Areas outside of 500 year Flood

Bolsa Chica Water Line and Wastewater Project

Figure C.6-1

City of Huntington Beach Flood Hazard Areas

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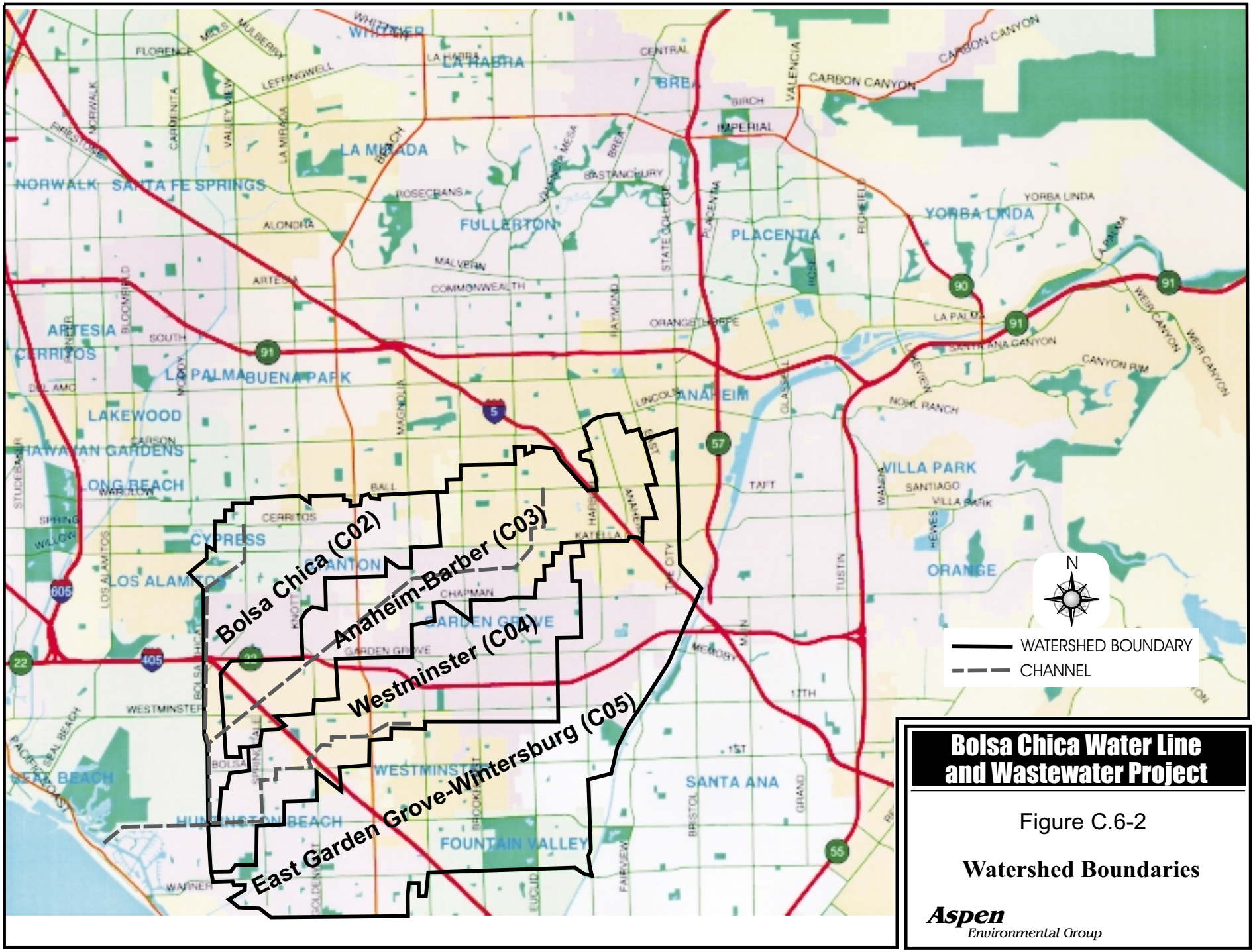

Bolsa Chica Water Line and Wastewater Project

Figure C.6-2

Watershed Boundaries

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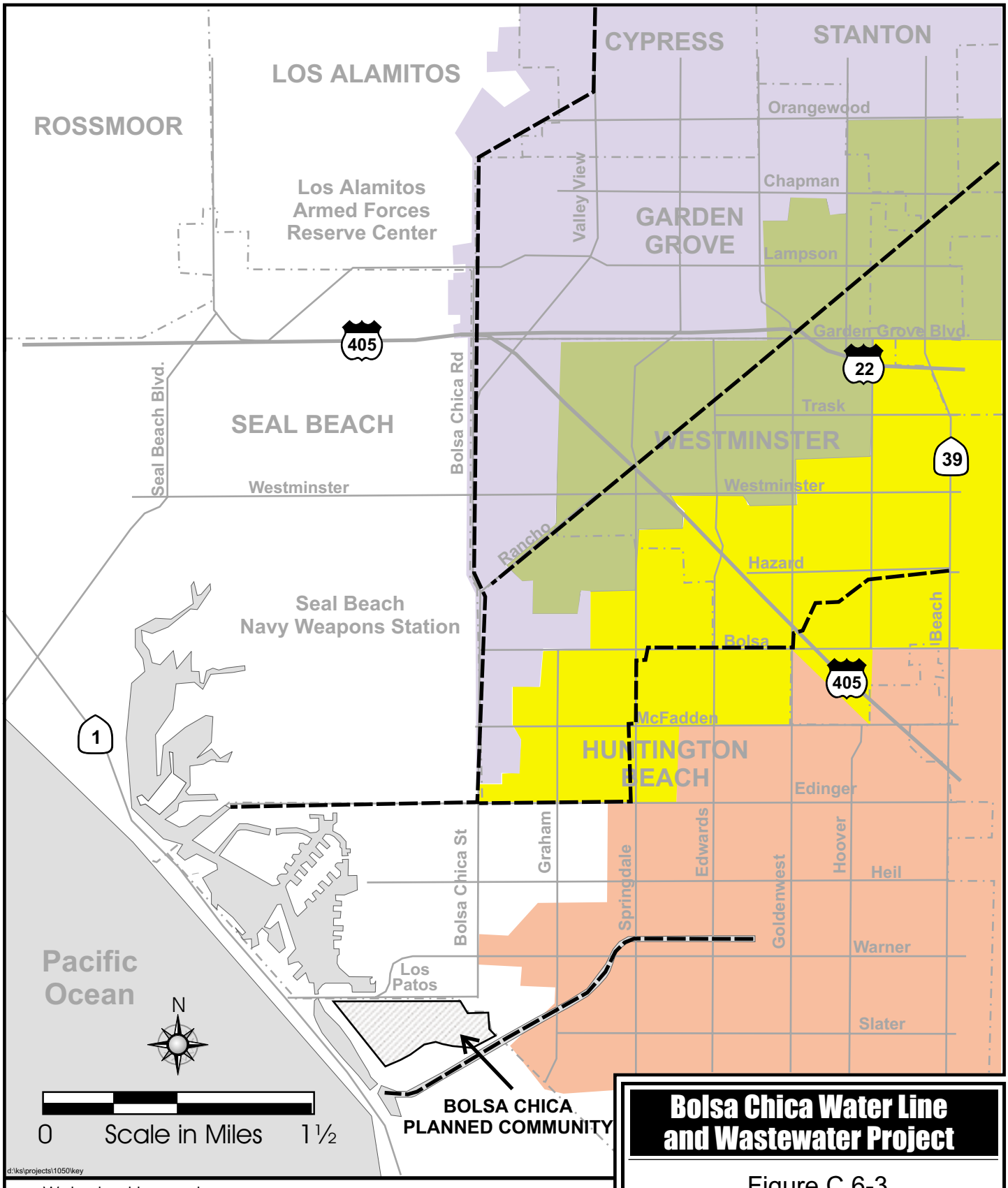


Bolsa Chica Water Line and Wastewater Project

Figure C.6-3

Watersheds and Drainage Channels In Project Area

Aspen Environmental Group

The drainage area of the entire Bolsa Chica Channel (C02) watershed consists of approximately 23,700 acres (about 37 square miles). It includes portions of the Cities of Huntington Beach, Westminster, Stanton, Garden Grove, Los Alamitos, Seal Beach, Cypress, Buena Park, and Anaheim. Anaheim Barber City Channel (C03) with about 9,950 acres, and Westminster Channel (C04) with about 7,355 acres, comprises about 75% of the total drainage area.

Once surface water reaches the Bolsa Chica Channel, it flows south and west to its outlet in Huntington Harbor. Although the Harbor provides a water connection to the Anaheim Bay wetlands to the north and Bolsa Chica wetlands to the south, there is no direct discharge from the Bolsa Chica Channel into either of these wetland areas.

The East Garden Grove-Wintersburg Channel (C05) is also located in the vicinity of the project area. This facility receives drainage from the Wintersburg watershed and its outlet is Bolsa Bay. Although the drainage area includes the Bolsa Chica development site, it does not include any of the areas encompassed by the proposed or alternative pipeline alignments, and therefore will not be discussed further.

Hydrology of Drainage Channels. The Orange County PFRD hydrology department publishes hydrology reports on drainage channels throughout the county. Based on these reports, the following subsections provide available hydrology data for the Bolsa Chica Channel (C02) and Anaheim-Barber City Channel (C03). No reports were available for the Westminster Channel (C04), so no peak flow data are provided.

Bolsa Chica Channel – San Diego Freeway to Cerritos Avenue. The drainage area into Bolsa Chica Channel north of I-405 (San Diego Freeway) consists of approximately 5,610 acres and includes portions of the Cities of Anaheim, Cypress, Garden Grove, Los Alamitos, Stanton, and unincorporated County land. Land use is predominantly residential and commercial. Bolsa Chica Channel (C02) is a trapezoidal earth-lined channel that varies in size from a 54-foot base width with 2:1 side slopes at the San Diego Freeway to a 4-foot base width with 1.5:1 side slopes at Cerritos Avenue. Table C.6-2 provides the 100-year expected value discharges for the upper portion of Bolsa Chica Channel.

Bolsa Chica Channel – San Diego Freeway to Huntington Harbor Outlet. Bolsa Chica Channel is a trapezoidal earth channel from the San Diego Freeway (I-405) to Huntington Harbor. The land use is predominantly residential and commercial. Initial peak discharge data are presented in Table C.6-3 (PFRD, 1998).

Table C.6-2 Expected Value Discharges for Bolsa Chica Channel (CO2), San Diego Freeway to Cerritos Avenue (Upper Portion)

Concentration Point	Drainage Area (acres)	100-Year Expected Value Peak Discharges (cfs)
Downstream of the San Diego Freeway	5,610	4,150
San Diego Freeway to Downstream of Garden Grove Channel (C02S02)	5,560	4,100
Upstream of Garden Grove Channel	5,090	3,850
Garden Grove Channel (C02S02) to Belgrave Channel (C02S05)	4,800	3,800
Belgrave Channel (C02S05) to Holland Avenue	3,940	3,250
Holland Avenue to Los Alamitos City Boundary	3,810	3,200
Los Lamitos City Boundary to Walker Storm Drain (C02P02)	3,700	3,200
Walker Storm Drain (C02P02) to Orangewood Storm Drain (C02P01)	3,360	3,000
Orangewood Storm Drain (C02P01) to Stanton Storm Channel (C02S03)	3,090	2,850
Stanton Storm Channel (C02S01) to Jonathan Storm Channel (C02S03)	970	1,200
Jonathan Storm Channel (C02S03) to Cerritos Avenue	370	430
Belgrave Channel (C02S05)	860	970
Garden Grove Channel (C02S02)	470	470

Notes: Drainage areas are rounded to the nearest 10 acres.
Discharges are rounded to the nearest 10 cfs (for Q < 1000 cfs) and 50 cfs (for 1000 < Q < 5000 cfs)
(C02S02) = Specific segment along Bolsa Chica Channel.

Table C.6-3 Expected Value Discharges for Bolsa Chica Channel (CO2) San Diego Freeway to Huntington Harbor Outlet (Lower Portion)

Concentration Point	Drainage Area (acres)	100-Year Expected Value Peak Discharges (cfs)
Downstream of San Diego Freeway	5,650	2,950
Bolsa Chica Channel (C02)/Anaheim-Barber City Channel (C03)	16,085	9,000
Bolsa Chica Channel (C02)/Westminster Channel (C04)	23,435	11,900

Anaheim-Barber City Channel. The Anaheim-Barber City Channel extends approximately 8½ miles from Bolsa Chica Channel in the City of Huntington Beach to Ball Road in the City of Anaheim. The channel is also located within the Cities of Westminster, Garden Grove, and Stanton. The 9,590-acre drainage area is tributary to the Bolsa Chica Channel (Orange County Flood Program Division, 1986).

The existing channel is primarily a concrete-lined rectangular channel from the C02 confluence to Garden Grove Boulevard. From Garden Grove Boulevard to Ball Road, the channel is a concrete-lined trapezoidal channel. Land use is predominantly residential and commercial.

High confidence peak 100-year discharges are shown in Table C.6-4. Although expected value flood flows have been calculated since the publication of the 1986 report (Orange County Flood Program Division, 1986), they have not yet been published, and thus are not available.

A preliminary review of data indicates that expected values are generally similar to the high confidence peak values, but there were several changes in calculation methods.

Table C.6-4 Discharges for Anaheim-Barber City Channel

Reach	Drainage Area (acres)	100-Year Discharge (cfs)
C02 to San Diego Freeway	9,590	7450
San Diego Fwy. To C03P01 (Knott Avenue Storm Drain)	8,840	7180
C03P01 to C03S04 (Rosalia Storm Channel)	7,990	6,800
C03S04 to C03P06 (Chapman-Dale Storm Drain)	7,220	6,000
C03P06 to C03S05 (Shannon Storm Channel)	6,430	5,760
C03S05 to C03P08 (Gilbert-Cerritos Storm Drain)	6,040	5,650
C03P08 to Brookhurst Street	5,130	4,980
Brookhurst Street to Palmwood Drive	4,440	4,480
Palmwood Drive to Euclid Street	3,540	3,900
Euclid Street to Katella Avenue	3,360	3,780
Katella Avenue to Cerritos Avenue	2,500	2,990
Cerritos Avenue to Ball Road	1,510	2,080

Westminster Channel. The Westminster Channel is located in areas of residential and commercial land use. The channel is generally a reinforced concrete rectangular channel, from Beach Street to Edwards Street. From Edwards Street to the Bolsa Chica Channel (C02) confluence, it is a reinforced concrete trapezoidal channel. At Beach Street, the channel is 25 feet wide and 8.5 feet deep. At the C02 confluence, the channel has a 48-foot base width and 10-foot depth.

Water Quality

As previously mentioned, Huntington Harbor is the outlet for all of the drainage channels that would receive any runoff along any of the pipeline routes for the proposed project. In 1995, Huntington Harbor was designated by the RWQCB (1995) as a "Known Toxic Hot Spot" for cadmium, lead, selenium, chromium, and copper; and a "Potential Toxic Hot Spot" for pesticides including aldrin, chlorbenside, DDT, lindane, endosulfan, chlordane, chlorpyrifos, dieldrin, endrin, toxaphene, and heptachlorepoxide.

Huntington Harbor has multiple beneficial uses designated by the RWQCB in its Water Quality Control Plan (Basin Plan). The establishment of a beneficial use is intended to protect the water quality for that use. General water quality objectives are contained in the Basin Plan to protect the beneficial uses. To comply with its NPDES Urban Stormwater Permit, Orange County submits an annual water quality report to the RWQCB. The data in this report can be compared to the Basin Plan objectives and other applicable water quality criteria.

Currently, Orange County monitors water quality in four locations within the project drainage areas: (1) Bolsa Chica Channel at Westminster Boulevard, labeled BCC02, (2) Anaheim Barber City Channel at the Naval Weapons Station railroad tracks, labeled ABCC03, (3) Westminster Channel near Hazard Avenue and Beach Boulevard, labeled WMCC04, and (4) East Garden Grove Wintersburg Channel at Gothard Street, labeled EGCC05. At the Bolsa Chica and East Garden Grove-Wintersburg channels, water is sampled once per month. In addition, water is sampled during storm events, three to five times per year. Sampling data from 1998 are provided in Appendix 5. Sampling locations are shown on Figure C.6-4.

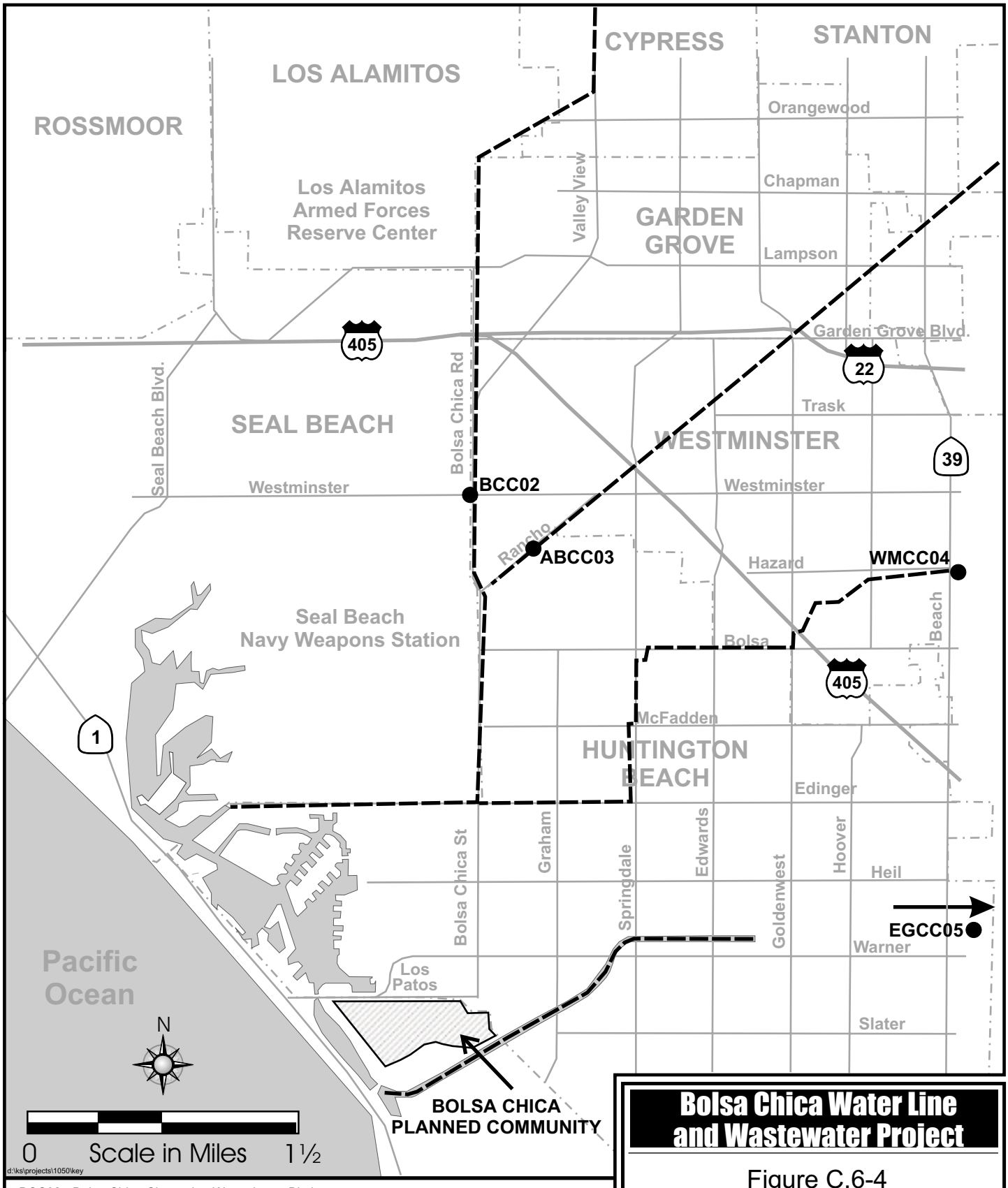
Huntington Harbor and Bolsa Bay are also sampled by Orange County, but only during two storm events per year, and semiannually before and after the storm season. Figure C.6-5 shows a map of the sampling locations, and 1998 sampling data are provided in Appendix 5.

Groundwater Basin

The project area is located within the Coastal Plain hydrologic area extending from Los Angeles County to Orange County. The Proposed Project is within the coastal portion of the Central Basin that extends south to Orange County, and is locally referred to as the Orange County groundwater basin. The Newport-Inglewood fault zone forms the west boundary of the basin and separates fresh water aquifers from the Pacific Ocean.

The Orange County groundwater basin is divided into a Forebay area located in the upper part of the basin, and a Pressure area located along the coastal margin. Recharge occurs in the Forebay by deep percolation of precipitation, irrigation return flow, base flows of the Santa Ana River, and artificial recharge. Recharge water flows southwest toward the Pressure area. The project is located in the Pressure area and, consequently, there is no local recharge by percolation or applied water.

Near the Proposed Project, the Orange County Basin is comprised of two shallow aquifers and five deep aquifers (DWR, 1968; Geoscience, 1994). The two shallow aquifers consist of Recent age alluvium and coastal deposits forming the Semiperched and Bolsa aquifers. The Semiperched aquifer varies from unconfined to semiconfined conditions, ranges from 20 to 40 feet thick, and typically contains saline to brackish water near the coast. Water depths as shallow as 10 to 20 feet are likely along the Proposed Project. The Bolsa aquifer ranges from 5 to 40 feet thick and generally extends to a depth of 80 to 100 feet. Historically, the Bolsa aquifer was intruded by seawater within the Newport-Inglewood fault zone, although largely protected by the overlying confining clay layer east of the fault. More recent water quality data by Orange County Water District (OCWD) indicates chloride levels are increasing within traditionally fresh water areas of the Bolsa aquifer.



BCC02- Bolsa Chica Channel at Westminster Blvd.

ABC03- Anaheim-Barber City Channel at Naval Weapons Station railroad tracks

WMC04- Westminster Channel near Hazard Ave. and Beach Blvd.

EGWC05- East Garden Grove-Winterburg Channel at Gothard St.

Drainage Channel

Bolsa Chica Water Line and Wastewater Project

Figure C.6-4
Huntington Watershed - Storm and Dry Weather Monitoring Location Map

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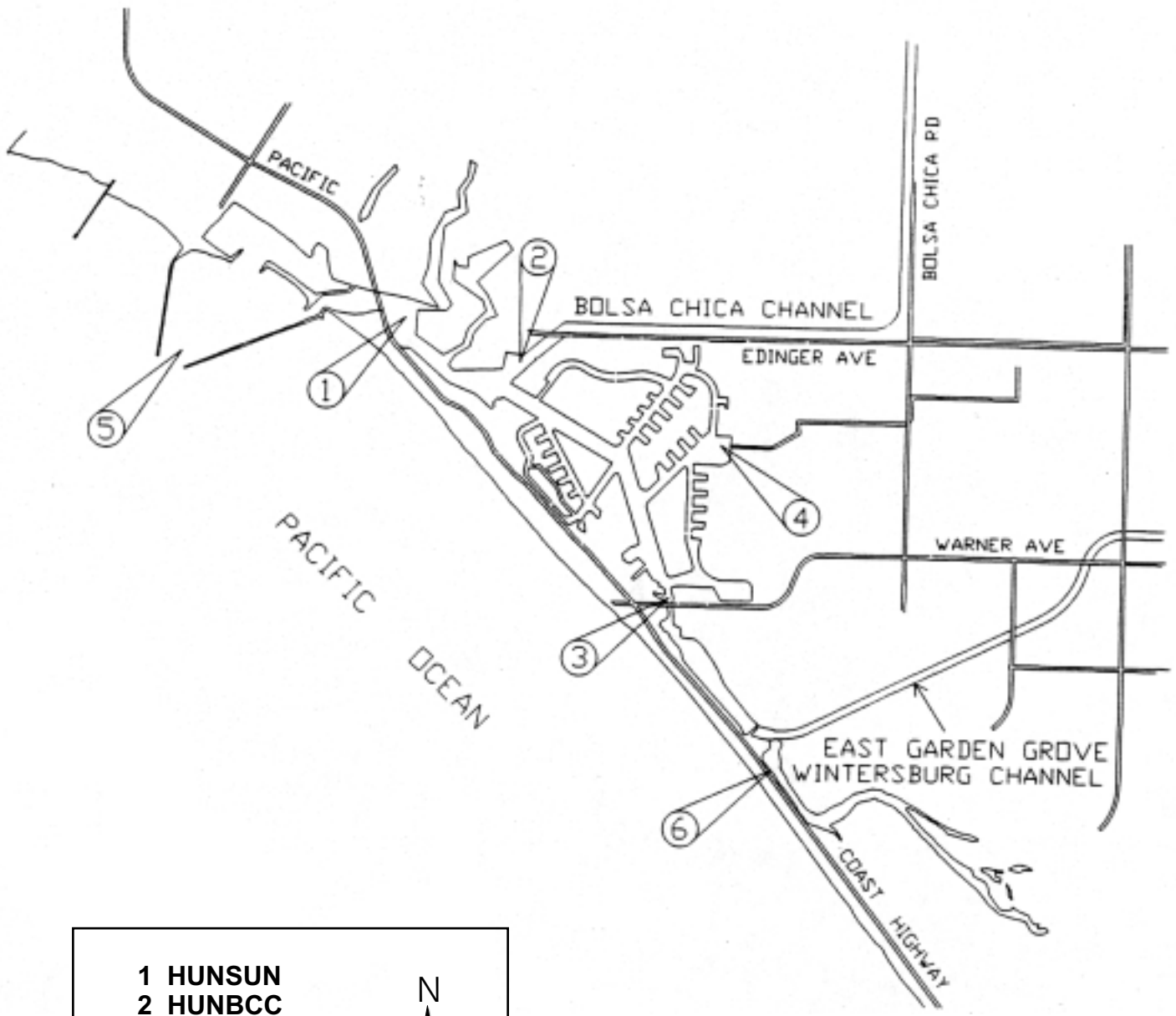

Bolsa Chica Water Line and Wastewater Project

Figure C.6-5
Water Quality Sampling Site Location Map- Huntington Harbour

Source: Orange County Water Quality Section of the Public Facilities and Resources Department

Aspen Environmental Group

The deep aquifers consist of fine- to coarse-grained sand and gravel of Pleistocene age. Individual aquifers are separated by silt and clay confining layers except in localized areas where the aquifers are merged. Within these zones of mergence, groundwater is allowed to migrate from one aquifer and mix with another. The deep aquifers are designated, from youngest to oldest (shallowest to deepest), Alpha, Beta, Lambda, Meadowlark and Main. Individual aquifers range from 30 to more than 250 feet in thickness, and generally increase in thickness toward the center of the basin (northeast). Locally within the Bolsa-Sunset Gap between Bolsa Chica and Huntington Beach mesas, the deep aquifers are merged with the shallow aquifers. Where groundwater flows inland due to groundwater pumping, seawater has intruded into the Alpha, Beta and Lambda aquifers. Typically, degradation of these aquifers is restricted to the coastal areas and is closely monitored by OCWD. A seawater intrusion barrier, consisting of a pressure ridge created by water injection, was constructed in 1976 by OCWD in the Santa Ana River or Talbert Gap, between Newport and Huntington Beach mesas. Similar seawater barriers were built in the Alamitos gap, Dominguez gap and West Coast Basin from Torrance to El Segundo by Los Angeles County Department of Public Works. No seawater barrier has been constructed in the Bolsa-Sunset Gap.

Generally, the Meadowlark and Main aquifers have not been impacted by seawater intrusion and are the principal potable water aquifers throughout the local basin. Locally the Main aquifer contains water with a distinct yellow-brown tint, known as "colored" water. Colored water in deep aquifers extends from Newport Mesa to Long Beach along the coastal margin of the Central Basin. Hydrogeologic studies (Geoscience, 1994) concluded that it is feasible to construct new wells in the area to supply future developments on Bolsa Chica Mesa. However, well sites north of the Mesa are the most likely to avoid water quality problems related to seawater intrusion. In addition, any new supply wells should avoid the Alpha, Beta and Lambda aquifers due to long-term water quality concerns (Geoscience, 1994). In 1997, a test hole was drilled on Bolsa Chica Mesa near the southern terminus of the Proposed Project (Slade, 1997). Three depth-specific water samples were collected for laboratory testing of water quality. Based on the sample depths (359-375 feet, 458-474 feet, and 556-572 feet) all samples were from the Main aquifer. Water quality was generally good although all samples measured 50 color units (apparent color, unfiltered samples).

Groundwater Production and Use. Land use has progressively changed from agricultural to urban since about 1930 in the Central Basin. Groundwater extraction and water imports have increased to meet the demand. Currently, OCWD manages the basin by purchasing import water for recharge, operating recharge facilities along the Santa Ana River to capture base flow, and encourages up to 75 percent groundwater use by local water utilities throughout the basin.

Water Wells. Groundwater production near the project area includes the City of Huntington Beach and Southern California Water Company (SCWC). SCWC wells are located near the north end of the proposed pipeline alignment. Three City of Huntington Beach Wells are located to the east within about

a mile of the proposed pipeline alignment. Several small system, domestic, and industrial wells are also located in the project area.

Groundwater Quality. Water quality data reveal local seawater intrusion of the shallow aquifers along the coast. Increasing chloride levels have been detected in monitoring wells in the Huntington Harbor and Bolsa-Sunset Gap areas reflecting seawater intrusion in the shallow aquifers due to a landward hydraulic gradient produced by a lowering of groundwater levels inland. There is little data to indicate seawater intrusion is impacting the Meadowlark and Main aquifers. Colored water is known to occur in the Main aquifer and was encountered in the test hole drilled in 1997 on Bolsa Chica Mesa. Otherwise, water quality of the deep aquifers is good and acceptable for domestic, municipal, agricultural and industrial uses.

C.6.1.2 Regulatory Setting

A U.S. Army Corps of Engineers "404 Permit" will be required for any construction of the pipeline and pipeline alternative routes within the Waters of the United States or adjacent wetlands. Most of the stream channels crossed by the pipeline would be considered in the Waters of the United States as defined by the ordinary high water mark of the individual channels. The Corps of Engineers, in reviewing 404 permit applications, stresses avoidance of impacts, minimization of unavoidable impacts, and mitigation of unavoidable impacts to the Waters of the United States wetlands. Any activities requiring a 404 permit would also require a Section 401 Water Quality Certification from the State Water Quality Control Board.

A California Department of Fish and Game (CDFG) "1603 Agreement" will be required for any new construction of the pipeline or pipeline alternative routes in riparian areas. The 1603 Agreement is similar to the 404 Permit, but the area of jurisdiction is typically defined on a case-by-case basis by the CDFG, and it is not, in a strict sense, a permit. It is an agreement between the project proponent and the CDFG regarding the location, nature and extent of disturbance, and mitigation.

A General Construction Activity Storm Water Permit will be required from the California Regional Water Quality Control Board under National Pollution Discharge Elimination System (NPDES) regulations, specifically Order Number 96054, System Permit CAS614. A Storm Water Pollution Prevention Plan (SWPPP) must be prepared in order to obtain the permit. The SWPPP will outline Best Management Practices to minimize water contamination during construction. Many of these Best Management Practices are included in the project description. Dewatering, if necessary during construction, is also required to meet National Pollution Discharge Elimination System (NPDES) requirements for temporary discharges. Examples of Best Management Practices include:

- Straw mulch with tackifier to temporarily stabilize earth uncovered during construction

- The application of bonded fiber matrix (with or without seed) to provide longer term stabilization of earth
- Silt fences
- Sand bags
- Storm drain inlet protection and sediment traps.

All cities and counties participating in the National Flood Insurance Program have floodplain regulations for activities within the floodplain. Floodplain regulations are intended to ensure that floodplain development is safe from flooding and causes no adverse impact on adjacent property. These regulations are applicable to the pipeline and new construction for the project as proposed and for alternative routes.

C.6.2 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

C.6.2.1 Significance Criteria

Impacts to channels and water quality will be considered significant if any of the following occur:

- Permanent structures would be placed above ground and within a 100-year floodplain as defined by the Federal Emergency Management Agency (FEMA)
- Lateral erosion, streambed scour, or long-term channel degradation would result in the buried pipeline being exposed to air or flowing water
- A pipeline leak or rupture would result in a failure in channel integrity
- After the use of Best Management Practices during pipeline construction, direct discharge of sediment into any storm drain, storm channel, and/or surface water body would occur
- Any impairment of beneficial uses of water
- Discharge of any toxic or hazardous material into any water body

Significance criteria specific to impacts on groundwater resources are also required. An impact on groundwater resources would be considered significant if:

- A useable groundwater aquifer for municipal, private, or agricultural purposes is substantially and adversely affected by depletion or recharge.
- Should an earthquake occur, inundation and/or groundwater recharge causes reduced soil pore pressure substantially and adversely increases the likelihood of ground liquefaction.
- Increases in groundwater levels produce soil settlement or ground swelling which substantially and adversely damages structures, utilities, or public works
- Any impairment of beneficial uses of groundwater.

Applicant's Environmental Commitments

The following measures relevant to surface water are stated either in the Plan of Works or the PEA.

The Applicant's Revised PEA addresses Hydrology and Water Quality in Item E, Section 3 of Appendix A. Section 3 is a questionnaire in which the Applicant answered "No impact" to all of the questions relating to Hydrology and Water Quality. In Section 4 of Appendix A, the applicant further explained responses to the questions posed on Section 3. Although the PEA does not specifically list proposed measures, the Applicant states herein that typical construction practice for erosion control and BMPs would minimize discharge to surface waters and avoid impacts to water quality.

In a letter to the Applicant from the design engineer (IWA Engineers, 12/15/98) enclosed with the Revised PEA, the design engineer discusses channel crossings. The pipeline crosses the Westminster and Anaheim-Barber City channels aboveground. These channels are identified on the FEMA Flood Insurance Rate Map as 100-year flood plain areas. The design engineer seems to be addressing questions from the CPUC about whether there will be an impact to channel flow in either channel as a result of the pipeline crossing. The design engineer makes the following statement:

> Both crossings are designed based on no allowable encroachment of the proposed pipeline into the full-flow condition of the hydraulic cross-section of the channel.

In fact, the design drawings available indicate that the pipe and supporting structures are located above the bridge soffits and generally stay within the profile of the bridge. One crossing requires the construction of a truss to support the pipe, and the other crossing will use the bridge supports; however, the existing bridge rather than the pipeline and supports would more significantly cause a restriction of flow as a result of a 100-year flood.

Discharge of groundwater is considered in the Revised PEA. Any discharge of groundwater would probably be to surface water channels. In this case, the Applicant has stated (in 3.4.4.1 Open Trench Construction) that the groundwater discharged would be required to meet National Pollutant Discharge Elimination System (NPDES) requirements.

C.6.2.2 Construction Impacts

Sediment Loading During Construction

During construction of the proposed water line, surface water could be impacted by an increased amount of sediment transported to drainage channels, and ultimately to Huntington Harbor. Specific construction methods will be decided by the construction contractor. However, SCWC proposed to

construct the water transmission pipeline in three concurrent construction segments; a specific length of trench (typically 100 feet per segment) will be open at a time, and excavated soil will be stockpiled in a location determined by the contractor. Sections of pipe will be pressure tested before the trench is backfilled. During the time that the trench is open, it may be covered with steel plates to eliminate safety hazards and to allow traffic to use the lane under construction. It is likely that the contractor will stockpile excavated soil adjacent to the pipeline trench. Stockpiled soil would be exposed to rainfall and could be transported to storm drains and the ocean via drainage pathways.

The amount of rainfall that could transport sediment would depend on the storm event (e.g., typical storm, 25-year event, 100-year event). Drainage from roadways is generally to flood control channels that ultimately lead to the Pacific Ocean at Huntington Harbor. Although there would clearly be a sediment source and pathways for sediment loading in flood channels as a result of pipeline construction, the actual risk of increasing sediment loading is unlikely to be significant. First, depending on the season of construction, rainfall is typically minimal (see Table C.6-1). Second, the contractor typically implements Best Management Practices to preserve a soil stockpile. For instance, if construction occurs during a rainy period and storms are predicted, it is assumed that the soil stockpile would be covered in plastic or hay bales placed around the perimeter of the stockpile. The Construction Best Management Practices to which the Applicant has committed (SCWC, 1999) typically reduce sediment contribution to stormflow, although the effectiveness of these practices may vary.

Based on the most likely construction scenario, which includes stockpiling, the implementation of Best Management Practices, and construction during a typical winter storm (not a 25-year or rarer event), it is unlikely that construction practices will result in a significant contribution to the sediment loading in storm channels or ocean outfalls. This impact is thus classified as adverse but less than significant (**Class III**).

Shallow groundwater aquifers and perched aquifers are within a few feet of the planned pipeline trench. Where perched groundwater is encountered during construction, dewatering may be required. Water sampling, laboratory testing, and monitoring of the discharge must be planned and undertaken in accordance with NPDES Permit requirements. Following the requirements of a construction-related NPDES Dewatering Permit, in addition to the applicant's existing commitments, will reduce the adverse impacts to surface water and shallow groundwater to less-than-significant level (**Class III**).
Impact: During construction, surface water could be adversely affected by an increased amount of sediment transported to drainage channels and Huntington Harbor **(Class III)**.

Mitigation Measures: None required

C.6.2.3 Operational Impacts

Permanent Structures in a 100-Year Floodplain

The proposed route requires the construction of a truss to support the pipeline for a channel crossing (across the Westminster Channel). The existence of this truss places the pipeline within a 100-year floodplain (over the drainage channel), and potentially increases its risk of damage during a 100-year flood event. In a 100-year storm event, if the channel were flowing full and the pipeline or truss were in contact with the storm flow, the force of the water might cause damage to the pipeline. In this case, drinking water would spill into the flood channel, disrupting service to the Bolsa Chica Planned Community. Refer to Section C.10 for an impact discussion on disruption of water service to the Bolsa Chica Planned Community. An occurrence such as this would cause damage to the pipeline, but would be repairable within a short period of time (typically one to two days).

According to FEMA flood zone maps, a 100-year flood would overflow the Westminster Channel banks in the vicinity of Bolsa Chica Channel. According to FEMA flood zone maps (FEMA 1997), flood flow in the Bolsa Chica Channel or Anaheim-Barber City Channel does not overflow its banks. Overtopping the channel levees would not result in any risk of flood flow damage to the pipeline. The proposed alternative has only one channel crossing where a truss would be placed in a 100-year flood flow path.

It is very unlikely that both (1) 100-year flood flows would occur, and (2) the flood flows would damage the truss of the pipeline. Furthermore, in the event that the pipeline was damaged, the pipeline would be repairable. These factors result in an adverse but less than significant impact (**Class III**).

Impact: A 100-year flood event could damage the pipeline **(Class III)**.

Mitigation Measures: None required

Leak or Rupture During Operation

During operation of the pipeline, there is a possibility that the pipeline may rupture or a pipeline component (valve or flange) could leak, eventually saturating and potentially eroding the surrounding soil. Because the pipeline will be used only to transport drinking water, there is a low probability of water quality impacts as a result of any potential leaks. However, in areas of the alignment where the pipeline borders an earth-lined storm channel, the potential to damage the structural integrity of the channel exists.

Along the proposed water transmission pipeline route, there are 6,180 feet that would be located beneath the maintenance road, along the east side of Bolsa Chica Channel. The pipeline would be buried 8 feet from the right-of-way, approximately 10 feet from the channel bank. Along this length of pipeline, Bolsa Chica is an earth-lined trapezoidal channel.

During construction, all appropriate methods to prevent leaks or pipeline ruptures from occurring will be implemented. The pipeline will be attached and sealed using conventional rubber joint sealing technologies and corrosion prevention methods. Prior to backfill of the pipeline trench, the water pipeline will be hydraulically pressure tested using standard construction methods. These methods require that the pipe be filled with water to a specific pressure and for a period of time, and then checked for leaks. Although the potential exists for water to leak from the pipeline, all preventative construction methods will be used.

Furthermore, in order for the structural integrity of the channel to be damaged, a significant rupture must occur. If this were to occur, it is very unlikely that the flood channel will be flowing full (only during a significant and rare flood event), which would hinder repair of the channel. Thus this impact is considered adverse but less than significant (**Class III**).

Impact: Risk of leak or rupture during pipeline operation **(Class III)**.

Mitigation Measures: None required

Lateral Erosion in Storm Channel Resulting in Exposure of Buried Pipe

Earth-lined channels tend to degrade over time, as flood flows erode soil from banks. Since the water transmission pipeline would be located adjacent to earth-lined Bolsa Chica Channel, this impact is considered. However, the pipeline would be located a minimum of 17 feet from the bank, given a minimum of 42-inch cover and 2:1 side slopes of the channel. It is therefore very unlikely that Bolsa Chica Channel would be eroded 17 feet at each side of the channel. In addition, the Orange County Flood Control District has planned a series of improvements to the flood control channel north of the I-405 freeway. These changes, which include providing the channel with a concrete lining, make the potential for lateral erosion even more remote. This impact would be less than significant (**Class III**).

Impact: Lateral erosion in storm channel resulting in exposure of buried pipeline **(Class III)**.

Mitigation Measures: None required

C.6.2.4 Impact and Mitigation Summary

All of the pipeline impacts on surface water are less than significant. Although the impacts are insignificant, the alternatives vary in length, drainage patterns, and number of crossings that may serve to compare the alternatives. In particular, the length of each alternative is a differentiating factor because the longer the pipeline route, the greater potential impact on surface water during construction. A summary of the surface water impacts identified for the Proposed Project are presented in Table C.6-5.

Table C.6-5 Impact and Mitigation Summary – Hydrology and Water Quality

Impact	Class	Mitigation Measures
During construction, surface water could be impacted by an increased amount of sediment transported to drainage channels and Huntington Harbour.	III	No mitigation required
Damage to pipeline during a 100-year flood event	III	No mitigation required
Risk of leak or rupture during pipeline operation	III	No mitigation required
Lateral erosion in storm channel resulting in exposure of buried pipeline	III	No mitigation required

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