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SAN JUAN CREEK WATERSHED MANAGEMENT STUDY
ORANGE COUNTY, CALIFORNIA

FEASIBILITY PHASE

ECONOMIC APPENDIX

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SAN JUAN WATERSHED STUDY

ECONOMIC APPENDIX

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1.0 INTRODUCTION

1.1 Study Area Location

The study area of this watershed study lies primarily within Orange County, California. The economic flood inundation damage analysis is principally located in and around the City of San Juan Capistrano. Flood inundation damage centers are located on three streams: San Juan Creek, Trabuco Creek, and Oso Creek. Flooding and erosion are major concerns for the study area. Recent storm flows and erosions have caused considerable damage to sewer and gas lines and to the infrastructure of the flood control channel, as detailed in Attachment 1.

1.2 Study Purpose and Scope

The purpose of this assessment is to present the economic analysis used to measure the existing flood inundation and erosion damage potentials for the San Juan Watershed study area. The scope of this economic analysis consists of the assessment of flood inundation and erosion problems along the streams of San Juan Creek, Trabuco Creek, and Oso Creek within the San Juan Watershed, which have caused severe damage to residential and commercial properties.

2.0 METHODOLOGY OVERVIEW

2.1 Guidance and Regulation

This economic analysis is formulated to be in accordance with ACOE's ER 1105-2-100, the Risk & Uncertainty guidance of ER 1105-2-101 and ER 1105-2-205, and EM 1110-2-1619. The price level for the analysis is April 2002, the discount rate is 6⅛ percent, and the period of analysis is 50 years. The analysis employs the HEC-FDA computer program to measure flood inundation damages in a risk-based environment. The most likely future year in the HEC-FDA model is set at 2030 and the base year is 2008. The future year was determined based upon the projected growth for Orange County and the limited available developable land within the study area. The study area is nearly fully developed, except for large tracts of National Forest, regional and local parklands. The current near full development condition is reflected by the slight increase between the base year and future year damages.

2.2 Models and Reference Sources

The following items were utilized in the economic analysis of flood inundation damage potential.

Models:

(1) HEC-FDA, Version 1.0
(2) HEC-RAS
(3) HEC-EAD

References:

(1) Marshall & Swift Evaluation Services
(2) FEMA's 1997 depth/damage relationships

(3) CH2M Hill Commercial Content Survey
(4) TRW Redi Real Estate data base

2.3 Database Field Survey

The structures of the San Juan Watershed floodplain were subject to a reference field survey to identify characteristics by which the Watershed's floodplain was segmented. A 100 percent survey of structures was not executed. Structures are segmented by general use (nonresidential versus residential areas), type (single-family, multifamily and manufactured housing) and subdivision.

2.4 Topographic Mapping

The San Juan Watershed is topographically mapped at a 1-meter contour interval. This mapping was used for the determination of first-floor elevation and standard deviation in accordance with Section 6-2 of EM 1110-2-1619 (dated 1 Mar 96).

2.5 Reach Delineation

Hydrology and Hydraulic study team members were consulted on the segmentation of the San Juan Watershed area into distinct reaches of homogenous characteristics. Factors of determination included: discharge/frequency characteristics overflow spatial characteristics, and economic activity.

2.5.1 Reach Definition

Reach delineation for the San Juan Watershed study area is shown in Table 1 and in the maps of Attachment 2.

Table 1 – Reach Locations

Stream	Reach Name	Location (River Meter)	Approximate Reach Location
San Juan Creek	Reach 1	100.20 to 115.55	Pacific Ocean to Stonehill Dr
	Reach 2	115.55 to 125.50	Stonehill Dr to Via del Amo
	Reach 3	125.50 to 139.00	Via del Amo to Trabuco Creek
	Reach 4	146.00 to 160.00	Trabuco Creek to La Novia Ave
	Reach 5	160.00 to 184.00	La Novia Ave to Ortega Hwy
Oso Creek	Reach 1	148.00 to 158.50	Crown Valley Pkwy to Via Grande
Trabuco Creek	Reach 1	100.00 to 109.75	San Juan Creek to Del Obispo St
	Reach 2	109.75 to 121.00	Del Obispo St to La Zanja St
	Reach 3	121.00 to 131.00	La Zanja St to Oso Rd
	Reach 4	148.50 to 159.00	Marina Rd to Briarwood Ln

2.5.2 HEC-FDA Reference Cross-sections

Reference cross-sections for the study's reaches are,

Table 2 – Reach Reference Cross-Section

Stream	Reach Name	Location (River Meter)
San Juan Creek	Reach 1	109.00
	Reach 2	121.00
	Reach 3	131.50
	Reach 4	154.00
	Reach 5	172.00
Oso Creek	Reach 1	155.28
Trabuco Creek	Reach 1	106.00
	Reach 2	115.00
	Reach 3	124.00
	Reach 4	169.00

2.6 R&U Variable Parameters

The variables subject to R&U variations for the determination of stage/damage functions are:

First-floor Elevation (FFE)
Depreciated Replacement Cost (DRC)

The HEC-FDA model parameters employed for their uncertainty are:

Table 3 – Stage/Damage R&U HEC-FDA Model Parameters

Variable	Distribution Form	Mean	Standard Deviation
FFE	Normal	0.00	0.30 meters
DRC	Normal	Marshall & Swift estimate	10 percent

The standard deviation for FFE is based on the methodology implied in EM 1110-2-1619 for topographical mapping. DRC's standard deviation is based on the upper and lower bounds of the Marshall & Swift estimates and assuming a normal distribution rather than the triangulation method. This approach eliminates the inherent skew present when Marshall & Swift data is combined with HEC-FDA triangulation method.

The relational hydrologic and hydraulic variables to the economic analysis were incorporated into the HEC-FDA model using its graphical exceedance probability method of the hydraulic HEC-RAS import file and the appropriate equivalent record length determinant.

Content values are set at 50 percent of DRC for residential structures, in line with the guidance of ER 1105-2-100, and 100 percent of DRC for nonresidential structures. The nonresidential content percentage is consistent with past ACOE studies and is the approximate mid-point of the reported commercial content percentages of the CH2MHILL study of commercial content percentages.

3.0 WITHOUT-PROJECT FLOODPLAIN INVENTORY AND DAMAGES

The inventory of structures for the San Juan Watershed study is shown in Table 4, below. Residential represents both single- and multi-family structures. Buildings are the measure of multi-family structures; therefore, the actual housing unit count would exceed the reported number. Manufactured represents manufactured residential housing.

Table 4 – San Juan Watershed Floodplain Inventory

(in $1000s, 2002 Price Level)

		Number of Structures			Value of Structures		
Stream	Reach	Nonresidential	Residential	Manufactured[1]	Nonresidential	Residential	Manufactured
San Juan	Reach 1	194	97	306	66,097	34,542	12,395
	Reach 2	22	861	232	28,373	142,770	9,399
	Reach 3	40	124	171	32,470	16,894	6,927
	Reach 4	38	197	0	15,331	72,797	0
	Reach 5	59	662	0	11,085	126,639	0
Oso	Reach 1	28	0	0	30,384	0	0
Trabuco	Reach 1	66	104	435	57,793	25,817	17,621
	Reach 2	66	81	0	17,663	14,364	0
	Reach 3	23	0	0	6,690	0	0
	Reach 4	0	313	0	0	75,637	0
Total		536	2439	1144	265,886	509,460	46,342

[1]Commonly referred to as mobile homes.

3.1 Flood Inundation Damages

Structural damages, i.e., damages to buildings and contents, are calculated using the HEC-FDA model. The analysis employed the levee function of the model to incorporate failure potential for geotechnical and levee overtopping factors. The results of the HEC-FDA model are shown in the following sections with the residential component representing both residential and manufactured housing units.

Besides structure and content damages, the analysis employed the general relationships shown between total expected annual damages and NED costs associated with clean-up, public assistance, and temporary relocation as indicated by the ACOE's studies on Orestimba Creek, Stanislaus County, California; the Chehalis and Skookumchuck Rivers study of the Seattle District and the flood damage assessment for the City of North Bend, Washington.

The flood frequency damages by event as computed in the HEC-FDA model are shown in Table 5 and Table 6.

Table 5 – San Juan Creek Damages By Event

	Nonresidential	Residential	Total
10-yr	0	0	0
25-yr	386,430	474,810	861,240
50-yr	22,978,100	19,587,430	42,565,530
100-yr	54,518,080	68,634,200	123,152,280
500-yr	107,861,030	164,212,360	272,073,390

Table 6 – Trabuco Creek Damages by Event

	Nonresidential	Residential	Total
10-yr	0	0	0
25-yr	0	24,630	24,630
50-yr	942,840	4,460,270	5,403,110
100-yr	6,719,120	19,257,330	25,976,450
500-yr	24,846,460	52,317,300	77,163,760

Based on the HEC-FDA model frequency damage functions for San Juan Creek, the non-damaging flood event for geotechnical failure and levee overtopping is approximately the 10-year and 20-year, respectively. Based on the HEC-FDA model frequency damage functions for Trabuco Creek, the non-damaging flood event for geotechnical failure and levee overtopping is approximately the 10-year and 25-year, respectively.

3.1.1 San Juan Creek Flood Inundation Damages

San Juan Creek
Equivalent Annual Damage by Damage Categories and Damage Reaches
for the Without (Without project condition) plan
(Damage in $1,000's)

Discount Rate: 6.125
Analysis Period: 50 Years
Plan was calculated with Uncertainty

Stream Name	Stream Description	Damage Reach Name	Damage Reach Description	Equivalent Annual Damage or Damage Categories		Total Damage
				Nonres	Res	
San Juan		Reach 1 Left	Pacific Ocean to Stonehill Dr	727.66	131.89	859.55
		Reach 1 Right	Pacific Ocean to Stonehill Dr	104.78	367.49	472.27
		Reach 2 Right	Stonehil Dri to Via del Amo	0.00	596.84	596.84
		Reach 2 Left	Stonehill Dr. to Via del Amo	179.87	277.30	457.17
		Reach 3 Right	Via del Amo to Trabuco Creek	10.61	214.23	224.84
		Reach 3 Left	Via del Amo to Trabuco Creek	329.82	0.00	329.82
		Reach 4 Left	Trabuco Creek to La Novia Ave	21.99	84.23	106.22
		Reach 4 Right	Trabuco Creek to La Novia Ave	60.50	10.96	71.46
		Reach 5 Left	La Novia Ave to Ortega Hwy	38.38	1.83	40.22
		Reach 5 Right	La Novia Ave. to Ortega Hwy	19.09	201.07	220.16
	Total for stream: San Juan			1492.71	1885.83	3378.54

3.1.2 Oso Creek Flood Inundation Damages

Oso Creek
Equivalent Annual Damage by Damage Categories and Damage Reaches
for the Without (Without project condition) plan
(Damage in $1,000's)

Discount Rate: 6.375
Analysis Period: 50 Years
Plan was calculated with Uncertainty

Stream Name	Stream Description	Damage Reach Name	Damage Reach Description	Equivalent Annual Damage or Damage Categories	Total Damage
				Nonres	
Oso Creek		Reach 1		255.34	255.34
	Total for stream: Oso Creek			255.34	255.34

3.1.3 Trabuco Creek Flood Inundation Damages

Trabuco Creek
Equivalent Annual Damage by Damage Categories and Damage Reaches
for the Without (Without project condition) plan
(Damage in $1,000's)

Discount Rate: 6.125
Analysis Period: 50 Years
Plan was calculated with Uncertainty

Stream Name	Stream Description	Damage Reach Name	Damage Reach Description	Equivalent Annual Damage or Damage Categories		Total Damage
				Nonres	Res	
Trabuco		Reach 1 Right	San Juan Creek to Del Obispo St.	53.84	307.01	360.85
		Reach 1 Left	San Juan Creek to Del Obispo St.	124.53	25.13	149.66
		Reach 2 Right	Del Obispo St. to La Zanja St.	0.00	23.60	23.60
		Reach 2 Left	Del Obispo St. to La Zanja St.	62.87	0.00	62.87
		Reach 3 Right	La Zanja St. to Oso Rd.	0.00	0.00	0.00
		Reach 3 Left	La Zanja St. to Oso Rd.	7.61	0.00	7.61
		Reach 4 Left	Marina Rd to Briarwood Ln.	0.00	0.00	0.00
		Reach 4 Right	Marina Rd to Briarwood Ln.	0.00	208.01	208.01
	Total for stream: Trabuco			248.85	563.75	812.60

3.2 Expected and Equivalent Flood Inundation Damage Summary

The HEC-FDA model predicts for the San Juan Watershed study area in the base year of 2008 that expected inundation damages to equal $4,359,130, as summarized in Table 7.

Table 7 – Expected Flood Inundation Damages

Base Year - 2008
(in $1000s, 2002 price level)

Stream	Expected Annual Flood Inundation Damage		
	Nonresidential	Residential	Total
San Juan Creek	1,440.35	1,866.68	3,307.03
Oso Creek	255.34	0.00	255.34
Trabuco Creek	243.03	553.73	796.76
Total	**1,938.72**	**2,420.41**	**4,359.13**

For the most likely future year 2030, HEC-FDA predicts inundation damages at:

Table 8 – Expected Flood Inundation Damages

Most Likely Future Year - 2030
(in $1000s, 2002 price level)

Stream	Expected Annual Flood Inundation Damage		
	Nonresidential	Residential	Total
San Juan Creek	1,541.69	1,903.74	3,445.43
Oso Creek	255.34	0.00	255.34
Trabuco Creek	254.24	573.12	827.36
Total	**2,051.27**	**2,476.86**	**4,528.13**

Equivalent annual flood inundation damage for the San Juan Watershed area is estimated at $4,446,480 as shown in Table 9.

Table 9 – Equivalent Annual Flood Inundation Damages

San Juan Watershed
(in $1000s, 2002 price level, 6⅛ percent)

Stream	Expected Annual Flood Inundation Damage		
	Nonresidential	Residential	Total
San Juan Creek	1,492.71	1,885.83	3,378.54
Oso Creek	255.34	0.00	255.34
Trabuco Creek	248.85	563.75	812.6
Total	**1,996.90**	**2,449.58**	**4,446.48**

3.3 Bridge Design Safety Criteria Analysis

Channel scour presents a significant potential hazard to many bridge crossings in the watershed. A hydraulic analysis at each bridge location of the scour hazard was performed to estimate the likelihood that a bridge would no longer satisfy design safety criteria over the period of analysis. A high likelihood, a 50% chance of design safety criteria failure, was set as the standard for the economic damage analysis. The analysis also assumes that certainty occurs at twice the timeframe of the high likelihood. The results of this design safety criteria analysis are shown in Table 3.6.

Table 10 – Estimated Scour Induced Design Safety Criteria Failure

Stream	Bridge	# of Lanes	High Likelihood of Design Safety Criteria Failure
San Juan Creek	Pacific Coast Highway	4	N/A
	Camino Las Ramblas	2	N/A
	Stonehill Drive	2	5 years
	Metro Link Railroad	-	N/A
	Camino Capistrano	2	25 years
	Interstate 5	8	5 years
	La Novia Avenue	2	5 years
	Lower Ortega Highway	2	25 years
	Antonio Parkway	-	N/A
Trabuco Creek	Del Obispo Street	4	5 years
	Metro Link Railroad	-	N/A
	Oso Parkway	2	N/A

The 1997 Reconnaissance Report for San Juan and Aliso Creeks cites the estimated replacement cost for the bridges in the study area at about $1.2 million per lane based on local agencies. For this analysis that estimated replacement cost will also be used. The expected average annual cost for bridge replacement due to erosion induced design safety criteria failure is $9,444,200, employing a Net Present Value technique and assuming a linear progression in the probability of design safety criteria failure.

3.4 Oso Creek Erosion Damage - Sewer, Power, and Telephone Lines

The ACOE reports, in the May 1999 Oso Creek – Streambank Erosion Protection Study, that sewer, power, and telephone lines along Oso Creek are in danger of being eroded away during flood events. In the flood of 1993 (measured as an approximately 15-year event), flood fighting by the Moulton Niguel Water District required the performance of slope, manhole, and ballast repair at milepost 195 near Oso Creek at a cost of $14,200 (1993 dollars). Excessive erosion took place during the El Niño storms of 1998 (25-year event) requiring the Moulton Niguel Water District to protect, repair, replace, and relocate pipelines at a cost of $726,538 (1998 dollars). Erosion damages were also reported by San Diego Gas and Electric, Pacific Bell, AT&T, Qwest, and MCI during the El Niño storms. Total erosion damage from El Niño to sewer, power, and telephone lines was $873,677.

The ACOE - Los Angeles District estimates the equivalent annual erosion damage on Oso Creek at $123,160 (1999 price level) using HEC's Expected Annual Damage model.

3.5 Emergency and Clean-Up Costs

Clean up, public assistance, and temporary relocation costs for this analysis are based on the ACOE studies mentioned in Section 3.1. These costs are based on the average relationships shown in these studies between their costs and the estimate of total equivalent annual structure and content damage by category. Based on these studies, the average relationships to total equivalent annual structure and content damage are as shown in Table 11.

Table 11 – Emergency and Clean-Up Cost Relationships to Total Equivalent Damages

Category	Residential	Non-Residential
Clean-up	20%	13%
Public Assistance	15%	
Temporary Relocation	3%	

Based on these relationships, equivalent annual damages for these categories are as follows.

Table 12 – Equivalent Annual Emergency and Clean-Up Costs

(in $1000s, 2002 price level)

Creek	Residential			Non-Residential
	Clean-up	Public Assistance	Temporary Relocation	Clean-up
San Juan	377.17	282.87	56.57	194.05
Trabuco	112.75	84.56	16.91	32.34
Oso	0.00	0.00	0.00	33.19
Total	489.92	367.43	73.48	259.58

Total emergency and clean-up equivalent annual damages for the San Juan Watershed are $1,190,410.

3.6 Without-Project Flood Damage Summary

Table 13 summarizes the equivalent and expected annual damages from flooding.

Table 13 – Without-Project Equivalent Annual Damage Summary

Category	Equivalent Annual Damage
Structural Inundation	4,446,480
Bridge Failure	9,444,200
Oso Creek Erosion	123,610
Emergency & Clean-up	1,190,410
Total	$15,204,700

4.0 WATER DEMAND AND SUPPLY ANALYSIS

4.1 Municipal and Industrial Water

The San Juan Creek Watershed is served by five retail water districts: Moulton Niguel Water District, Santa Margarita Water District, South Coast Water District, Trabuco Canyon Water District along with the Capistrano Valley Water District that is a subsidiary district to the City of San Juan Capistrano. Typical of political boundaries, the service areas for the retail districts also include portions of adjacent watersheds.

The retail districts are served by the Metropolitan Water District of Southern California (MWD) through the water wholesale agencies Coastal Municipal Water District, the Municipal Water District of Orange County and the Tri-Cities Municipal Water District. Regional wastewater treatment and disposal in the watershed is managed by the South East Regional Reclamation Authority (SERRA).

4.2 Retail Water Districts

Moulton Niguel Water District (MNWD) serves about 24,500 acres and nearly 50,000 connections. MNWD provides water and wastewater services to portions of the Cities of Dana Point, Laguna Niguel, Laguna Hills and Mission Viejo. Residential housing, primarily single family, is the predominant land use in the service area. MNWD receives 100% of its domestic water from MWD and operates a large recycled water system.

Santa Margarita Water District (SMWD) serves about 42,000 connections now, and expects to grow to 62,000 connections by the year 2020. SMWD provides water and wastewater services to portions of the City of Mission Viejo and unincorporated foothill area communities including Rancho Santa Margarita, Coto de Caza, Las Flores and Ladera Ranch. SMWD receives 99% of its domestic water from MWD and operates an extensive water recycling system.

Capistrano Valley Water District (CVWD) has recently become a subsidiary district to the City of San Juan Capistrano. CVWD has just over 10,000 service connections within the city as well

as a small portion of the City of Dana Point. The city is actively pursuing groundwater opportunities for its customers and has enacted growth management ordinances. The CVWD service area is primarily residential with commercial uses that focus on tourism.

South Coast Water District (SCWD) recently consolidated with the former Dana Point Sanitary District and Capistrano Beach Water District. It was formed in 1932 and added wastewater services in 1976. SCWD serves portions of Dana Point, Laguna Beach and San Clemente. SCWD receives 100% of its domestic water from MWD.

Trabuco Canyon Water District (TCWD) serves over 9,100 acres and almost 4,000 connections with residential, agricultural and forestland in an unincorporated area of southeastern Orange County. In addition, 441 acres of the Cleveland National Forest is within the TCWD service area. The developed areas within TCWD are primarily residential and the major agricultural activities are commercial nurseries. TCWD has some groundwater supply, but most of its domestic water is from MWD. TCWD also has a small-recycled water system.

Table 14 shows the current estimate of the demand for M&I water for water districts in the San Juan Creek Watershed. Estimated purchase rates for MWD water is provided in Table 15.

Table 14 – Water Demand Projection through 2020

Agencies in the San Juan Creek Watershed*

	M&I Water Demand in Acre-Feet				
District	2000	2005	2010	2015	2020
CVWD	8,500	9,000	9,500	10,100	10,700
MNWD	42,400	47,400	50,400	53,400	56,400
SMWD	28,300	39,600	44,200	49,600	55,000
SCWD	8,900	9,000	9,000	9,000	9,000
TCWD	3,900	4,300	4,700	4,800	4,800

*CVWD, SMWD and TCWD service areas are mostly within the watershed; MNWD's service area is less than half in the watershed; SCWD's service area is mostly outside of the watershed.

Table 15 – Projected MWD Water Rates

1998-99 Budget Forecast (July, 1998)
($/acre-foot)

Year	Rate
1998	$431
1999	$431
2000	$431
2001	$431
2002	$431
2003	$435
2004	$439
2005	$443
2006	$452
2007	$461
2008	$471

In addition, to the MWD rate, the water districts pay a Readiness-to-Serve charge to MWD of about $20/acre-foot, a surcharge to MWDOC/Coastal Municipal Water District of about $5/acre-foot, and Operation & Maintenance costs of jointly owned transmission mains that very according to each facility.

SERRA, a joint powers authority, was formed in 1972 to provide regional wastewater collection, treatment and disposal. The member agencies of SERRA are Moulton-Niguel Water District, Santa Margarita Water District, South Coast Water District (formerly Capistrano Beach Water District) along with the City of San Juan Capistrano and the City of San Clemente.

Table 16 shows the recent and projected reclaimed water demand through 2005 by the producing water districts.

Table 16 – Reclaimed Water Demand*, San Juan Watershed

	Historical		Projected	
District	1995	1998	2000	2005
MNWD	1,900	1,700	6,000	10,000
SMWD	2,600	2,800	3,100	4,000
CVWD	565	565	565	2,411
SCWD	1,000	700	1,000	1,000
TCWD	500	700	800	900

*In acre-feet, for the fiscal year ending on June 30 of the year shown. Only a portion of the total production was utilized in the San Juan Creek Watershed.

Watershed demands for recycled water are for the purposes of golf course irrigation, landscape irrigation for homeowners associations, schools, road medians, parklands and nurseries.

SERRA's Latham Regional Wastewater Treatment Facility is located in Dana Point. The facility is a conventional activated sludge treatment plant that receives raw wastewater from the City of San Juan Capistrano (Capistrano Valley Water District), the South Coast Water District, Moulton-Niguel Water District and the Santa Margarita Water District. Other facilities in the watershed include the Santa Margarita Water Reclamation Plant located in Chiquita Canyon near the Las Flores Planned Community, the SMWD Oso Creek treatment facility located at La Paz Road near Marguerite Parkway, the MNWD 3A Plant adjacent to the I-5 Freeway at Oso Creek, and the Trabuco Canyon Water Reclamation Plant located in the upper reach of Trabuco Creek.

The SERRA outfall line collects the treated discharges from the above referenced treatment facilities (except for the TCWD facility discharges that are sent to the Aliso Water Management Agency outfall line) and conveys them to the Pacific Ocean southwesterly of the mouth of San Juan Creek. The outfall line also collects treated effluent from the City of San Clemente's facility and the former Capistrano Beach Water District's Victoria treatment facility until its closure on July 1, 1999. The outfall line extends approximately 10,000 feet offshore to a depth of approximately 100 feet. The design capacity of the outfall line is 107 million gallons per day (MGD), with 24 MGD of that capacity available as gravity flow.

4.3 Water Quality

The San Juan Creek drains to the ocean at Doheny Beach State Park. As a major recreation center for the region, the quality of the creek water and its interaction with beach users in the surf zone is of great interest to the residents, businesses engaged in commercial tourism and visitors. The water/wastewater agencies and cities of San Juan Capistrano and Dana Point along with local environmental organizations have a long history of concern for pollutants in the creek. A proposal for a manufactured wetland project on property adjacent to San Juan Creek in 1992 helped initiate the existing watershed feasibility study.

The implementation of new 1999 state water testing standards at beaches will further highlight the need for a comprehensive solution to creek water pollution. Orange County has established a Coastal Summit team of cities, the County and State Parks representatives to cooperatively act on issues and to respond to problems such as water quality concerns. The local agencies are pursuing grant funding for a water quality study from the State to establish a monitoring program for the sources of toxins and bacteria in the stream.

The recent consolidation of water and wastewater agencies in the watershed included the merging of Dana Point Sanitary District, the Capistrano Beach Water District and the South Coast Water District into one umbrella district under the South Coast name. As of July 1, 1999, the former Capistrano Beach Water District's outdated Victoria Wastewater Treatment Plant will be closed down and treatment capacity purchased in the modern SERRA facility. This action is viewed locally as a likely improvement for creek water quality as the newer SERRA facility is less vulnerable to storm event overflows and internal failures that plagued the Victoria facility and resulted in occasional sewage spills on Doheny Beach.

5.0 ALTERNATIVES ANALYSIS

Two broad categories of alternative types are under examination for the San Juan Creek watershed. They are: (1) Channel Stabilization and (2) Flood Control. Channel stabilization alternatives fall into two general classifications, full creek and urbanized leveed. Full creek channel stabilization measures extend the full practical length of the mainstem of a creek; whereas, urban leveed measures are principally confined to areas of existing flood control measures. In the flood control area, five structural alternatives are under consideration. These alternatives are:

- FC-2: Floodwalls (or Levees) ONLY
- FC-3: Detention Basin on San Juan Creek
- FC-4: Detention Basin on Trabuco Creek
- FC-5: Detention Basins on San Juan and Trabuco Creeks
- FC-6: Channel Widening

and with flood control measure FC-1 being the No Action Plan.

5.1 Full Channel Stabilization Alternatives

CS-1: San Juan Creek: Stabilization of San Juan Creek

This alternative would entail the construction of seven grade stabilizers in the reach between Station 122+00 (upstream of Stonehill), and Station 233+50 (downstream of Conrock access road) on San Juan Creek. This alternative does not address channel stabilization on any tributary to San Juan Creek. These structures would each span the width of the channel. The structures were designed to prevent further downcutting of the channel, although localized scour would still be possible, and could pose a continued threat to existing infrastructure and channel linings. A structure would be located at the San Juan/Trabuco confluence to enhance stability at this critical location. The invert would be raised as much as two meters in some locations. There would be a potential loss of capacity in those reaches, due to the added material on the invert, although this would be minimal. Fish passage would be designed into the structure, with a low-flow "path" or paths through the structure. Each structure would consist of a grouted rip-rap invert, a series of 0.3 meter low-flow drops for passage, and 2 or 3 to 1 side slopes of Armorflex or its equivalent to encourage vegetative regrowth on the banks. Scour would be circumvented by a soil cement cut-off at the upstream end. The riprap of the structure could be covered with soil, either mechanically, or by natural infilling of the channel. Modified slopes of less than 1% would lessen water velocities, reducing scour potential, and providing for more "residence time" for the flow, slightly enhancing recharge.

The estimated cost of the alternative is $7,825,000. Assuming a two-year construction schedule, interest during construction (IDC) would be $479,300; thus increasing the economic cost of this alternative to $8,304,300. Amortization of the economic cost over 50-years at an interest rate of 6⅛ percent yields an annual cost of $536,100.

Stabilization of San Juan Creek would reduce equivalent annual inundation related damages by $925,020 along the creek, as show in Table 17. Stabilization would also reduce the expected annual damage of bridge failure by $7,181,000. Total annual damage reduction associated with channel stabilization along San Juan Creek is estimated at $8,106,020.

Table 17 – CS-1 San Juan Creek Equivalent Annual Damage Reduction

(in $1000s, 2002 price level)

	Without-Project	With-Project	Damage Reduction
Non-Residential	1,492.71	1,138.61	354.10
Residential	1,885.83	1,505.48	380.35
Emergency & Other	910.67	720.1	190.57
Total Inundation	*4,289.21*	*3,364.19*	*925.02*
Bridge Failure	9,444.20	2,263.20	7,181.00
Total Damages	**13,733.41**	**5,627.39**	**8,106.02**

National Economic Development (NED) economics for alternative CS-1 are shown in Table 18, below.

Table 18 – NED Economics Alternative CS-1 San Juan Creek	
	Annual Cost & Benefits
Flood Inundation Reduction Benefits	925,020
Bridge Failure Reduction Benefits	7,181,000
Total Benefits	8,106,020
Economic Cost	*536,100*
B/C Ratio - Total Benefits	15.12
Net Benefits – Total Benefits	7,569,920

CS-2: Trabuco Creek Stabilization

Because Trabuco Creek is undergoing considerably more downcutting than San Juan Creek, and the creek itself is steeper, stabilization of the creek would likely require 14 structures to stabilize the channel while also providing for fish passage. The structures would be located between Stations 118+00 (upstream of Del Obispo) and the AT&SF crossing of the creek at Station 136+00. Some of the structures would be very close together, due to the necessity of providing a minimum height for fish passage, and the need to reduce slope to a long-term equilibrium slope without excessive structure height. Other features of the plan are as above.

The estimated cost of the alternative is $9,921,000. Assuming a two-year construction schedule, interest during construction (IDC) would be $607,700; thus increasing the economic cost of this alternative to $10,528,700. Amortization of the economic cost over 50-years at an interest rate of 6⅛ percent yields an annual cost of $679,700.

Stabilization of Trabuco would reduce equivalent annual inundation related damages by $450,580 along the creek, as show in Table 19. Stabilization would also reduce the expected annual damage of bridge failure by $2,263,200. Total annual damage reduction associated with channel stabilization along Trabuco Creek is estimated at $2,713,780.

Table 19 – CS-2 Trabuco Creek Equivalent Annual Damage Reduction (in $1000s, 2002 price level)			
	Without-Project	With-Project	Damage Reduction
Non-Residential	248.85	166.36	82.49
Residential	563.75	304.79	258.96
Emergency & Other	246.58	137.45	109.13
Total Inundation	*1,059.18*	*608.60*	*450.58*
Bridge Failure	2,263.20	0.00	2,263.20
Total Damages	**3,322.38**	**608.60**	**2,713.78**

National Economic Development (NED) economics for alternative CS-2 are shown in Table 20, below.

Table 20 – NED Economics Alternative CS-2 Trabuco Creek	
	Annual Cost & Benefits
Flood Inundation Reduction Benefits	450,580
Bridge Failure Reduction Benefits	2,263,200
Total Benefits	2,713,780
Economic Cost	*679,700*
B/C Ratio - Total Benefits	3.99
Net Benefits – Total Benefits	2,034,080

5.2 Limited Channel Stabilization Alternatives

CS-1a: San Juan Creek: Stabilization of San Juan Creek (leveed section only)

This alternative would entail the construction of a total of four grade stabilizers in the reach between Station 122+00 (upstream of Stonehill), and Station 139+00 (downstream of Trabuco Creek confluence) on San Juan Creek.

The channel stabilization plan would require 20 hectares of clearing and stripping, approximately 48,000 cubic meters of excavation, 10,000 cubic meters of shaped and compacted fill material, 42,000 cubic meters of excavation and stockpiling fill for the soil cement cut-off, 10,00 cubic meters of installed soil cement, 31,000 cubic meters of structural backfill, 1,800 square meters of Armorflex revetment, 1,400 square meters of hand placed grouted rip-rap, 2,600 square meters of dumped rip-rap, 1,800 square meters of filter fabric, and 0.2 hectare revegetated side slope on San Juan Creek.

The estimated cost of the alternative is $2,851,200. Assuming a one-year construction schedule, interest during construction (IDC) would be $87,300; thus increasing the economic cost of this alternative to $2,938,500. Amortization of the economic cost over 50-years at an interest rate of 6⅛ percent yields an annual cost of $189,700.

Stabilization of San Juan Creek in the leveed sections would reduce equivalent annual inundation related damages by $925,020 along the creek, as show in Table 21. Stabilization would also reduce the expected annual damage of bridge failure by $7,181,000. Total annual damage reduction associated with channel stabilization along San Juan Creek in the leveed sections is estimated at $8,106,020.

Table 21 – CS-1a San Juan Creek Equivalent Annual Damage Reduction (in $1000s, 2002 price level)			
	Without-Project	With-Project	Damage Reduction
Non-Residential	1,492.71	1,138.61	354.10
Residential	1,885.83	1,505.48	380.35
Emergency & Other	910.67	720.1	190.57
Total Inundation	*4,289.21*	*3,364.19*	*925.02*
Bridge Failure	9,444.20	2,263.20	7,181.00
Total Damages	**13,733.41**	**5,627.39**	**8,106.02**

National Economic Development (NED) economics for alternative CS-1a are shown in Table 22, below.

Table 22 – NED Economics Alternative CS-1a San Juan Creek	
	Annual Cost & Benefits
Flood Inundation Reduction Benefits	925,020
Bridge Failure Reduction Benefits	7,181,000
Total Benefits	8,106,020
Economic Cost	*189,700*
B/C Ratio - Total Benefits	42.73
Net Benefits – Total Benefits	7,916,320

CS-2a: Trabuco Creek Limited Stabilization

Two stabilization structures would be placed along the leveed section located between Stations 102 (upstream of San Juan Creek confluence) and the Station 119+00. The channel stabilization plan would require 4 hectares of clearing and stripping, approximately 34,000 cubic meters of excavation, 15,000 cubic meters of excavation and stockpiling fill for the soil cement cut-off, 5,200 cubic meters of installed soil cement, 10,000 cubic meters of structural backfill, 1,700 square meters of Armorflex revetment, 3,400 square meters of hand placed grouted rip-rap, 2,700 square meters of dumped rip-rap, 1,700 square meters of filter fabric, and 0.2 hectare revegetated side slope.

The estimated cost of the alternative is $3,615,300. Assuming a one-year construction schedule, interest during construction (IDC) would be $110,700; thus increasing the economic cost of this alternative to $3,726,000. Amortization of the economic cost over 50-years at an interest rate of 6⅛ percent yields an annual cost of $240,500.

Stabilization of Trabuco would reduce equivalent annual inundation related damages by $450,580 along the creek, as show in Table 23. Stabilization would also reduce the expected annual damage of bridge failure by $2,263,200. Total annual damage reduction associated with channel stabilization along Trabuco Creek is estimated at $2,713,780.

Table 23 – CS-2a Trabuco Creek Equivalent Annual Damage Reduction (in $1000s, 2002 price level)			
	Without-Project	With-Project	Damage Reduction
Non-Residential	248.85	166.36	82.49
Residential	563.75	304.79	258.96
Emergency & Other	246.58	137.45	109.13
Total Inundation	*1,059.18*	*608.60*	*450.58*
Bridge Failure	2,263.20	0.00	2,263.20
Total Damages	**3,322.38**	**608.60**	**2,713.78**

National Economic Development (NED) economics for alternative CS-2a are shown in Table 24, below.

Table 24 – NED Economics Alternative CS-2a Trabuco Creek	
	Annual Cost & Benefits
Flood Inundation Reduction Benefits	450,580
Bridge Failure Reduction Benefits	2,263,200
Total Benefits	2,713,780
Economic Cost	*240,500*
B/C Ratio - Total Benefits	11.28
Net Benefits – Total Benefits	2,473,280

5.3 Flood Control Alternatives

FC-2: Floodwalls (or Levees) ONLY

The "All Floodwall Plan" utilizes floodwalls to ensure in-channel confinement of flood flows up to and including a nominal 1% exceedance flood event. The nominal 1% exceedance flood event was used for the analysis of all flood damage reduction alternatives so that they could be compared on an equivalent damage reduction basis. The floodwall plan was developed by modeling a confining wall (where needed) on one or both banks, to ensure flood flow confinement to the channel for all events up to and including the desired frequency of flood event.

The plan would require an over 2 meter high floodwall immediately upstream of Pacific Coast Highway, tapering quickly down to one half meter several hundred meters upstream. A similar floodwall height would be required immediately upstream of Stonehill Drive Bridge, also tapering down to a half meter several thousand feet upstream. The floodwall would continue upstream past the confluence of San Juan and Trabuco Creeks, with again, a 2-meter high floodwall immediately upstream of Interstate 5. A floodwall would no longer be necessary as one approaches the Ortega Highway Bridge. On Trabuco Creek, a floodwall would be required to a point upstream of Del Obispo Street Bridge.

The height of the floodwall may be further reduced in some cases by the complete replacement of certain bridges, most notably Pacific Coast Highway, particularly if that replacement includes modification for increased capacity, of the bridge's associated channel cross-section at and upstream of the bridge. The PCH Bridge is an impediment to flow during the 100-year event, although its replacement poses its own problems due to the necessity of raising the bridge, and the need to extend its approaches on both sides of the bridge. The key ingredient in this replacement is, however, the elimination of its numerous piers, with their attendant potential for debris blockage and further reduction of the bridge and associated channel cross-section's carrying capacity. The replacement of bridges with inadequate capacity does not eliminate the need for floodwalls at these locations, however; it only reduces the height of the structure.

Alternative FC-2 would additionally involve the installation of 10,030 meters of concrete floodwall of 0.5 to 2.0 meters in height, and 1,514 meters of concrete floodwall in excess of 2.0 meters in height, which includes 40 meters of floodwall 4.0 meters in height. There would also be 1,137 meters of floodwall of 1.5 meters or less in height on Trabuco Creek.

Assuming some stabilization measure is in place, the construction cost of this alternative, exclusive of real estate needs, would be approximately $12,984,000. With real estate costs of approximately $784,000, the cost would be approximately $13,768,000. This includes replacement of Pacific Coast Highway, La Novia Avenue, and the Del Obispo Street Bridge on Trabuco Creek.

Assuming a two-year construction schedule, interest during construction (IDC) would be $843,300; thus increasing the economic cost of this alternative to $14,611,300. Amortization of the economic cost over 50-years at an interest rate of 6⅛ percent yields an annual cost of $943,200.

Alternative FC-2 would reduce equivalent annual inundation related damages by $626,770 along the both San Juan and Trabuco Creeks, as show in Table 25. Since stabilization is assumed to be in place, there would be no benefits to be derived from bridge failure.

Table 25 – FC-2 All Floodwall Plan Equivalent Annual Damage Reduction

(in $1000s, 2002 price level)

	Without-Project	With-Project	Damage Reduction
Non-Residential	1,304.97	1,078.29	226.68
Residential	1,810.27	1,541.70	268.57
Emergency & Other	857.55	726.03	131.52
Total Inundation	*3,972.79*	*3,346.02*	*626.77*
Bridge Failure	0.00	0.00	0.00
Total Damages	**3,972.79**	**3,346.02**	**626.77**

National Economic Development (NED) economics for alternative FC-2 are shown in Table 26, below.

Table 26 – NED Economics Alternative FC-2	
	Annual Cost & Benefits
Flood Inundation Reduction Benefits	626,770
Bridge Failure Reduction Benefits	0
Total Benefits	626,770
Economic Cost	*943,200*
B/C Ratio - Total Benefits	0.66
Net Benefits – Total Benefits	-316,430

FC-3: Detention Basin on San Juan Creek

This alternative assumes that flood flow containment within the channel would be achieved by a combination of storage of flood flows on San Juan Creek in a basin constructed for that purpose, and floodwalls of reduced height on San Juan Creek downstream of the basin, as well as floodwalls on Trabuco Creek. Preliminarily, the basin is located on San Juan Creek immediately upstream of Antonio Parkway, a location that is less environmentally sensitive than others, is not too far upstream to provide the needed reduction in discharge, and provides minimal interference with existing infrastructure or development.

The provision of storage on San Juan Creek reduces the required floodwall height along San Juan Creek, and eliminates the need for it in some locations. Storage on San Juan Creek does not eliminate the need for an extensive floodwall immediately upstream of PCH or Stonehill. The floodwalls would be of identical design to those of Alternative FC-2, with the exception of height. The basin itself would be of earthen construction, with 3 to 1 slopes on both sides. The basin was designed with riprap slopes approximately one half meter thick. The basin embankment would be approximately 24 meters high (65 feet), and 400 meters long, with a base width of approximately 140 meters. The impoundment area during a 100-year flood event would extend upstream almost to the Conrock access road, and a short distance upstream on Canada Gobernadora. Basin construction would require the relocation of several small roads and some utilities, although existing development would not be impacted. The basin would store approximately 5,700 acre-feet of water when full to the spillway crest. Flows would pass through the basin by means of an unregulated double reinforced concrete 12' x 9' box culvert, providing discharge and sediment transport through the basin for most events. A stilling basin and concrete spillway would occupy the center of the structure, with protective wing walls. There would be a grouted stone apron at the downstream end of the stilling basin to control erosion. Toe-down depth on the structure would be approximately 5 meters. The pool at spillway crest would be approximately 15 meters deep. No excavation within the reservoir area would be performed, and no permanent pool would be established.

The cost of this alternative is approximately $31.32 million, including mitigation and assuming some stabilization measure is in place. Real estate costs are estimated at $5.02 million. Included in this estimate is the replacement of PCH and La Novia bridges.

Assuming a two-year construction schedule, interest during construction (IDC) would be $1,918,000; thus increasing the economic cost of this alternative to $33,233,000. Amortization

of the economic cost over 50-years at an interest rate of 6⅛ percent yields an annual cost of $2,145,300.

Alternative FC-3 would reduce equivalent annual inundation related damages by $1,174,820 along the both San Juan and Trabuco Creeks, as show in Table 27. Since stabilization is assumed to be in place, there would be no benefits to be derived from bridge failure.

Table 27 – FC-3 Detention Basin on San Juan Creek Equivalent Annual Damage Reduction

(in $1000s, 2002 price level)

	Without-Project	With-Project	Damage Reduction
Non-Residential	1,304.97	877.70	427.27
Residential	1,810.27	1308.82	501.45
Emergency & Other	857.55	611.45	246.10
Total Inundation	*3,972.79*	*2,797.97*	*1,174.82*
Bridge Failure	0.00	0.00	0.00
Total Damages	**3,972.79**	**2,797.97**	**1,174.82**

National Economic Development (NED) economics for alternative FC-3 are shown in Table 28, below.

Table 28 – NED Economics Alternative FC-3

	Annual Cost & Benefits
Flood Inundation Reduction Benefits	1,174,820
Bridge Failure Reduction Benefits	0
Total Benefits	1,174,820
Economic Cost	*2,145,200*
B/C Ratio - Total Benefits	0.55
Net Benefits – Total Benefits	-970,380

FC-4: Detention Basin on Trabuco Creek

This alternative consists of a detention basin on Trabuco Creek only, and floodwalls on San Juan Creek and Trabuco Creek. The basin would be sited on Trabuco Creek upstream of Station 171+00, a location that is less environmentally sensitive than others, is not too far upstream to provide the needed reduction in discharge, and provides minimal interference with existing infrastructure or development. The provision of storage on Trabuco Creek reduces the required floodwall height along the creek downstream, but still requires floodwalls on San Juan Creek. Storage on Trabuco Creek does not eliminate the need for a floodwall immediately upstream of PCH or Stonehill, although it does reduce the height of the structure. The floodwalls would be of identical design to those of Alternative FC-2 with the exception of height. The basin itself would be of earthen construction, with 3 to 1 slopes on both sides. The basin was designed with riprap slopes. The basin embankment would be approximately 20 meters high (60 feet), and 510 meters long, with a base width of approximately 130 meters. The impoundment area during a

100-year flood event would extend upstream approximately 1400 meters. Basin construction would require the relocation of several small roads and some utilities, although existing development would not be impacted. The basin would store approximately 2,700 acre-feet of water during the design event (1% exceedance). Flows would pass through the basin by means of an unregulated 12' x 9' reinforced concrete box culvert, providing discharge and sediment transport through the basin for most events. A stilling basin and concrete spillway would occupy the center of the structure, with protective wing walls. There would be a grouted stone apron at the downstream end of the stilling basin to control erosion. The pool at spillway crest would be approximately 13 meters deep. No excavation within the reservoir area would be performed, and no permanent pool established in this alternative. The basin would not be capable of storing water beyond the period of floodwater storage, as no clay core was included in the design.

Alternative FC-4 would involved the installation of 8,265 meters of concrete floodwall of 0.5 to 2.0 meters in height and 741 meters floodwall in excess of 2.0 meters in height. There would also be 428 meters of floodwall on Trabuco Creek, all of it 0.5 meters or less in height.

The cost of this alternative is approximately $32,694,000, including mitigation. Real estate costs would be approximately $7.0 million. This alternative includes replacement of PCH, La Novia and Del Obispo bridges.

Assuming a two-year construction schedule, interest during construction (IDC) would be $2,002,000; thus increasing the economic cost of this alternative to $34,696,000. Amortization of the economic cost over 50-years at an interest rate of 6⅛ percent yields an annual cost of $2,239,800.

Alternative FC-4 would reduce equivalent annual inundation related damages by $1,010,140 along the both San Juan and Trabuco Creeks, as show in Table 29. Since stabilization is assumed to be in place, there would be no benefits to be derived from bridge failure.

Table 29 – FC-4 Detention Basin on Trabuco Creek Equivalent Annual Damage Reduction

(in $1000s, 2002 price level)

	Without-Project	With-Project	Damage Reduction
Non-Residential	1,304.97	901.15	403.82
Residential	1,810.27	1,408.95	401.32
Emergency & Other	857.55	652.55	205.00
Total Inundation	*3,972.79*	*2,962.65*	*1,010.14*
Bridge Failure	0.00	0.00	0.00
Total Damages	**3,972.79**	**2,962.65**	**1,010.14**

National Economic Development (NED) economics for alternative FC-4 are shown in Table 30, below.

Table 30 – NED Economics Alternative FC-4	
	Annual Cost & Benefits
Flood Inundation Reduction Benefits	1,010,140
Bridge Failure Reduction Benefits	0
Total Benefits	1,010,140
Economic Cost	*2,239,800*
B/C Ratio - Total Benefits	0.45
Net Benefits – Total Benefits	-1,229,660

FC-5: Detention Basins on San Juan and Trabuco Creeks

This alternative consists of detention basins on both San Juan and Trabuco Creeks, and limited lengths of floodwall of minimal height on San Juan Creek downstream of the basin, and a minimal floodwall on Trabuco Creek upstream of Del Obispo and at the Oso Creek confluence. The basins would be sited identically to FC-3 and 4. The floodwalls would be of identical design to those of FC-2 with the exception of height. The basins would be of identical construction. No excavation within the reservoir areas would be performed, and no permanent pools established in this alternative. The basins would not be capable of storing water beyond the period of floodwater storage, as no clay core was included in the design.

FC-5 would involved the installation of 6,425 meters of concrete floodwall of 0.5 to 2.0 meters in height, and 722 meters of concrete floodwall in excess of 2.0 meters in height, with 73 meters of that consisting of floodwall 3.0 meters in height, and none in excess of that figure. There would also be 428 meters of floodwall on Trabuco Creek, all of it 0.5 meters or less in height. The basin on San Juan Creek would require approximately 349,000 cubic meters of excavation, 297,000 cubic meters of structural fill utilizing on-site materials, 343,600 cubic meters of imported structural fill material, 52,000 cubic meters of common fill, 17,400 cubic meters of rip-rap protection, 3,900 cubic meters of concrete for the spillway lining, 13,300 cubic meters of excavation in the stilling basin, 2,150 cubic meters of concrete for the stilling basin lining, 120 cubic meters of concrete for the stilling basin retaining wall, 2,700 cubic meters of rip-rap protection for the stilling basin, and 127 meters of concrete 12’ x 9’ box culvert for the basin outlet. The basin on Trabuco Creek would require approximately 398,000 cubic meters of excavation, 339,500 cubic meters of structural fill utilizing on-site materials, 355,300 cubic meters of imported structural fill material, 58,400 cubic meters of common fill, 24,400 cubic meters of rip-rap protection, 2,475 cubic meters of concrete for the spillway lining, 8,050 cubic meters of excavation in the stilling basin, 1,430 cubic meters of concrete for the stilling basin lining, 120 cubic meters of concrete for the stilling basin retaining wall, 1,800 cubic meters of rip-rap protection for the stilling basin, and 110 meters of concrete 12’ x 9’ box culvert for the basin outlet.

The cost of this alternative is approximately $51,184,400, including mitigation. Real estate is estimated at $11,315,300. This alternative includes replacement of PCH, La Novia and Del Obispo bridges.

Assuming a two-year construction schedule, interest during construction (IDC) would be $3,135,000; thus increasing the economic cost of this alternative to $54,319,400. Amortization of the economic cost over 50-years at an interest rate of 6⅛ percent yields an annual cost of $3,506,500.

Alternative FC-5 would reduce equivalent annual inundation related damages by $1,356,500 along the both San Juan and Trabuco Creeks, as show in Table 31. Since stabilization is assumed to be in place, there would be no benefits to be derived from bridge failure.

Table 31 – FC-5 Detention Basins on San Juan & Trabuco Creeks Equivalent Annual Damage Reduction

(in $1000s, 2002 price level)

	Without-Project	With-Project	Damage Reduction
Non-Residential	1,304.97	812.51	492.46
Residential	1,810.27	1230.54	579.73
Emergency & Other	857.55	573.24	284.31
Total Inundation	*3,972.79*	*2,616.29*	*1,356.50*
Bridge Failure	0.00	0.00	0.00
Total Damages	**3,972.79**	**2,616.29**	**1,356.50**

National Economic Development (NED) economics for alternative FC-5 are shown in Table 32, below.

Table 32 – NED Economics Alternative FC-5

	Annual Cost & Benefits
Flood Inundation Reduction Benefits	1,356,500
Bridge Failure Reduction Benefits	0
Total Benefits	1,356,500
Economic Cost	*3,506,500*
B/C Ratio - Total Benefits	0.39
Net Benefits – Total Benefits	-2,150,000

FC-6: Channel Widening

This alternative consists of widening the channel of San Juan Creek to provide greater capacity within the channel system. The widening would extend from the Ocean upstream to some 600 meters upstream of La Novia, and upstream along Trabuco Creek approximately 650 meters upstream of Del Obispo. The side of the channel on which widening was conducted is the side on which development is less extensive, which varies along San Juan Creek, but is the east side of the channel on Trabuco. This will result in the dislocation of the minimum number of structures, although the land required is significant. The widening is approximately 20 meters additional width throughout the reaches defined. All bridges crossing the channel in this alternative would have to be lengthened by means of construction of additional "bays" on the side excavated.

FC-6 would require approximately 19,200 cubic meters of concrete demolition, 648,000 cubic meters of excavation, 78,000 cubic meters of on-site materials compaction, 118,000 cubic meters of common fill, and 34,400 cubic meters of concrete lining to a toe-down depth of 3 meters on San Juan Creek. On Trabuco Creek, FC-6 would require 5,600 cubic meters of concrete demolition, 127,000 cubic meters of excavation, 600 cubic meters of on-site materials compaction, 30,000 cubic meters of common fill, and 6,500 cubic meters of concrete lining to a toe-down depth of 3 meters.

The cost of this alternative is approximately $48,635,000, including mitigation, including real estate costs of approximately $17.7 million.

The assumption is made that existing flood control structures downstream will be capable of ensuring containment of the 100-year and lesser flood events through the period of analysis of 50 years by such means are determined appropriate, although this would only be required for one bank of the channel.

Assuming a two-year construction schedule, interest during construction (IDC) would be $2,978,900; thus increasing the economic cost of this alternative to $51,613,900. Amortization of the economic cost over 50-years at an interest rate of 6⅛ percent yields an annual cost of $3,331,900.

Alternative FC-6 would reduce equivalent annual inundation related damages by $1,618,320 along the both San Juan and Trabuco Creeks if bridge failure benefits are ignored and $6,340,410 if bridge failure benefits are included, as show in Table 33. Since stabilization could be a by-product of the channel widening process, FC-6 is presented with and without the benefits from bridge failure prevention as an economic project component.

Table 33 – FC-6 Channel Widening Equivalent Annual Damage Reduction

(in $1000s, 2002 price level)

	Without-Project	With-Project	Damage Reduction
Non-Residential	1,304.97	683.49	621.48
Residential	1,810.27	1146.47	663.80
Emergency & Other	857.55	524.51	333.04
Total Inundation	*3,972.79*	*2,354.47*	*1,618.32*
Bridge Failure	4,722.09	0.00	4,722.09
Total Damages	**8,694.88**	**2,354.47**	**6,340.41**

National Economic Development (NED) economics for alternative FC-6 are shown in Table 34, below.

Table 34 – NED Economics Alternative FC-6	
	Annual Cost & Benefits
Flood Inundation Reduction Benefits	1,618,320
Bridge Failure Reduction Benefits	4,722,090
Total Benefits	6,340,410
Economic Cost	*3,331,900*
B/C Ratio - Total Benefits	1.90
Net Benefits – Total Benefits	3,008,510

FC-7: Combination Flood Control & Stabilization

Alternative FC-7 combines the flood protection of alternative FC-2 with the stabilization offered through CS-1a and CS-2a. These elements are as described in previous sections of this report.

The cost of this alternative is approximately $20,234,500, including mitigation and real estate costs. IDC for this alternative is estimated at $1,041,300. Thus, the total economic cost of the alternative is $21,275,800.

Amortization of the economic cost over 50-years at an interest rate of 6⅛ percent yields an annual cost of $1,373,400.

Alternative FC-7 would reduce equivalent annual inundation related damages by $11,446,540 along the both San Juan and Trabuco Creeks, as show in Table 35.

Table 35 – FC-7 Combination Flood Control & Stabilization Equivalent Annual Damage Reduction

(in $1000s, 2002 price level)

	Without-Project	With-Project	Damage Reduction
Non-Residential	1,741.56	1,078.29	663.27
Residential	2,449.58	1,541.70	907.88
Emergency & Other	1,157.22	726.03	431.19
Total Inundation	*5,348.36*	*3,346.02*	*2,002.34*
Bridge Failure	9,444.20	0.00	9,444.20
Total Damages	**14,792.56**	**3,346.02**	**11,446.54**

National Economic Development (NED) economics for alternative FC-7 are shown in Table 36, below.

Table 36 – NED Economics Alternative FC-7	
	Annual Cost & Benefits
Flood Inundation Reduction Benefits	2,002.34
Bridge Failure Reduction Benefits	9,444.20
Total Benefits	11,446.54
Economic Cost	*1,373.40*
B/C Ratio - Total Benefits	8.33
Net Benefits – Total Benefits	10,073.14

ATTACHMENT 1

San Juan Creek Watershed Study
1996-1999 Flooding and Erosion Damages Summary
(In $1999)

Location	Owner	Description	Cost	Secondary Impacts
Doheny state Beach	State of California—Dept. of Parks and Recreation	Miscellaneous debris, hazardous and non-hazardous, including assorted plant material, (arundo sp.) was deposited on State Beach	$55,398	The establishment of the arundo sp. in Doheny state Beach.
Antonio Parkway at San Juan Creek	Antonio Parkway Bridge over San Juan Creek. Orange County Road Department	Bridge under construction was damaged by storm flow discharge. Partially completed work was destroyed. Damaged December 1997	$155,000	Delay in opening Antonio Parkway to public access.
From Coast Highway Bridge upstream to Camino Capistrano	San Juan Creek Channel (L01), Orange County Flood Control District	Off site lateral erosion created voids behind the channel slope paving at several locations. Damaged Winter 1996	$4,300	N/A
Upstream from Del Obispo Street (2 sites) San Juan Capistrano	Trabuco Creek Channel (L02), Orange County Flood Control District	Approximately 110 linear feet of concrete channel slope protection failed and collapsed. Damaged February 1998	$18,000	Reduced level of flood protection for surrounding community.
Upstream from Del Obispo Street (2 sites) San Juan Capistrano	Trabuco Creek Channel (L02), Orange County Flood Control District	Approximately 110 linear feet of concrete channel slope protection failed and collapsed. Damaged February 1998	$18,500	Reduced level of protection for surrounding community.
Downstream Del Obispo at City-owned pedestrian bridge crossing.	Trabuco Creek Channel (L02), Orange County Flood Control District	Concrete channel slope paving failed and collapsed at this site thereby threatening the city's bridge. The City relocated the bridge to a new location after the storm flows receded. Damaged December 1997	$39,300	Inaccessibility of city-owned bridge.
Approximately 6,000 linear feet from Stonehill Drive, San Juan Capistrano	San Juan Creek Channel (L01) Orange County Flood Control District	Approximately 505 linear feet of concrete channel slope protection failed and collapsed. Damaged February 1998	$91,900	Reduced level of flood protection for surrounding community.
Approximately 6,000 linear feet upstream from Stonehill Drive, San Juan Capistrano	San Juan Creek Channel (L01) Orange County Flood Control District	Approximately 505 linear feet of concrete channel slope protection failed and collapsed. Damaged February 1998	$515,000	Reduced level of flood protection for surrounding community.
Upstream from the I-5 Freeway (approximately 1000 feet)	Trabuco Creek Channel (L02) Orange County Flood Control District	Storm flows damaged pile driven slope protection fencing. Trees and general storm debris became caught upon the damaged fence. This debris then diverted flows against adjacent slopes. Damaged February 1998	$16,900	Damage to adjacent private property
Downstream from Camino Capistrano (Approximately 500 feet)	Trabuco Creek Channel (L02) Orange County Flood Control District	Storm debris diverting creek flow against levee embankment. Damaged Winter of 1996	$11,500	N/A

Location	Owner	Description	Cost	Secondary Impacts
Downstream from Del Obispo Street (2 sites) San Juan Capistrano	Trabuco Creek Channel (L02) Orange County Flood Control District	Approximately 230 linear feet of concrete channel slop lining failed and collapsed. Damaged December 1997	$56,700	Reduced level of flood protection for surrounding community.
Downstream from Del Obispo Street (2 sites) San Juan Capistrano	Trabuco Creek Channel (L02) Orange County Flood Control District	Approximately 230 linear feet of concrete channel slope lining failed and collapsed. Damaged December 1997	$246,900	Reduced level of flood protection for surrounding community.
Downstream from Del Obispo Street (3 sites) San Juan Capistrano	Trabuco Creek Channel (L02) Orange County Flood Control District	Approximately 310 linear feet of concrete channel slope paving failed and collapsed. Damaged February 1998	$62,400	Reduced level of flood protection for surrounding community.
Downstream from Del Obispo Street (3 sites) San Juan Capistrano	Trabuco Creek Channel (L02) Orange County Flood Control District	Approximately 310 linear feet of concrete channel slope paving failed and collapsed. Damaged February 1998	$335,300	Reduced level of flood protection for surrounding community.
Aliso Creek near Alicia Parkway	Moulton Niguel Water District	March 1998 storms caused bank erosion and sewer pipeline failure along the bank of the creek.	$63,500	Entire length of Aliso Creek from Alicia Parkway to the ocean is very unstable. The stream bead is down cutting in certain areas and the bank is eroding.
Trabuco Creek at AT&SF Railroad Bridge	Moulton Niguel Water District; Santa Margarita Water District	March 1998 storms washed out natural creek bottom and broke a sewer line and an effluent transmission main. Temporary pumping was needed to bypass flows. Permanent fix included sheet piling for added protection to pipelines.	$1,550,900	Need a permanent solution for bank and streambed stability.
Oso Creek along Camino Capistrano s/o of Avery Parkway	Moulton Niguel Water District; Santa Margarita Water District	El Nino storms of March 1998 caused slide that broke sewer line and caused sewage to flow into Oso Creek. Temporary pumps had to be installed to bypass sewage flow; pipe had to be replaced.	$391,500	All affected agencies are investigating a long-term solution to stabilizing the banks of Oso Creek.
Fallbrook St. at Aliso Creek—Upper reach	El Toro Water District	February 22, 1996 storm eroded side slopes of creek exposing 8" Potable water line	$30,000	Loss of Potable Water to residential community.
Oso Creek 4,000 feet North of Oso Creek & Trabuco Creek	Capistrano Valley Water District	1997-1998 rain season, El Nino, continued erosion to a point where a lens failure occurred. This failure impacted the Amtrak Railway, CVWD's 24" Line, a 30" Gas line, a sewer effluent line, and the I-5.	$51,500	CVWD has spent staff time valued at $10,000 NOTE: these figures don't include cost of repair to railroad, Camino Capistrano, I-5, 30" Gas Line, sewer line, or non domestic line

Location	Owner	Description	Cost	Secondary Impacts
Hickey Creek at Shady Land and Sycamore Canyon Drive	Trabuco Canyon Water District	During February 1998 storms, the creek eroded and exposed 6" AC pipeline crossing creek. Cobble rock pushed by rapidly moving streamflow impacted exposed pipeline, creating a 4" hole on upstream side. Pipe bedding was removed and replaced by cobble pushed from upstream sources by streamflow.	$15,400	Entire system in area of break was shut down in an attempt to locate damage. Customers without water for a full day.
34152 Del Obispo, Dana Point	South East Regional Reclamation Authority (SERRA)	A storm event on 1/28/80 and 1/29/80 pronounced runoff into the drainage areas to the north and northeast of the SERRA treatment facility in Dana Point. Normally, this runoff would have been carried via a system of culverts and ditches to San Juan Creek. Because some of the drainage system outlets to the creek were plugged, the runoff ponded at the facility's northern levee, forming a lake estimated to be 18.25 feet deep. On 1/29/80, the ponded runoff overtopped the levee, continuing until the levee was breached, causing the water to pour through the opening into the SERRA facility. The waters caused extensive damage to buildings and equipment and rendered the plant useless for treating wastewater until the damage was repaired.	$1,602,000	Untreated sewage from the facility impacted the outlet of San Juan Creek to the Pacific Ocean and subsequently the surrounding beaches.

San Juan Creek Watershed Study
Historical Flooding and Erosion Damages
Reported in the 1997 Reconnaissance Report

Historical Flood Damages, Erosion Damages, and Damages from Unknown Factors 1999 Dollars			
Stream	Year	Damage	Type of Damage
San Juan Creek	1937	$23,080,000	Agriculture, buildings, highways, utilities
	1938	NA	Water lines, bridges, loss of life
	1969	$7,049,000	Recreational inundation, bridges, land loss
	1969	$7,475,000	Erosion of flood control facilities
	1993	$764,000	Erosion of sewer lines, flood control facilities
	1995	$1,408,000	Erosion of land, bridges, sewer line
	1995	$936,000	Recreational inundation
Trabuco Creek	1969	$4,834,000	Bridges, unknown factors
	1993	$930,000	Erosion damage to stream bank, water and sewer lines
	1995	$241,000	Erosion of stream bank and flood control channels
	1995	$111,000	Bike path damage
Oso Creek	1969	$233,000	Agricultural
	1983	$847,000	Sewer line erosion
	1993	$3,260,000	Sewer line, bank, flood control structure erosion
	1995	$981,000	Flood control channel infrastructure erosion

ATTACHMENT 2

REACH DELINEATION PLATES

San Juan Creek Overflow – Sheet 1
San Juan Creek Overflow – Sheet 2
San Juan Creek Overflow – Sheet 3
Oso Creek Overflow – Sheet 2
Trabuco Creek Overflow – Sheet 1
Trabuco Creek Overflow – Sheet 2

ATTACHMENT 3

RECREATION ANALYSIS FOR SAN JUAN CREEK WATERSHED

1.0 BASELINE RECREATION ANALYSIS

The San Juan Creek Watershed is a popular Orange County recreation destination, offering a variety of recreation opportunities including, camping, hiking, walking, biking, mountain biking and nature appreciation. The watershed offers unique natural recreation opportunities in the increasingly developed region.

RECREATION MARKET AREA:

For this baseline economic assessment's study of recreation opportunities and impacts from watershed instability and flooding, the recreation market area is assumed to be Orange County, California. This assumption is based upon discussion with local experts from the Orange County Department of Harbors, Beaches and Parks. The San Juan Creek Watershed offers unique recreation experiences that are enjoyed by residents throughout the County. Although watershed recreation opportunities do attract some visitors from outside Orange County, for example from Riverside and San Bernardino Counties, their numbers are small enough relative to Orange County visitors to make their effect on these recreation analyses insignificant. Growth in attendance rates is based upon growth in the population rate for the market area. This assumption was determined reasonable by the Orange County Department of Harbors, Beaches and Parks because the majority of growth in Orange County will take place in the relatively less developed southern portion of the County. The close proximity of the watershed to these growth areas will invite recreation visitors.

WATERSHED RECREATION RESOURCES:

A variety of parks offering recreation opportunities exists throughout the San Juan Creek Watershed. Major parks are listed in Table 1.1 followed by a description of recreation opportunities offered at each.

TABLE 1.1 – Recreation Facilities within San Juan Creek Watershed	
Park	**Water Course**
Cleveland National Forest	Trabuco, San Juan
O'Neill Regional Park	Trabuco
Coto de Caza Golf & Racquet Club	Canada Gobernadora
Del Obispo Park	Oso
Descanso Park	Oso
Cook Park	Oso
San Juan Hills Golf Course	Oso
Caspers Wilderness Park	Oso
Audubon Starr Ranch Sanctuary	Bell Canyon
Riley Wilderness Park	Near Canada Gobernadora
Doheny State Beach	San Juan Creek

RECREATION FACILITIES

Cleveland National Forest. Wilderness backpacking, hiking, and horseback riding are some of the recreational pursuits available in Cleveland National Forest.

Doheny State Beach. Doheny State Beach is located in the City of Dana Point, with access from Pacific Coast Highway. The beach is managed by the State of California Department of Parks and Recreation, Orange Coast District. The beach park is 62.02 acres and has 6,569 lineal feet of ocean frontage. The total beach area is 2,701,591 square feet. There are 1,108 parking spaces plus 110 developed campsites without hook-ups. Recreation activities offered at Doheny State Beach include camping, surfing, picnicking, sunbathing, walking and volleyball.

Caspers Wilderness Park is a 7,600-acre park surrounding Oso Creek in the western coastal Santa Ana Mountains. It is accessed from the Ortega Highway. The park's scenic natural resources are its principal attraction including specimen groves of native Coastal Live Oak, magnificent stands of California Sycamore and an abundance of wildlife. These areas are accentuated by seasonal wildflower displays and running streams. The park offers camping, picnicking, hiking, horseback riding, mountain biking, photography, nature study and astronomy. The park has campgrounds, restrooms and showers, picnic areas, equestrian camping, hiking and equestrian trails and a visitor/nature center.

O'Neill Wilderness Park. The O'Neill Wilderness Park includes 3,100 acres surrounding Trabuco Creek in beautiful Trabuco and Live Oak Canyons. It is accessed from Live Oak

Canyon Road. The park is heavily wooded with coast live oak and sycamore trees. The hillsides surrounding the park are filled with cactus, wild buckwheat, sagebrush and chaparral of scrub oak, buckthorn and mountain mahogany. A significant park resource is the Arroyo Trabuco, a 935-acre pristine wilderness area. O'Neill park offers overnight camping and day/picnic use activities. The picnic area provides for single and group uses and contains picnic tables, barbeques, a large turf area, horseshoe pits and playground equipment. 3.5 acres are available for RV camping groups. The park also offers an equestrian campground, an arena and 20 miles of riding trails.

Riley Wilderness Park. Riley Wilderness Park is a 475-acre wilderness park designated a wildlife and plant sanctuary. It is located east of Mission Viejo in the community of Coto de Caza. The park is access at the corner of Oso Parkway and Coto de Caza Drive. The park terrain includes large open grassy slopes with deep Oak and Sycamore groves surrounded by Coastal Sage Scrub habitat. The park contains at least 16 Heritage Oak Trees and a small seasonal pond.

Coto de Caza Golf & Racquet Club is a commercially operated course located in the County unincorporated community of Coto de Caza. The Canada Gobernadora watercourse runs though the center of the course.

Del Obispo Park is a community park located in Dana Point.

Descanso Park is a community park located in San Juan Capistrano.

Cook Park is a community park located in San Juan Capistrano.

San Juan Hills Golf Course is a private golf course in Coto de Caza.

Audubon Starr Ranch Sanctuary is a private wildlife sanctuary operated by National Audubon Society in the Bell Canyon watershed.

WITHOUT-PROJECT RECREATION USE ANALYSIS:

Of the parks in the San Juan Creek Watershed, detailed analysis was focused on those parks that are significantly impacted by flooding and/or creek instability. These parks include the O'Neill Regional Park, Caspers Wilderness Park and the Coto de Caza Golf and Racquet Club. The commercial golf course was analyzed in the flood inundation analyses described in section 5 of this report. The lost revenues identified at the course provide an indication of the dollar value club customers were willing to pay for the recreation experience offered.

O'NEILL REGIONAL PARK RECREATION ANALYSIS

Recreational facilities within O'Neill Regional Park are managed by the Orange County Department of Harbors, Beaches, & Parks.

Table 1.2 shows the annual attendance at the park from 1992 through 1998. Park rangers have no set rules on how to count the number of people in the park. The park's Chief Ranger estimates park attendance monthly. The park has only one principal vehicular entrance. While parking is limited, park users may enter the park by bike or by foot from the surrounding residential and commercial developments and trails. Special events have been held at the park with 2,000 people in attendance.

Table 1.2
Annual Attendance O'Neill Regional Park

Year	Annual Attendance
1992	60,126
1993	88,212
1994	115,210
1995	129,277
1996	90,943
1997	247,447
1998	230,193

According to Orange County Department of Harbors, Beaches, & Parks, the park has lost parkland for recreational use due to the degradation of stream banks. In addition, roads in the park have been damaged by streambed degradation and bank erosion.

Monthly attendance estimates for the park in 1998 indicate an average monthly attendance of 230,193. The attendance in 1997 was 247,447. Both these attendance figures are well above the average annual attendance of 90,943 in the 1996. The upturn in park attendance estimates may be based on a combination of circumstances.

The value of existing and future without project general recreation at O'Neill Regional Park was calculated using a unit day value and annual visitation estimates for years 1999-2048. Table 1.3 shows the judgment factors and point values that were used to calculate the unit day value for general recreation.

The recreation experience was calculated to be 26 on scale of 0 to 30, because the park offers a variety of general activities including: family, equestrian and group camping; horse back riding; nature study; hiking; bicycling; nature center programs; and walking. The calculation for the availability of opportunity at the park was determined to be 1 on scale of 0 to 18, because several other parks with similar facilities are within one hour of driving time (Riley Wilderness Park, Whiting Ranch and Cleveland National Forest), however few exist within 30 minutes of the park. The carrying capacity for O'Neill Regional Park was calculated to be 7 on scale of 0 to 14, because the park offers adequate facilities for camping, hiking and bicycling activities. The calculation for the accessibility to the park is 13 on scale of 0 to 18, because of limited road access to large areas within the park, but the park does has adequate access from Live Oak Canyon Road. The roads within the park are mostly paved, with dirt roads in the Arroyo Trabuco. The environmental value at the park was calculated to be 11 on a scale of 0 to 20, because the park offers a pristine environment for people to explore nature. The park has areas that offer excellent opportunities to explore nature.

Table 1.3
Calculations of the Unit Day Value for General Recreation
O'Neill Regional Park

Recreation Criteria	**Range of Values**	**Judgment Value**
Recreation Experience	0 to 30	26
Availability of Opportunity	0 to 18	1
Carrying Capacity	0 to 14	9
Accessibility	0 to 18	11
Environmental	0 to 20	11
	Total	58
	Conversion of Points to Dollar Values	$6.07

Table 1.3 provides a summary of the unit day value ratings for O'Neill Regional Park. The ratings total to 58 points, which correspond to a dollar value of $6.07 based upon the Economic Guidance Memorandum Revised Table 6-28 (FY 99) Conversion of Points to Dollar Values.

To calculate the expected annual recreation benefits of O'Neill Regional Park, attendance projections were calculated for years 1999 through 2048. The 1999 attendance projection was derived by averaging the annual attendance from the most recent five years that had complete

attendance records (1994-1998). This five-year average is realistic because it incorporates years with different weather patterns. This 1999 projection was then increased annually by the annual rate of population growth in the recreation demand area through the end of the fifty-year period of analysis (2048).

The attendance projections were then multiplied by the unit day value of $6.07 to arrive at a total recreation benefit for each year in the period of analysis. Each year's benefit was converted to its present value, and the stream of present values summed and converted to an average annual equivalent benefit of $2,036,412. Table 1.4 provides the summary results of this analysis.

Table 1.4
O'Neill Regional Park
Recreation Analysis Summary Results

Period of Analysis:	50 years
Present Value of Recreation Benefit Stream:	$ 27,665,977
Average Annual Equivalent Benefit:	$ 2,036,412

CASPERS WILDERNESS PARK RECREATION ANALYSIS

Table 1.5 shows the annual visitation at Caspers Wilderness Park from 1991 to 1998. Recreational facilities within Caspers Wilderness Park are managed by the Orange County Department of Harbors, Beaches, & Parks. The park's Supervising Park Ranger estimates park attendance monthly. The park has only one principal vehicular entrance from the Ortega Highway. In addition, it is possible for park users to enter the park by bike or by foot from the surrounding developments and trails. Special events have been held at the park with 2,000 people in attendance.

Caspers Wilderness Park has operated under extraordinary procedures since 1986 when two children, in separate incidents, were attacked by a mountain lion in the park. From 1986 to 1995, park use by minors was restricted to the San Juan Capistrano Hot Springs Lease Area (now closed) and to picnic areas near the park entrance. Use of campgrounds and hiking trails was restricted to adults with a minimum of two persons per party.

In 1995, Caspers Park was re-opened to all visitors, including minors on a limited basis. However, minors were prohibited from using park trails, except for ranger- or docent-led tours. Finally, in 1997, these extraordinary operational practices were eliminated to establish consistency of Caspers with other County wilderness parks.

Table 1.5 Annual Attendance Caspers Wilderness Park	
Year	Annual Visitation
1996	45,506
1997	55,254
1998	61,105

According to Orange County Department of Harbors, Beaches, & Parks, access to the park has been lost to the park for recreational use due to the severe downcutting of trails, and deposition of silt in campgrounds and on park trails and access roads..

Complete recent annual attendance figures for Caspers Wilderness Park Monthly attendance estimates for the park in over the past three years indicate an average monthly attendance of 4,496. However, this does not reflect the complete closure of the park for several months during the 1997-98 El Nino storm season. In fact, several park employees, with 15 years of experience each at the park, have indicated that the summer of 1998 was the busiest summer ever at the park. An upturn in park attendance is expected to continue to grow due to a combination of circumstances including; the park re-opening to minors, and the rapid growth of urban development in southeastern Orange County.

The value of existing and future without project general recreation at Caspers Wilderness Park was calculated using a user day value and annual visitation estimates for years 1999-2048. Table 1.6 shows the judgment factors and point values that were used to calculate the unit day value for general recreation.

The recreation experience was calculated to be 26 on scale of 0 to 30, because the park offers a variety of general activities including: family, equestrian and group camping; horse back riding; nature study; hiking; bicycling; nature center programs; and walking. The calculation for the availability of opportunity at the park was determined to be 1 on scale of 0 to 18, because there are several other parks with similar facilities within one hour of driving time (Riley Wilderness Park, Whiting Ranch and Cleveland National Forest), but few within a 30-minute drive. Caspers Park's carrying capacity was calculated to be 7 on scale of 0 to 14, because the park offers adequate facilities for camping, hiking and bicycling activities. The calculation for the accessibility to the park is 7 on scale of 0 to 18, because of limited access to large areas within the park, and fair vehicular park access from Ortega Highway. The few roads within the park are mostly paved. The environmental value at the park was calculated to be 15 on a scale of 0 to 20, because the park offers a pristine environment of very high aesthetic value for people to explore nature. The park has areas that offer excellent opportunities to explore nature.

Table 1.6 Calculations of the Unit Day Value for General Recreation Caspers Wilderness Park		
Recreation Criteria	**Range of Values**	**Judgment Value**
Recreation Experience	0 to 30	26
Availability of Opportunity	0 to 18	1
Carrying Capacity	0 to 14	6
Accessibility	0 to 18	7
Environmental	0 to 20	15
	Total	55
	Conversion of Points to Dollar Values	$5.91

Table 1.3 provides a summary of the unit day value ratings for O'Neill Regional Park. The ratings total to 55 points, which correspond to a dollar value of $5.91 based upon the Economic Guidance Memorandum Revised Table 6-28 (FY 99) Conversion of Points to Dollar Values.

To calculate the expected annual recreation benefits of Caspers Wilderness Park, attendance projections were calculated for years 1999 through 2048. The 1999 attendance projection was derived by averaging the annual attendance from the most recent three years that had complete attendance records (1996-1998). This three-year average is realistic because it incorporates years with different weather patterns. This 1999 projection was then increased annually by the annual rate of population growth in the recreation demand area through the end of the fifty-year period of analysis (2048).

The attendance projections were then multiplied by the unit day value of $5.91 to arrive at a total recreation benefit for each year in the period of analysis. Each year's benefit was converted to its present value, and the stream of present values summed and converted to an average annual equivalent benefit of $819,199. Table 1.7 provides the summary results of this analysis.

Table 1.7 Caspers Wilderness Park Recreation Analysis Summary Results	
Period of Analysis:	50 years
Present Value of Recreation Benefit Stream:	$11,129,341
Average Annual Equivalent Benefit:	$ 819,199

DOHENY STATE BEACH RECREATION ANALYSIS

Doheny State Beach is managed by the State of California Department of Parks and Recreation Orange Coast District.

Table 1.8 Annual Attendance Doheny State Beach	
Year	Annual Attendance
1990	590,469
1991	433,219
1992	452,935
1993	507,500
1994	648,724
1995	670,206
1996	866,200
1997	777,131
1998	1,112,876

The average annual attendance in the most recent three years totals 918,735.

An analysis of the yearly parking capacity at the beach assumed each vehicle will have 3.8 people (based on State of California Department of Parks and Recreation Study for Doheny State Beach). The expected turnover rate for one parking space was expected to be 3 per day, based on the recreation methodology from the Carlsbad Feasibility Study. If three vehicles use the day use parking spaces per day, the annual capacity of the parking lot for day-use is 4,610,388 visitors. If the average stay in the campground is 2 days, the 110 campsites would generate an additional 76,285 park visitors per year. The total capacity for day-use and camping would be 4,686,673 visitors. Visitors also walk, skate, jog or bicycle to Doheny Beach.

The value of existing and future without project general recreation at Doheny State Beach was calculated using a unit day value and annual visitation estimates for years 1999-2048.

Table 1.9 shows the judgment factors and point values that were used to calculate the unit day value for general recreation.

The recreation experience was calculated to be 17 on scale of 0 to 30, because the park offers a variety of general activities including: surfing, picnicking, sunbathing, volleyball and walking. In addition, it provides high quality RV and tent camping opportunities. The calculation for the availability of opportunity at the park was determined to be 1 on a scale of 0 to 18, because several other beaches with similar facilities are within one hour of driving time (Huntington State

Beach, San Clemente State Beach and San Onofre State Beach). The carrying capacity for Doheny Beach was calculated to be 8 on scale of 0 to 14, because the beach offers adequate facilities for beach and camping activities. The calculation for the accessibility to the park is 15 on scale of 0 to 18, because there is good access to Doheny State Beach from Pacific Coast Highway. There are good roads within the beach park. The environmental value at the beach was calculated to be 11 on a scale of 0 to 20, because the park offers beautiful views of the Pacific Ocean and the coastline from Dana Point Harbor to San Clemente.

Table 1.9
Calculations of the Unit Day Value for General Recreation
Doheny State Beach

Recreation Criteria	**Range of Values**	**Judgment Value**
Recreation Experience	0 to 30	17
Availability of Opportunity	0 to 18	1
Carrying Capacity	0 to 14	8
Accessibility	0 to 18	15
Environmental	0 to 20	11
	Total	52
	Conversion of Points to Dollar Values	$5.76

Table 1.9 provides a summary of the unit day value ratings for Doheny State Beach total to 52 points, which correspond to a dollar value of $5.76 based upon the Economic Guidance Memorandum Revised Table 6-28 (FY 99) Conversion of Points to Dollar Values.

To calculate the expected annual recreation benefits of Doheny State Beach attendance projections were calculated for years 1999 through 2048. The 1999 attendance projection was derived by averaging the annual attendance from the most recent five years that had complete attendance records (1994-1998). This five-year average is realistic because it incorporates years with different weather patterns. This 1999 projection was then increased annually by the annual rate of population growth in the recreation demand area through the end of the fifty-year period of analysis (2048).

The attendance projections were then multiplied by the unit day value of $5.70 to arrive at a total recreation benefit for each year in the period of analysis. Each year's benefit was converted to its present value, and the stream of present values summed and converted to an average annual equivalent benefit of $7,603,404. Table 1.10 provides the summary results of this analysis.

Table 1.10 Doheny State Beach - Recreation Analysis Summary Results	
Period of Analysis:	50 years
Present Value of Recreation Benefit Stream:	$103,297,151
Average Annual Equivalent Benefit:	$ 7,603,404