APPENDIX H

Transportation Impact Study

BUENA VISTA LAGOON ENHANCEMENT PROJECT

TRANSPORTATION IMPACT STUDY

Prepared for:

San Diego Association of Governments

Prepared by:

VRPA Technologies, Inc.
9520 Padgett Street, Suite 213
San Diego, CA 92126

In Association With:

AECOM

September 18, 2014

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

TRANSPORTATION IMPACT STUDY

Buena Vista Lagoon Enhancement Project

SAN DIEGO COUNTY, CALIFORNIA

This Transportation Impact Study (TIS) has been prepared for the purpose of analyzing transportation impacts expected due to the development of the Buena Vista Lagoon Enhancement Project (BVLEP) located in the Cities of Oceanside and Carlsbad in San Diego County.

1.1 DESCRIPTION OF THE PROJECT

The purpose of the proposed project is to enhance the biological and hydrological functions of the Buena Vista Lagoon to address increased sedimentation and invasive vegetation encroachment, as well as resulting declining coastal biodiversity, degrading water quality, water circulation restriction, and increased vector concerns. It is proposed to achieve these objectives through the following:

- Enhancement in all basins
- Vegetation removal to increase circulation/decrease vectors
- Infrastructure improvements where appropriate to increase circulation/prevent increases to flooding
- Improvements to public access by construction of recreational amenities, where possible, including a public boardwalk and fishing access
- Adaptive management strategies to maintain enhanced functions of the lagoon into the future

Four project alternatives are under consideration:

- Freshwater Alternative
- Saltwater Alternative
- Hybrid Alternative A
- Hybrid Alternative B

Figure 1-1 shows the project vicinity and Figure 1-2 shows the study area for transportation analysis.

1.2 METHODOLOGY

Project transportation impacts were analyzed according to regional guidelines for the San Diego region (SANTEC/ITE Guidelines for the Preparation of Traffic Impact Studies in the San Diego Region, March 2, 2000). The methodology can be summarized as follows:

- Determine the project trip generation (the number of daily and peak hour trips the project is expected to add to the roadway network)
- Determine whether a traffic impact analysis is necessary
- Determine the study area for detailed analysis of traffic impacts (if necessary)
- Analyze traffic impacts and recommend mitigation measures (if necessary)

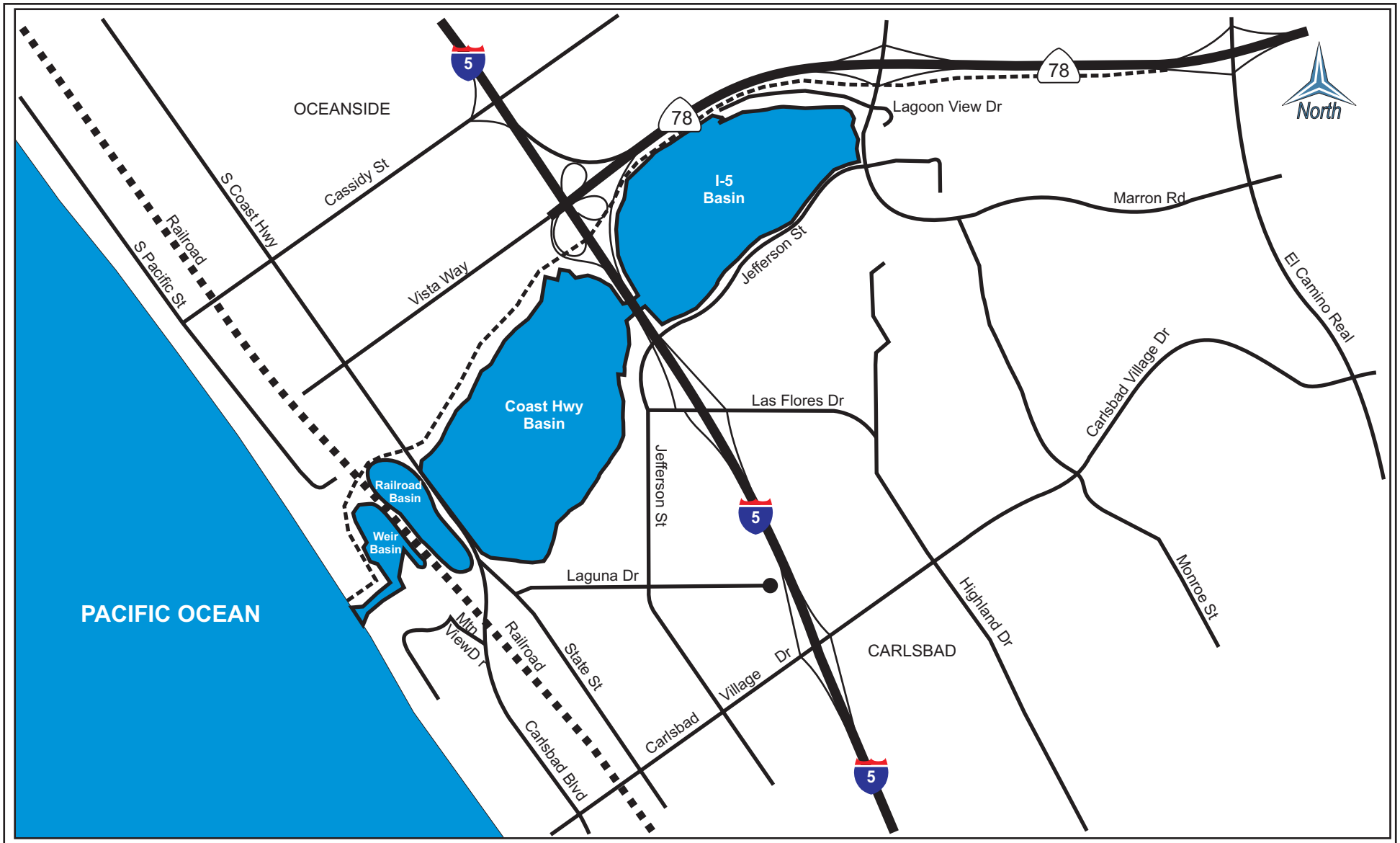
Transit, bicycle, and pedestrian impacts of the project were also analyzed, but the methodology for this type of analysis is not specified in the guidelines and impacts were analyzed using accepted transportation engineering principles.

Buena Vista Lagoon Enhancement Project
Project Vicinity

Figure
1-1

Buena Vista Lagoon Enhancement Project
Project Study Area

Figure 1-2



2.0 EXISTING CONDITIONS

The project is located in the Cities of Oceanside and Carlsbad in San Diego County. The analysis of traffic impacts was focused on three areas where construction staging areas are proposed to be located and access is proposed to be provided from the local roadway system. Existing conditions for each of these areas is described below.

2.1 WEIR BASIN

The Weir Basin is the westernmost of the four basins shown in Figure 1-2. Construction staging is proposed to occur at the south side of the basin. Access will be provided via Mountain View Drive, Ocean Street, Garfield Drive and Carlsbad Boulevard. In the vicinity of the project site, Mountain View Drive and Ocean Street are one-lane, one-way local streets, Garfield Drive is a two-lane, two-way arterial, and Carlsbad Boulevard is a divided arterial with one lane of traffic in each direction.

2.2 RAILROAD AND COAST HIGHWAY BASINS

The Railroad and Coast Highway Basins are the middle two of the four basins shown in Figure 1-2. Construction staging for both of these basins is proposed to occur along Carlsbad Boulevard/South Coast Highway north of the existing Carlsbad Boulevard Bridge. This roadway is named Carlsbad Boulevard in Carlsbad and South Coast Highway in Oceanside and the proposed staging area is near the boundary between the two cities. In the vicinity of the project site, Carlsbad Boulevard is a two-lane arterial street with bicycle lanes in each direction and a multi-use bicycle/pedestrian pathway provided west of the roadway. Farther to the north in Oceanside, South Coast Highway transitions into a four-lane, undivided arterial.

2.3 I-5 BASIN

The I-5 Basin is the easternmost of the four basins shown in Figure 1-2. Construction staging is proposed to occur at the south side of the basin along Jefferson Street in Carlsbad. Access will be provided via Jefferson Street toward SR 78 to the north and I-5 to the south and west. In the vicinity of the project site, Jefferson Street is a two-lane arterial with bicycle lanes in each direction of traffic.

2.4 EXISTING TRAFFIC CONDITIONS

Existing traffic conditions for 2014 are documented in Figure 2-1 and Table 2-1. The methodology for conducting this analysis can be described as follows:

- Existing daily traffic counts were obtained from the websites of Caltrans and SANDAG. Traffic counts were generally available only for years prior to 2014 and counts from previous years were updated to 2014 conditions using a growth factor of 2% per year. Traffic counts for some study area roadways were not available on the Caltrans and SANDAG websites and were estimated by VRPA Technologies.

- Capacity analysis was conducted using information contained in the SANTEC/ITE Guidelines mentioned in Chapter 1.

In traffic engineering methodology, roadway operations are rated in terms of level of service that range from level of service A (light traffic, minimal delays) to level of service F (traffic congestion, substantial delays). Level of service D is the typical standard for urban and suburban design. The results shown in Table 2-1 indicate that several study area roadways operate at level of service E or F indicating some level of traffic congestion, at least during the peak hours. These roadways include Interstate 5, State Route 78, Vista Way, South Coast Highway, and Carlsbad Boulevard. Other study area roadways were shown to be operating at level of service ranging from level of service A to level of service d, indicating that they would meet the typical design standards for traffic capacity.

Buena Vista Lagoon Enhancement Project
Existing (2014) Average Daily Traffic

Figure 2-1

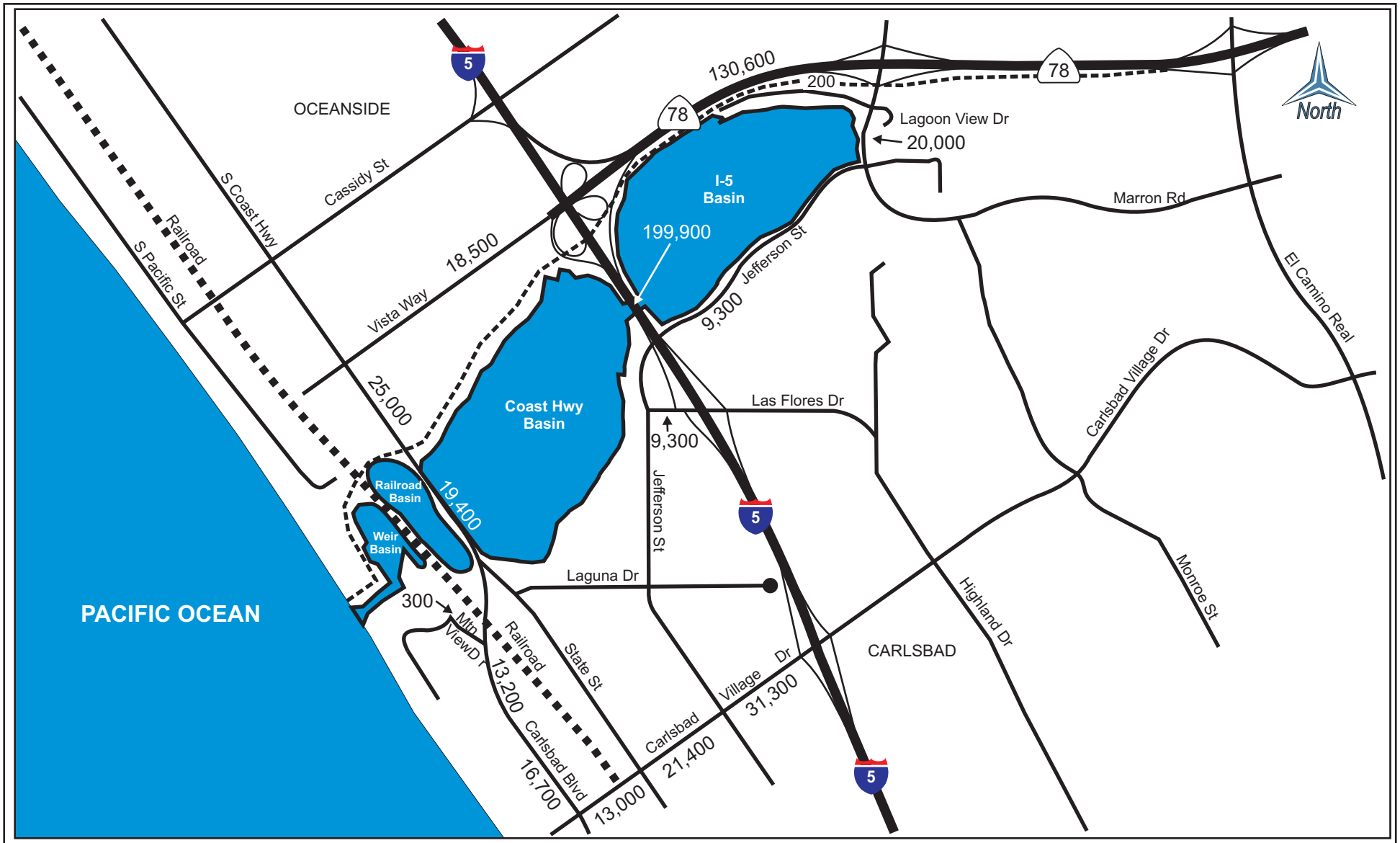


Table 2-1
Existing (2014) Street Segment Capacity Analysis

ROADWAY	LOCATION	FUNCTIONAL CLASSIFICATION	DAILY CAPACITY AT LOS E	EXISTING (2014 CONDITIONS) VOLUME	LOS	V/C
CARLSBAD VILLAGE DRIVE	Jefferson Street to I-5 SB Ramps	4-Lane Secondary Arterial/Collector	40,000	13,000	A	0.33
	Jefferson Street to I-5 SB Ramps	4-Lane Secondary Arterial/Collector	40,000	21,400	C	0.54
	Jefferson Street to I-5 SB Ramps	4-Lane Major Arterial	40,000	31,300	D	0.78
INTERSTATE 5	SR 78 to Las Flores Dr	8-Lane Freeway	150,000	199,900	F	1.33
JEFFERSON STREET	Jefferson Street to I-5 SB Ramps	4-Lane Major Arterial	40,000	20,000	B	0.50
	Jefferson Street to I-5 SB Ramps	2-Lane Collector	15,000	9,300	C	0.62
LAGOON VIEW DRIVE	West of Jefferson Street	Local	2200 (1)	200 (2)	C	0.10
LAS FLORES DRIVE	Jefferson Street to I-5 SB Ramps	2-Lane Collector	15,000	9,400	C	0.63
MOUNTAIN VIEW DRIVE	Ocean Street to Carlsbad Blvd	Local	1100 (1)	300 (2)	C	0.27
SOUTH COAST HWY/ CARLSBAD BOULEVARD	Jefferson Street to I-5 SB Ramps	2-Lane Collector	15,000	25,000	F	1.67
	Jefferson Street to I-5 SB Ramps	2-Lane Collector	15,000	19,400	F	1.29
	Jefferson Street to I-5 SB Ramps	2-Lane Collector	15,000	13,200	E	0.88
	Jefferson Street to I-5 SB Ramps	4-Lane Secondary Arterial/Collector	30,000	16,700	C	0.56
STATE ROUTE 78	East of I-5	6-Lane Freeway	120,000	130,600	F	1.09
VISTA WAY	South Coast Hwy to I-5	2-Lane Collector	15,000	18,500	F	1.23

Note: Volume = Average Daily Traffic
LOS = Level of Service
V/C = Volume to Capacity Ratio
(1) Daily Capacity Estimated
(2) Existing Volume Estimated

3.0 IMPACTS

3.1 TRIP GENERATION

Project trip generation was calculated separately for each of the alternatives (Freshwater Alternative, Saltwater Alternative, Hybrid Alternative A, and Hybrid Alternative B) and each of the staging areas (Weir Basin, Railroad/Coast Highway Basins, and I-5 Basin). The result is twelve different trip generation calculations, as shown in Tables 3-1 through 3-12. The trip generation was based on project construction calculations, as shown in Appendix A.

3.2 PROJECT TRAFFIC

Figures 3-1 through 3-4 show project daily and peak hour traffic for each of the alternatives and staging areas.

3.3 BRIDGE CONSTRUCTION IMPACTS

For three of the four alternatives under consideration (Saltwater Alternative, Hybrid Alternative A, and Hybrid Alternative B), it will be necessary to narrow the roadway width of Carlsbad Boulevard in order to construct a new bridge over the waterway that connects the Railroad Basin and the Coast Highway Basin. During construction, it is proposed that the roadway that will be provided will include two fourteen-foot travel lanes, one lane in each direction for vehicle and bicycle traffic. Pedestrian travel will be prohibited and the existing multi-use pathway located on the west side of Carlsbad Boulevard will be closed. It is estimated that this closure related to construction will last for a period of nine months.

3.4 TRAFFIC IMPACTS

As described in Chapter 1, the SANTEC/ITE regional guidelines for traffic impact studies were used as the basis for determining traffic impacts. The guidelines specify that detailed traffic analysis be conducted for any roadway segments or intersections where a project will add 50 or more trips in the peak hour in either direction of travel. The guidelines are not specific regarding whether the threshold would change depending on whether the trips to be generated would be auto trips or truck trips. However, it is common transportation engineering practice whenever truck traffic is a substantial portion of project traffic to use passenger car equivalents (PCE's) to estimate the impacts of combined auto and truck traffic. For the purposes of this study, each truck was considered to be the equivalent of two passenger cars. Based on the calculations shown in Tables 3-1 through 3-12, there were no cases where the project would add 50 or more vehicles to the roadway network in either direction of traffic. Therefore, additional traffic analysis was not considered to be necessary.

3.5 TRANSIT IMPACTS

NCTD operates bus service along Carlsbad Boulevard/South Coast Highway through the study area via Route 101. Project construction is not expected to affect bus travel times or existing bus stops and the project is not considered to have any significant transit impacts.

3.6 BICYCLE IMPACTS

The construction of the Carlsbad Boulevard bridge will affect recreational and commuter bicyclists in different ways. For recreational bicyclists, the multi-use pathway will be closed temporarily during bridge construction and it is assumed that bicyclists who do not wish to share the roadway with vehicles will choose other locations for recreational travel. For commuter bicyclists, access will still be provided, but it will be less convenient because bicyclists will be sharing a fourteen-foot lane with vehicles rather than traveling in a separate lane as is possible with the existing roadway.

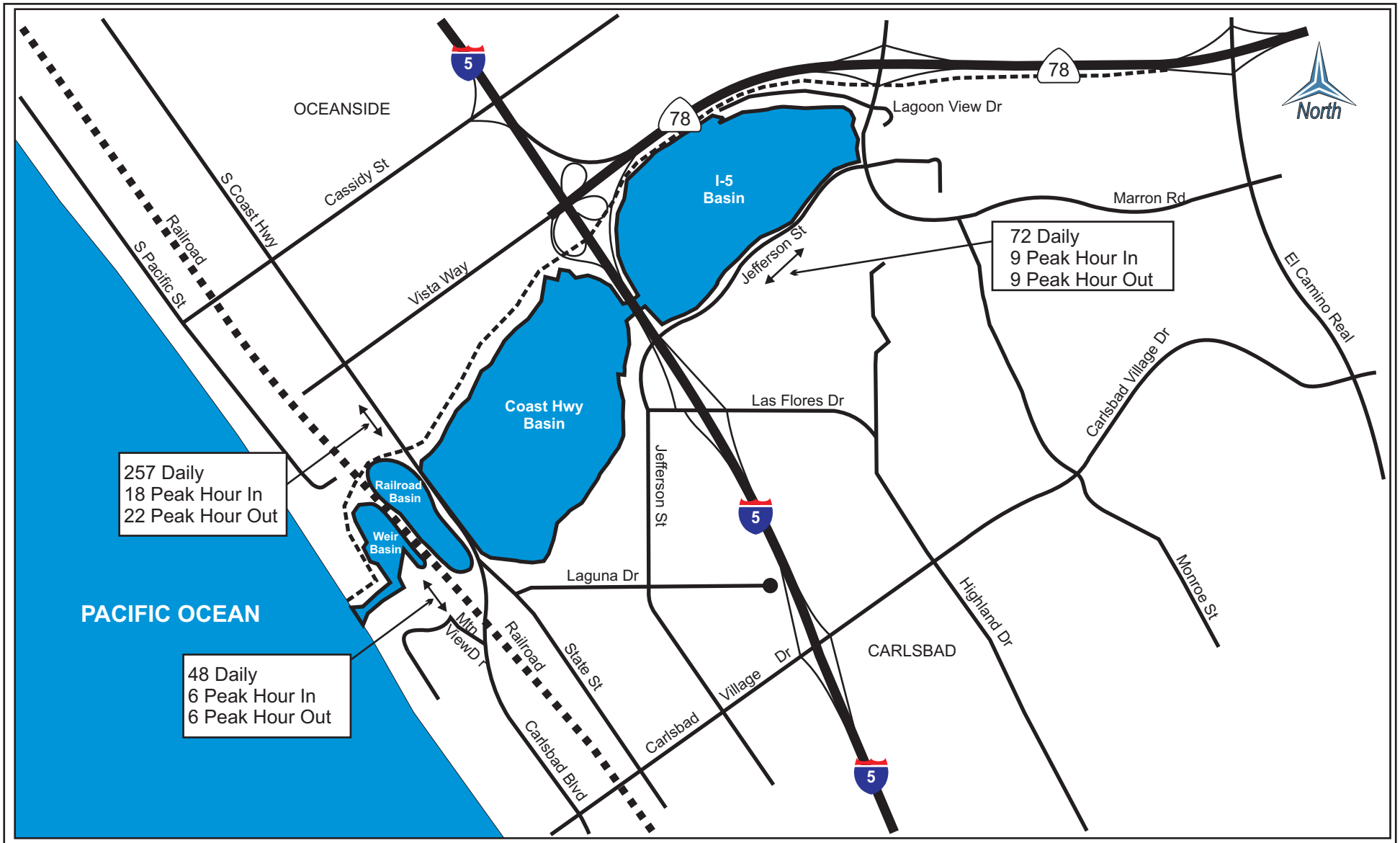
3.7 PEDESTRIAN IMPACTS

During construction of the Carlsbad Boulevard Bridge, pedestrians will be prohibited from using the roadway. Similar to the situation for recreational bicyclists, pedestrians who currently use the multi-path trail to the west of the roadway for recreational purposes would be assumed to seek other locations for recreational walking. Given the relatively long distances involved, it is expected that very few pedestrians use the multi-purpose trail for employment, shopping, or other utilitarian purposes. For the few pedestrians who are in this category, there is no viable alternative route of travel and these pedestrians would need to change to other modes of travel (auto, transit, or bicycle) during bridge construction.

Buena Vista Lagoon Enhancement Project

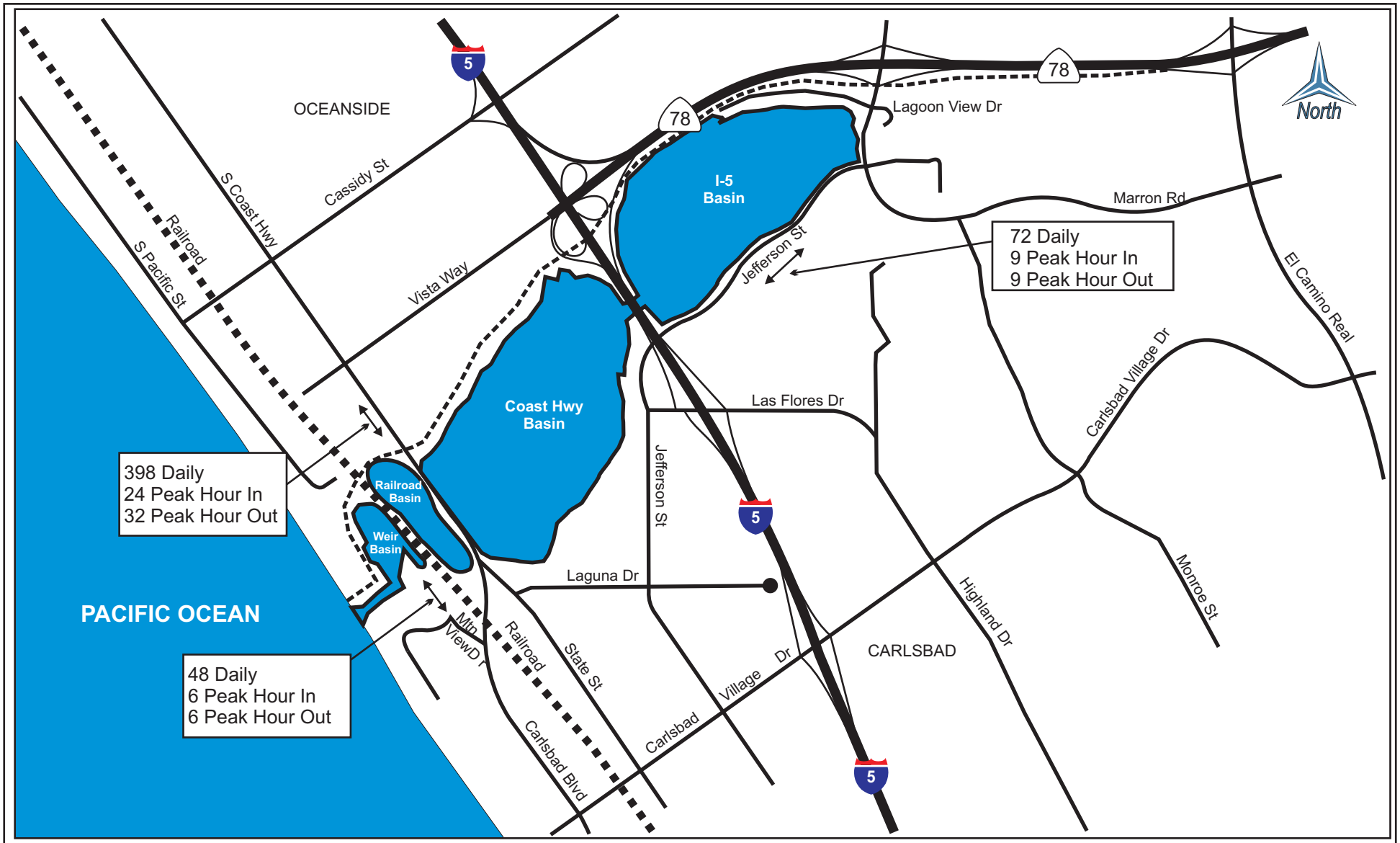
Project Trips - Freshwater Alternative (Passenger Car Equivalents)

Figure 3-1



Buena Vista Lagoon Enhancement Project
Project Trips - Saltwater Alternative (Passenger Car Equivalents)

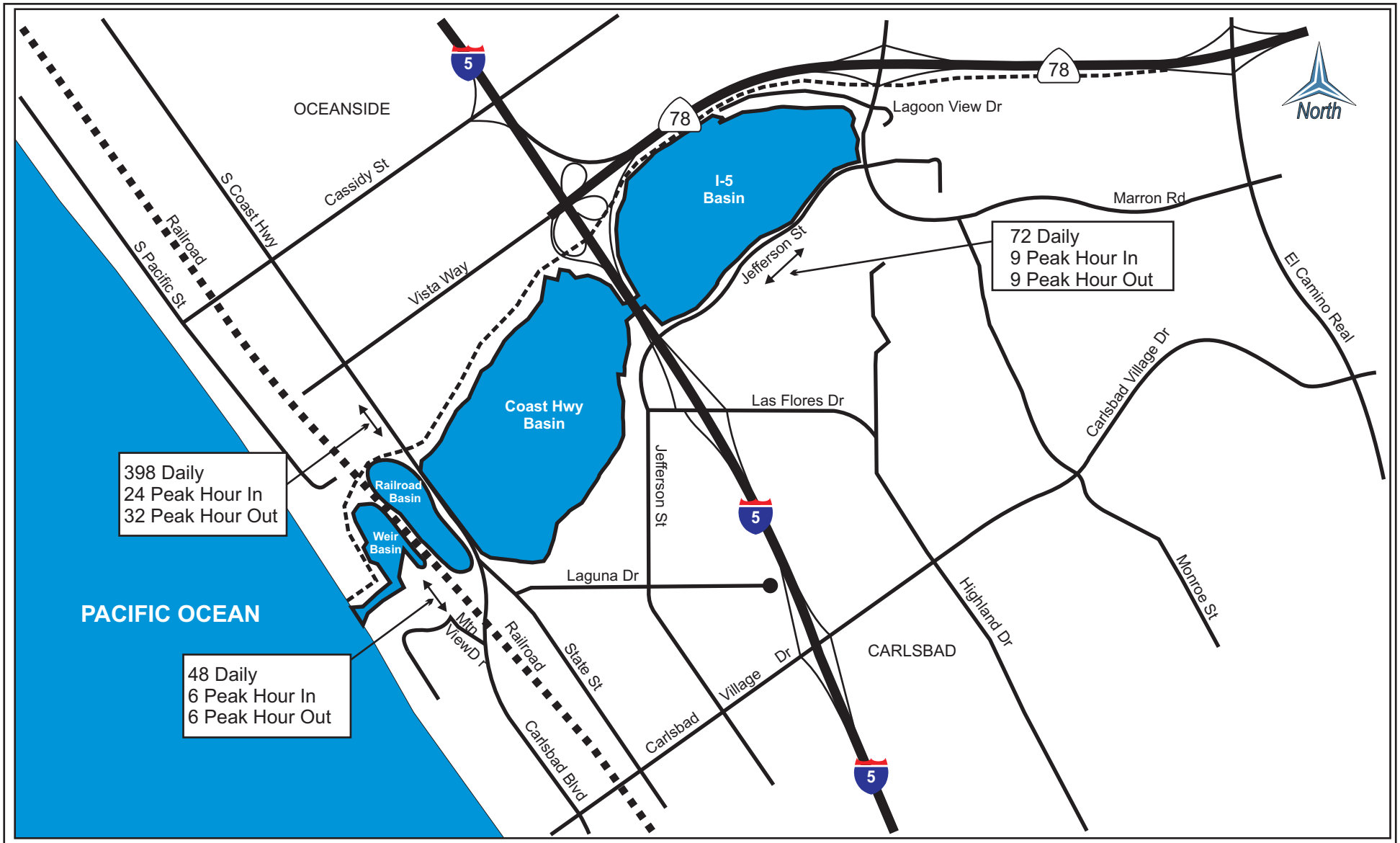
Figure 3-2



Buena Vista Lagoon Enhancement Project

Project Trips - Hybrid Alternative A (Passenger Car Equivalents)

Figure 3-3



Buena Vista Lagoon Enhancement Project

Project Trips - Hybrid Alternative B (Passenger Car Equivalents)

Figure 3-4

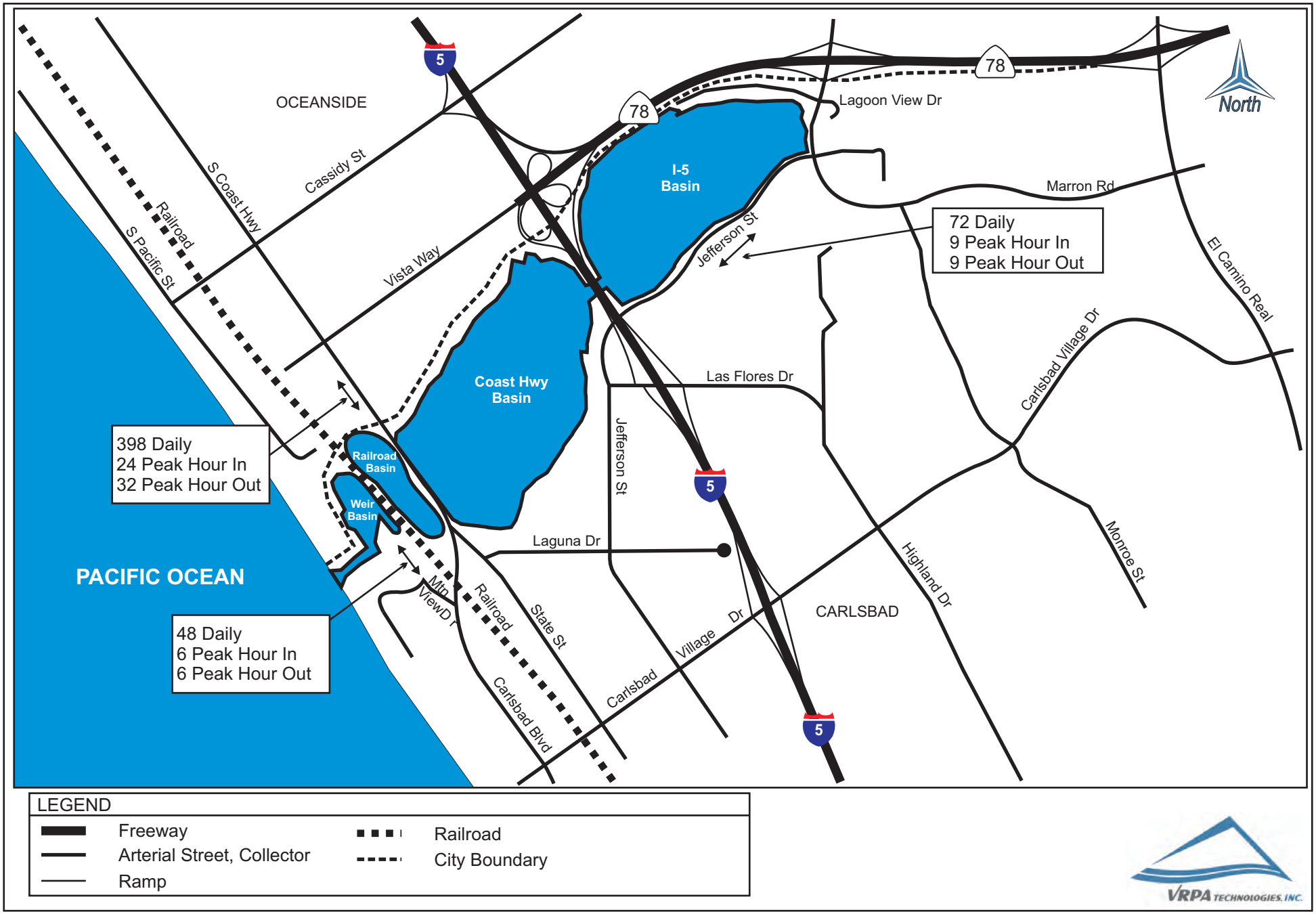


TABLE 3-1
Project Trip Generation
Freshwater Alternative - Weir Basin
Number of Trips

PROJECT COMPONENT	TRUCKS			AUTOS			TOTAL PCE's		
	Daily	Peak Hour		Daily	Peak Hour		Daily	Peak Hour	
		In	Out		In	Out		In	Out
Vegetation Removal	8	1	1	8	1	1	24	3	3
Weir Replacement	8	1	1	8	1	1	24	3	3
Total	16	2	2	16	2	2	48	6	6

(1) PCE = Passenger Car Equivalent

TABLE 3-2
Project Trip Generation
Freshwater Alternative - Railroad and Coast Highway Basin
Number of Trips

PROJECT COMPONENT	TRUCKS			AUTOS			TOTAL PCE's		
	Daily	Peak Hour		Daily	Peak Hour		Daily	Peak Hour	
		In	Out		In	Out		In	Out
Vegetation Removal	84	5	5	10	1	1	178	11	11
Carlsbad Boulevard Bridge	16	1	1	15	2	4	47	4	6
Boardwalk	8	1	1	16	1	3	32	3	5
Total	108	7	7	41	4	8	257	18	22

(1) PCE = Passenger Car Equivalent

TABLE 3-3
Project Trip Generation
Freshwater Alternative - I-5 Basin
Number of Trips

PROJECT COMPONENT	TRUCKS			AUTOS			TOTAL PCE's (1)		
	Daily	Peak Hour		Daily	Peak Hour		Daily	Peak Hour	
		In	Out		In	Out		In	Out
Vegetation Removal	32	4	4	8	1	1	72	9	9
Total	32	4	4	8	1	1	72	9	9

(1) PCE = Passenger Car Equivalent

TABLE 3-4
Project Trip Generation
Saltwater Alternative - Weir Basin
Number of Trips

PROJECT COMPONENT	TRUCKS			AUTOS			TOTAL PCE's		
	Daily	Peak Hour		Daily	Peak Hour		Daily	Peak Hour	
		In	Out		In	Out		In	Out
Vegetation Removal	8	1	1	8	1	1	24	3	3
Weir Removal	8	1	1	8	1	1	24	3	3
Total	16	2	2	16	2	2	48	6	6

(1) PCE = Passenger Car Equivalent

TABLE 3-5
Project Trip Generation
Saltwater Alternative - Railroad and Coast Highway Basin
Number of Trips

PROJECT COMPONENT	TRUCKS			AUTOS			TOTAL PCE's		
	Daily	Peak Hour		Daily	Peak Hour		Daily	Peak Hour	
		In	Out		In	Out		In	Out
Vegetation Removal	84	5	5	10	1	1	178	11	11
Carlsbad Boulevard Bridge	64	4	4	60	2	8	188	10	16
Boardwalk	8	1	1	16	1	3	32	3	5
Total	156	10	10	86	4	12	398	24	32

(1) PCE = Passenger Car Equivalent

TABLE 3-6
Project Trip Generation
Saltwater Alternative - I-5 Basin
Number of Trips

PROJECT COMPONENT	TRUCKS			AUTOS			TOTAL PCE's (1)		
	Daily	Peak Hour		Daily	Peak Hour		Daily	Peak Hour	
		In	Out		In	Out		In	Out
Vegetation Removal	32	4	4	8	1	1	72	9	9
Total	32	4	4	8	1	1	72	9	9

(1) PCE = Passenger Car Equivalent

TABLE 3-7
Project Trip Generation
Hybrid Alternative A - Weir Basin
Number of Trips

PROJECT COMPONENT	TRUCKS			AUTOS			TOTAL PCE's		
	Daily	Peak Hour		Daily	Peak Hour		Daily	Peak Hour	
		In	Out		In	Out		In	Out
Vegetation Removal	8	1	1	8	1	1	24	3	3
Weir Removal	8	1	1	8	1	1	24	3	3
Total	16	2	2	16	2	2	48	6	6

(1) PCE = Passenger Car Equivalent

TABLE 3-8
Project Trip Generation
Hybrid Alternative A - Railroad and Coast Highway Basin
Number of Trips

PROJECT COMPONENT	TRUCKS			AUTOS			TOTAL PCE's		
	Daily	Peak Hour		Daily	Peak Hour		Daily	Peak Hour	
		In	Out		In	Out		In	Out
Vegetation Removal	84	5	5	10	1	1	178	11	11
Carlsbad Boulevard Bridge	64	4	4	60	2	8	188	10	16
Boardwalk	8	1	1	16	1	3	32	3	5
Total	156	10	10	86	4	12	398	24	32

(1) PCE = Passenger Car Equivalent

TABLE 3-9
Project Trip Generation
Hybrid Alternative A - I-5 Basin
Number of Trips

PROJECT COMPONENT	TRUCKS			AUTOS			TOTAL PCE's (1)		
	Daily	Peak Hour		Daily	Peak Hour		Daily	Peak Hour	
		In	Out		In	Out		In	Out
Vegetation Removal	32	4	4	8	1	1	72	9	9
Total	32	4	4	8	1	1	72	9	9

(1) PCE = Passenger Car Equivalent

TABLE 3-10
Project Trip Generation
Hybrid Alternative B - Weir Basin
Number of Trips

PROJECT COMPONENT	TRUCKS			AUTOS			TOTAL PCE's		
	Daily	Peak Hour		Daily	Peak Hour		Daily	Peak Hour	
		In	Out		In	Out		In	Out
Vegetation Removal	8	1	1	8	1	1	24	3	3
Weir Removal	8	1	1	8	1	1	24	3	3
Total	16	2	2	16	2	2	48	6	6

(1) PCE = Passenger Car Equivalent

TABLE 3-11
Project Trip Generation
Hybrid Alternative B - Railroad and Coast Highway Basin
Number of Trips

PROJECT COMPONENT	TRUCKS			AUTOS			TOTAL PCE's		
	Daily	Peak Hour		Daily	Peak Hour		Daily	Peak Hour	
		In	Out		In	Out		In	Out
Vegetation Removal	84	5	5	10	1	1	178	11	11
Carlsbad Boulevard Bridge	64	4	4	60	2	8	188	10	16
Boardwalk	8	1	1	16	1	3	32	3	5
Total	156	10	10	86	4	12	398	24	32

(1) PCE = Passenger Car Equivalent

TABLE 3-12
Project Trip Generation
Hybrid Alternative B - I-5 Basin
Number of Trips

PROJECT COMPONENT	TRUCKS			AUTOS			TOTAL PCE's (1)		
	Daily	Peak Hour		Daily	Peak Hour		Daily	Peak Hour	
		In	Out		In	Out		In	Out
Vegetation Removal	32	4	4	8	1	1	72	9	9
Total	32	4	4	8	1	1	72	9	9

(1) PCE = Passenger Car Equivalent

APPENDIX A

PROJECT TRIP GENERATION INFORMATION

Construction Method 1 - Fines to LA-5	Unit	Power Rating (HP)	Fresh Water Alternatives								Salt Water Alternatives								Hybrid Alternatives							
			Quantity	Daily Production	Equipment Quantity per Day	Number of Trips	Hours per Day per Equipment	Number of Days per Equipment	Total Equipment Hours	Remarks	Quantity	Daily Production	Equipment Quantity per Day	Number of Trips	Hours per Day per Equipment	Number of Days per Equipment	Total Equipment Hours	Remarks	Quantity	Daily Production	Equipment Quantity per Day	Number of Trips	Hours per Day per Equipment	Number of Days per Equipment	Total Equipment Hours	Remarks
Site Access, Haul Roads, Staging Area Maintenance																										
Front-end loader		250			1		4.0	198	793				1		4.0	300	1,202				1		4.0	264	1,137	
Motor grader		150			1		4.0	198	793				1		4.0	300	1,202				1		4.0	264	1,137	
Backhoe		280			1		4.0	198	793				1		4.0	300	1,202				1		4.0	264	1,137	
Dump truck (12 CY)		300			1		4.0	198	793				1		4.0	300	1,202				1		4.0	264	1,137	
Water truck		175			1		4.0	198	793				1		4.0	300	1,202				1		4.0	264	1,137	
Prepare Dredge Launch Area																										
Backhoe		290			1		8.0	12	96	1 launch area/basin			1		8.0	12	96	1 launch area/basin			1		8.0	12	96	1 launch area/basin
Front-end loader		250			1		8.0	12	96				1		8.0	12	96				1		8.0	12	96	
Dump truck (16.5 CY)		375			1		8.0	12	96				1		8.0	12	96				1		8.0	12	96	
Remove Vegetation and Stockpile	CY		129,000	1,750							211,000	1,750							144,100	1,750						
Amphibious harvester		100			1		8.0	74	592				1		6.0	121	968				1		8.0	99	879	
Bulldozer		375			1		8.0	74	1,179				2		8.0	121	1,929				2		8.0	85	1,354	
Load and Transport Vegetation to Sycamore Landfill - 72 miles round trip	CY		129,000																							
Front-end loader		250			3		8.0	74	1,769				5		8.0	121	2,884				3		8.0	85	2,037	
Dump truck (16.5 CY)		375			27	7,818	8.0	74	15,822	2 hr round trip			27	12,788	8.0	121	26,043	2 hr round trip			27	9,000	8.0	85	18,419	2 hr round trip
Excavate Sediment with Dredge	CY		562,000	4,800							781,500	4,800							833,000	4,800						
Dredge (18") with pump		1,350			1		8.0	117	937	Ellicott Dredge 1270			1		8.0	163	1,303	Ellicott Dredge 1270			1		8.0	174	1,859	Ellicott Dredge 1270
Dredge support vessel		200			1		4.0	117	468				1		4.0	163	651				1		4.0	174	694	
Boat - survey crew for lagoon		150			1		0.8	117	94	8 hours/10 days			1		0.8	163	130	8 hours/10 days			1		0.8	174	139	8 hrs every 10 days
Transport Dredged Sand to Oceanside Beach with Pipeline	CY		49,000	4,800							130,000	4,800							129,500	4,800						
Booster pump		1,000			2		8.0	10	163				2		8.0	23	367				2		8.0	27	433	
Spread Sand along Beach	CY		49,000	4,800							130,000	4,800							129,500	4,800						
Bulldozer		300			3		8.0	10	245				3		8.0	23	550				3		8.0	27	648	
Scraper		150			1		8.0	10	82				1		8.0	23	183				1		8.0	27	216	
Front-end loader		350			1		8.0	10	82				1		8.0	23	183				1		8.0	27	216	
Truck - survey crew for beach		150			1		0.8	10	8	8 hours/10 days			1		0.8	163	130	8 hours/10 days			1		0.8	174	139	8 hrs every 10 days
Transport Dredged Sand (70-80%) to Nearshore with Pipeline	CY		30,000	4,800							49,000	4,800							51,500	4,800						
Booster pump		1,000			2		8.0	6	100				2		8.0	10	163				2		8.0	11	172	
Boat		200			1		4.0	6	25				1		4.0	10	41				1		4.0	11	43	
Boat - survey crew for nearshore		150			1		0.8	6	5	8 hours/10 days			1		0.8	10	8	8 hours/10 days			1		0.8	11	9	8 hrs every 10 days
Transport Dredged Fine Grained Sediment to Barge with Pipeline	CY		483,000	4,800							623,500	4,800							652,000	4,800						
Booster pump		1,000			2		8.0	101	1,610				2		8.0	170	2,075				2		8.0	136	2,173	
Barge (Idle)		200			1		2.0	101	201				1		2.0	130	259				1		2.0	136	272	
Crew boat (from/to Oceanside Harbor)																										
Transport Fine Grained Sediment by Barge to LA-5 ODMDS (30% solids)	CY		483,000	4,800							672,500	4,800								4,400						
Barge					2	11	10.0	101	2,013	1500 cy capacity			2	11	10.0	130	2,594	1500 cy capacity			2	11	10.0	136	2,737	1500 cy capacity
Tug		2,000			2	11	10.0	101	2,013				2	11	10.0	130	2,594				2	11	10.0	136	2,717	
Skiff		150			2		10.0	101	2,013				2		10.0	130	2,594				2		10.0	136	2,717	
Boat - survey crew for LA-5		150			1		0.8	101	81	8 hrs every 10 days			1		0.8	130	104				1		0.8	136	109	
Construct Inlet Weir																										
Dewater site (build cofferdam, pump, etc)																										
Crawler Crane - install and remove cofferdam piles	LF	300	300	150	1		5.0	2	10																	
Compressor - drive and remove cofferdam piles		100			1		8.0	2	16																	
Pump		100			3		8.0	6	96																	
Install weir (1 to 1.5 ft thick)	LF		100	20																						
Truck (16.5 CY) - import material (steel & concrete)		375			2	2	8.0	1	12																	
Backhoe (3 CY) - build weir		290			1		8.0	4	32																	
Crawler crane		300			1		4.0	4	16																	
Demolish refusing weir																										
Backhoe		290			1		8.0	1	12																	
Truck - transport demolished material to landfill		375			1	2	8.0	1	8																	
Construct I-5 Weir																										
Dewater site (build cofferdam, pump, etc)																										
Crawler crane - install and remove cofferdam piles	LF	300																	500	150	1		5.0	4	20	
Compressor - drive and remove cofferdam piles		100																			1		8.0	4	32	
Pump		100																			2		8.0	5	80	
Install weir (1 to 1.5 ft thick)	LF																		300	20						
Truck (16.5 CY) - import material (steel & concrete)		375																			3	3	8.0	1	24	
Backhoe (3 CY) - build weir		290																			1		8.0	6	48	
Crawler crane		300																			1		4.0	6	24	
Construct Inlet Channel Guide	LF																									
Dewater site (build cofferdam, pump, etc)																										
Crawler crane - install and remove cofferdam piles		300																								
Compressor - drive and remove cofferdam piles		100																								
Pump		100									400	150	1		5.0	3	15		400	150	1		5.0	3	15	
Site preparation/excavation		150											1		8.0	3	24				1		8.0	3	24	
Backhoe		290											2		8.0	17	269				2		8.0	17	269	
Install channel guide	Ton												1		8.0	2	16				1		8.0	2	16	
Truck (16.5 CY) - import armor material (rock)	CY	375									9,800	900							9,000	800						
Backhoe (3 CY) - place material		290									5,500	470	12	556	8.0	12	1,152		5,000	470	12	356	8.0	12	1,152	
Front-end loader (5 CY) - place material		250											2		8.0	11	192				2		8.0	12	192	
Crawler crane													3		6.0	12	144				3		6.0	12	144	
													1		8.0	12	96				1		8.0	12	96	
Construct Weir Basin Channel Guide (For Hybrid Alternative A Only)	LF																									
Dewater site (build cofferdam, pump, etc)																										
Crawler crane - install and remove cofferdam piles	LF	300																	850							
Compressor - drive and remove cofferdam piles		100																								
Pump		100																	1,340	150	1		5.0	9	45	
Site preparation/excavation																					1		8.0	9	71	
Backhoe		290																			2		8.0	11	168	
Install channel guide																										
- Truck (10 CY) - transport concrete	CY	300																			1		8.0	7	16	
Crane (40 ton) - place material		250																								
Front-end loader (5 CY) - place material		250																	1,100	250	4	110	6.0	5	120	
																					1		6.0	5	30	
																					1		6.0	5	30	

Construction Method 2 - Fines to Sycamore Landfill

	Unit	Power Rating (HP)	Fresh Water Alternative								Salt Water Alternative								Hybrid Alternative							
			Quantity	Daily Production	Equipment Quantity per Day	Number of Trips	Hours per Day per Equipment	Number of Days per Equipment	Total Equipment Hours	Remarks	Quantity	Daily Production	Equipment Quantity per Day	Number of Trips	Hours per Day per Equipment	Number of Days per Equipment	Total Equipment Hours	Remarks	Quantity	Daily Production	Equipment Quantity per Day	Number of Trips	Hours per Day per Equipment	Number of Days per Equipment	Total Equipment Hours	Remarks
Site Access, Haul Roads, Staging Area Maintenance																										
Front-end loader		150			1		4.0	274	1,095																	
Motor grader		150			1		4.0	274	1,095				1		4.0	381	1,522				1		4.0	385	1,418	
Backhoe		180			1		4.0	274	1,095				1		4.0	381	1,522				1		4.0	385	1,418	
Dump truck (12 CY)		300			1		4.0	274	1,095				1		4.0	381	1,522				1		4.0	385	1,418	
Water truck		175			1		4.0	274	1,095				1		4.0	381	1,522				1		4.0	385	1,418	
Prepare Dredge Launch Area																										
Backhoe		150																								
Front-end loader		300			1		8.0	12	96				1		8.0	12	96	1 launch area/basin			1		8.0	12	96	1 launch area/basin
Dump truck (18.5 CY)		230			1		8.0	12	96	1 launch area/basin			1		8.0	12	96				1		8.0	12	96	
		375			1		8.0	12	96				1		8.0	12	96				1		8.0	12	96	
Remove Vegetation and Stockpile																										
Amphibious harvester	CY		125,000	2,750																						
Bulldozer		300			1		8.0	74	590		211,000	1,750														
		375			2		8.0	74	1,179				1		8.0	121	965		148,500	1,750						
Load and Transport Vegetation to Sycamore Landfill - 72 miles round trip													2		8.0	121	1,930				1		8.0	15	679	
Front-end loader	CY		129,000																		7		8.0	85	1,366	
Dump truck (18.5 CY)		250			3		8.0	74	1,769																	
		375			27	7,818	8.0	74	13,321	1 hr round trip			3		8.0	121	2,894				3		8.0	85	2,037	
Excavate Sediment with Dredge													27	12,798	8.0	121	26,042	2 hr round trip			27	9,000	8.0	85	18,339	2 hr round trip
Dredge (18") with pump	CY		562,000	4,800							795,300	4,800							838,000	4,800						
Dredge support vessel		1,350			1		8.0	117	937	Ellicott Dredge 1270			1		8.0	363	1,303	Ellicott Dredge 1270			1		8.0	174	1,388	Ellicott Dredge 1270
Boat - survey crew for lagoon		300			1		4.0	117	468				1		4.0	363	651				1		4.0	174	698	
		150			1		0.8	117	94	8 hours/10 days			1		0.8	363	130	8 hours/10 days			1		0.8	174	139	8 hours/10 days
Transport Dredged Sand to Oceanside Beach with Pipeline											110,000	4,800														
Booster pump	CY		49,000	4,800									2		8.0	23	367		139,500	4,800						
		1,000			2		8.0	10	163		110,000	4,800									2		8.0	37	492	
Spread Sand along Beach													3		2.0	77	590		139,500	4,800						
Bulldozer	CY		49,000	4,800									1		8.0	99	394				3		8.0	37	648	
Scraper		300			3		8.0	10	245				1		8.0	33	263				3		8.0	37	216	
Front-end loader		180			2		8.5	20	62				1		0.8	33	26	8 hours/10 days			1		8.0	37	216	
Truck - survey crew for beach		250			1		8.0	10	62												1		0.8	37	22	8 hours/10 days
		230			1		0.8	10	8	8 hours/10 days																
Transport Dredged Sand (70-80%) to Nearshore with Pipeline	CY		30,000	4,800							49,000	4,800							51,500	4,800						
Booster pump		1,000			2		8.0	6	100				2		8.0	10	162									
Boat		700			3		4.0	6	25				3		4.0	30	41				2		8.0	11	172	
Boat - survey crew for nearshore		150			1		0.8	6	5	8 hours/10 days			1		0.8	10	8	8 hours/10 days			1		4.0	12	49	
Construct Inlet Weir																							0.8	11	9	8 hours/10 days
Dewater site (build cofferdam, pump, etc)																										
Crawler Crane - install and remove cofferdam piles	LF	300	300	150	2																					
Compressor - drive and remove cofferdam piles		300			1		5.0	2	10																	
Pump		100			1		4.0	2	8																	
Install weir (1 to 1.5 ft thick)	LF		100	20	2		8.0	6	96																	
Truck (18.5 CY) - import material (steel & concrete)		375																								
Backhoe (3 CY) - build weir		250			2	2	6.0	2	12																	
Crawler crane		300			1		8.0	4	32																	
Demolish existing weir					1		4.0	4	16																	
Backhoe		250																								
Truck - transport demolished material to landfill		375			1		8.0	2	11																	
					1	2	8.0	1	8																	
Construct I-5 Weir																										
Dewater site (build cofferdam, pump, etc)																										
Crawler crane - install and remove cofferdam piles	LF	300																								
Compressor - drive and remove cofferdam piles		300																								
Pump		100																								
Install weir (1 to 1.5 ft thick)	LF	300																	500	150	1					
Truck (18.5 CY) - import material (steel & concrete)		375																			1		5.0	4	20	
Backhoe (3 CY) - build weir		250																			1		8.0	4	32	
Crawler crane		300																			2		8.0	5	80	
Construct Inlet Channel Guide																			100	30						
Dewater site (build cofferdam, pump, etc)	LF																				5	3	8.0	1	24	
Crawler crane - install and remove cofferdam piles		300																			1		8.0	6	48	
Compressor - drive and remove cofferdam piles		300																			1		6.0	6	36	
Pump		100																								
Site preparation/excavation											400	150	1		5.0	3	15									
Backhoe		100											1		8.0	7	56		400	150	1		5.0	3	15	
Install channel guide		280											2		8.0	17	269				1		8.0	3	24	
Truck (18.5 CY) - import armor material (rock)	Ton																				2		8.0	17	269	
Backhoe (3 CY) - place material	CY	575									9,000	800	3		8.0	2	16									
Front-end loader (5 CY) - place material		290									5,300	470	12	44,000	6,673.8						1		8.0	2	16	
Crawler crane		150											2	556	8.0	12	1,152		9,000	800						
		300											2		8.0	12	192		5,300	470	12	336	8.0	12	1,152	
Construct Weir Berth Channel Guide (For Hybrid Alternative A Only)													3		8.0	12	144				7		8.0	12	192	
Dewater site (build cofferdam, pump, etc)	LF												1		8.0	12	96				3		8.0	12	144	
Crawler crane - install and remove cofferdam piles		300																			1		8.0	12	96	
Compressor - drive and remove cofferdam piles	LF	300																	830							
Pump		100																								
Site preparation/excavation		100																	1,340	130	1		5.0	3	45	
Backhoe		280																			1		8.0	9	71	
Install channel guide																					2		8.0	11	168	
Truck (10 CY) - transport concrete	CY																									
Crane (40 ton) - place material	CY	300																			3		8.0	2	35	
Front-end loader (5 CY) - place material		250																								
		250																	1,100	230	4	110	6.0	5	330	
Procure Lagoon View Drive Dewatering Site																					1		6.0	5	30	
Clear & grub	AE		9																		1		8.0	5	30	
Bulldozer	AC		5																							
Front-end loader	CY	300	6,500	1,750	1		8.0	4	35		9															
Dump truck (12 CY)		350			2		8.0	4	71		9															
Grade and pave access roads	SF	300			2		8.0	4	71		6,000	1,750	1		8.0	4	35									
Front-end loader		250	5,000		7	146	8.0	4	248				2		8.0	4	71									
Motor grader		150			1		2.0	100	400		5,000		7	146	8.0	4	248		6,000	1,750	1					
Dump truck		300			1		2.0	100	400												2		8.0	4	71	
Roller, pneumatic		130			1		2.0	100	400				1		2.0	280	520				7	146	8.0	4	248	
Construct simulating cells	LF				1		2.0	100	400				1		7.0	160	320									
Dump truck (18.5 CY)	CY	375	5,900	300			2.0	100	400				1		2.0	260	520				1		2.0	270	540	
Front-end loader		230	16,111	556									1		2.0	260	520				2		2.0	270	540	
Bulldozer		300			4	1,269	8.0	29	928		5,600	200									1		2.0	270	540	
Demo dewatering cells					2		9.0	29	464		16,111	556	4	1,269	9.0	29	928		5,800	200						
Front-end loader		230	5,800	600	1		8.0	29	232				2		8.0	29	464		16,111	556	4	1,269	8.0	29	928	
Bulldozer		300			1		8.0	10	232				1		8.0	29	232				2		8.0	29	464	
							8.0	10	77		5,800	600	2		8.0	10	155				1		8.0	29	232	
Transport Dewatered Materials to Sycamore Landfill													1		8.0	10	77									
Front-end loader (5 CY)	CY		463,000	2,400															5,800	600	2		8.0	10	155	
Dump truck (18.5 CY)		250			4		9.0	380	6,400	2 hr round trip	422,800	2,400									1		8.0	10	77	
Bulldozer		375			48	38,055	8.0	380	72,200	1.6 bulk factor			4		9.0	360	8,320	2 hr round trip	462,000	2,400						
Pump - return water to dredge site		300			3		8.0	380	9,600				48	49,045	8.0	320	99,840	2.0 bulk factor			4		9.0	370	8,640	2 hr round trip
		300			4		8.0	380	7,600				3		8.0	360	8,240				48	51,370	8.0	370	103,680	1.3 bulk factor
							8.0	200	6,400				4		8.0	360	8,320				3		8.0	370	8,880	
																					4		8.0	370	8,880	

Construction Method 3 - Fines to Overdredged Pit	Unit	Power Rating (HP)	Fresh Water Alternative							Salt Water Alternative							Hybrid Alternative						
			Quantity	Daily Production	Equipment Quantity per Day	Number of Trips	Hours per Day per Equipment	Number of Days per Equipment	Total Equipment Hours	Remarks	Quantity	Daily Production	Equipment Quantity per Day	Number of Trips	Hours per Day per Equipment	Number of Days per Equipment	Total Equipment Hours	Remarks	Quantity	Daily Production	Equipment Quantity per Day	Number of Trips	Hours per Day per Equipment	Number of Days per Equipment	Total Equipment Hours	Remarks
Site Access, Haul Roads, Staging Area Maintenance																									
Front-end loader		250			1		4.0	433	1,731				1		4.0	565	2,260				1		4.0	529	2,115	
Motor grader		130			1		4.0	433	1,731				1		4.0	565	2,260				1		4.0	529	2,115	
Backhoe		280			1		4.0	433	1,731				1		4.0	565	2,260				1		4.0	529	2,115	
Dump truck (12 CY)		300			1		4.0	433	1,731				1		4.0	565	2,260				1		4.0	529	2,115	
Water truck		175			1		4.0	433	1,731				1		4.0	565	2,260				1		4.0	529	2,115	
Prepare Dredge Launch Area																									
Backhoe		280			1		8.0	12	96	1 launch area/basin			1		8.0	12	96	1 launch area/basin			1		8.0	12	96	1 launch area/basin
Front-end loader		250			1		8.0	12	96				1		8.0	12	96				1		8.0	12	96	
Dump truck (16.5 CY)		375			1		8.0	12	96				1		8.0	12	96				1		8.0	12	96	
Remove Vegetation and Stockpile	CY		120,000	1,750							211,000	1,750							148,500	1,750						
Amphibious harvester		100			1		8.0	74	590				1		8.0	121	965				1		8.0	85	679	
Bulldozer		375			2		8.0	74	1,179				2		8.0	121	1,929				2		8.0	85	1,358	
Load and Transport Vegetation to Sacramento Landfill - 72 miles round trip	CY		120,000																							
Front-end loader		250			3		8.0	74	1,769				3		8.0	121	2,894				3		8.0	85	2,037	
Dump truck (16.5 CY)		375			27	7,819	8.0	74	15,822	1 hr round trip			27	12,788	8.0	121	26,048	1 hr round trip			27	9,000	8.0	85	18,829	2 hr round trip
Excavate Sediment with Dredge																										
Design Cut	CY		861,000	4,800							781,500	4,800							681,000	4,600						
Dredge (16") with pump		1,250			1		8.0	117	937	Ellicott Dredge 1270			1		8.0	163	1,303	Ellicott Dredge 1270			1		8.0	174	1,388	Ellicott Dredge 1270
Dredge support vessel		200			2		4.0	117	468				2		4.0	163	652				1		4.0	174	694	
Boat - survey crew for lagoon		150			1		0.8	117	94	8 hours/10 days			1		0.8	163	130	8 hours/10 days			1		0.8	174	139	8 hours/10 days
Construct Overdredged Pit	CY		675,500	4,800							614,000	4,800							718,000	4,800						
Dredge (18") with pump		1,350			1		8.0	141	1,126				1		8.0	170	1,357				1		8.0	150	1,197	
Dredge support vessel		200			1		4.0	141	563				1		4.0	170	678				1		4.0	150	598	
Boat - survey crew for lagoon		150			1		0.8	141	113	8 hours/10 days			1		0.8	170	136	8 hours/10 days			1		0.8	150	120	8 hours/10 days
Transport excavated sand to Oceanside Beach with pipeline booster pump	CY	1,000	420,000	4,800	2		8.0	88	1,400		420,000	4,800	2		8.0	88	1,400		420,000	4,800	2		8.0	88	1,400	
Transport excavated sand to North Carlsbad Beach with pipeline booster pump	CY	1,000	58,500	4,800	2		8.0	11	196		59,000	4,800	2		8.0	11	196		136,500	4,800	2		8.0	28	455	
Spread Sand along Beach	CY		476,500	4,800							519,000	4,800							516,500	4,800						
Bulldozer		300			3		8.5	99	2,523				3		8.0	108	2,595				3		8.0	116	2,784	
Scraper		550			1		8.0	99	794				1		8.0	108	865				1		8.0	116	928	
Front-end loader		250			1		8.0	99	794				1		8.0	108	865				1		8.0	116	928	
Truck - survey crew for beach		150			1		0.8	99	79	8 hours/10 days			1		0.8	108	87	8 hours/10 days			1		0.8	116	93	8 hours/10 days
Transport Dredged Sand (TI-MON) to Nearshore with Pipeline	CY		85,500	4,800							292,000	4,800							276,500	4,800						
Booster pump		1,000			2		8.0	18	285				2		8.0	55	873				2		8.0	58	922	
Boat		200			1		4.0	18	71				1		4.0	55	218				1		4.0	58	230	
Boat - survey crew for nearshore		150			1		0.8	18	14	8 hours/10 days			1		0.8	55	44	8 hours/10 days			1		0.8	58	46	8 hours/10 days
Transport excavated fine grained soil from Oil Basin to stockpile in I-5 Basin or Oil Basin to Overdredged Pit	CY		417,000	4,600							457,000	4,800							457,000	4,800						
Boat		200			1		8.0	95	782	other equipment included			1		8.0	95	762	other equipment included			1		8.0	95	762	other equipment included
Transport stockpile fine grained soil from stockpile to Overdredged Pit with pipeline			457,000	4,800							457,000	4,800							457,000	4,800						
Dredge (18") with pump		1,350			1		8.0	95	763				1		8.0	95	781				1		8.0	95	762	
Dredge support vessel		200			1		4.0	95	381				1		4.0	95	381				1		4.0	95	381	
Boat - survey crew for lagoon		150			1		0.8	95	76	8 hours/10 days			1		0.8	95	76	8 hours/10 days			1		0.8	95	76	8 hours/10 days
Transport excavated fine grained soil from I-5 Basin or Oil Basin to Overdredged Pit w	CY		318,500	4,800						other equipment included	357,000	4,600						other equipment included	261,000	4,600						other equipment included
Boat		200			1		8.0	46	364				1		8.0	74	593				1		8.0	54	435	
Construct Inlet Weir																										
Dewater site (build cofferdam, pump, etc)																										
Crawler crane - install and remove cofferdam piles	LF	300	300	150	1		5.0	3	10																	
Compressor - drive and remove cofferdam piles		100			1		9.0	2	16																	
Pump		300			2		8.0	6	96																	
Install wall (1 to 1.5 ft thick)	LF		100	10																						
Truck (16.5 CY) - import material (steel & concrete)		375			2	2	6.0	1	12																	
Backhoe (3 CY) - build weir		190			1		8.0	4	33																	
Crawler crane		300			1		4.0	4	16																	
Demolish existing weir																										
Backhoe		190			1		8.0	2	12																	
Truck - transport demolished material to landfill		375			1	2	8.0	1	6																	
Construct I-5 Weir																										
Dewater site (build cofferdam, pump, etc)																										
Crawler crane - install and remove cofferdam piles	LF	300																								
Compressor - drive and remove cofferdam piles		100																	500	150	1		5.0	6	79	
Pump		300																			1		8.0	4	37	
Install wall (1 to 1.5 ft thick)	LF																				2		9.0	5	80	
Truck (16.5 CY) - import material (steel & concrete)		375																	200	20						
Backhoe (3 CY) - build weir		190																			3	3	8.0	1	24	
Crawler crane		300																			1		8.0	6	48	
Construct Inlet Channel Guide	LF																				1		4.0	6	24	
Dewater site (build cofferdam, pump, etc)																										
Crawler crane - install and remove cofferdam piles		300																								
Compressor - drive and remove cofferdam piles		100									400	150	1		5.0	3	15		400	150	1		5.0	3	15	
Pump		100											1		6.0	3	19				1		8.0	3	24	
Site preparation/excavation													2		8.0	17	269				3		8.0	17	408	
Backhoe		290																								
Install channel guide	Ton												1		8.0	2	16				1		8.0	2	16	
Truck (16.5 CY) - import armor material (rock)	CY	375									9,000	800							9,000	800						
Hydraulic (3 CY) - place material		290									5,500	470	13	556	8.0	13	1,282		5,500	470	13	556	8.0	13	1,152	
Front-end loader (5 CY) - place material		350											2		8.0	12	192				2		4.0	12	192	
Crawler crane													1		8.0	12	144				2		8.0	12	144	
													1		8.0	12	96				1		8.0	12	96	
Construct Weir Basin Channel Guide (For Hybrid Alternative A Only)	LF																									
Dewater site (build cofferdam, pump, etc)																			810							
Crawler crane - install and remove cofferdam piles	LF	300																								
Compressor - drive and remove cofferdam piles		100																	1,340	150	1		5.0	9	45	
Pump		100																			1		8.0	9	71	
Site preparation/excavation																					2		8.0	11	168	
Backhoe		290																								
Install channel guide	CY																				1		8.0	2	16	
Truck (10 CY) - transport concrete	CY	300																								
Crane (40 ton) - place material		260																								
Front-end loader (5 CY) - place material		350																	1,100	250	4	110	6.0	5	120	
																					1		6.0	5	30	
																					1		6.0	5	30	