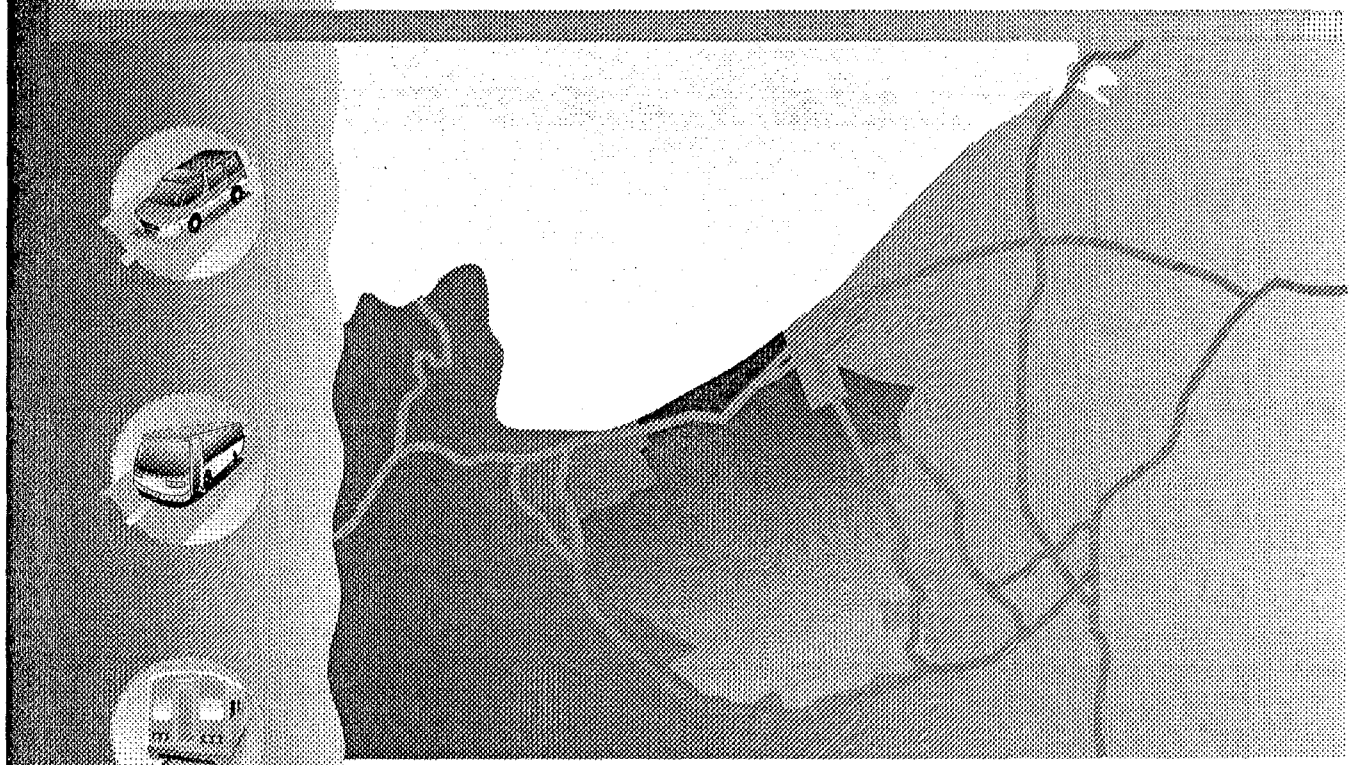
FINAL REPORT

FORT ORD TRANSPORTATION STUDY

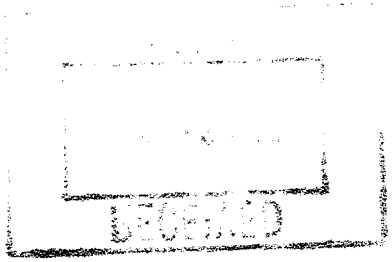


Prepared for
Transportation Agency for Monterey County

Prepared by
TRANSCORE
An SAIC Company

In association with
Angus McDonald & Associates

July 8, 1997



FORT ORD REGIONAL TRANSPORTATION STUDY

FINAL REPORT

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DISCLAIMER

The Fort Ord Transportation Study is a technical report and is intended to be used for reference and guidance purposes only; it is not a policy-making document. Its contents, including the financing mechanisms, do not reflect policy direction from the TAMC Board.

The transportation analysis included in this report was based on the Draft Fort Ord Reuse Plan of May 1996. The proposed redevelopment plans included in the Final Fort Ord Reuse Plan were subsequently modified. Therefore, the information in the Fort Ord Transportation Study may differ from information contained in the Final Fort Ord Reuse Plan.

Signed:

Gerald J. Gromko, PhD
TAMC Executive Director

ACKNOWLEDGMENT

This report could not have been completed without assistance from many individuals and organizations. Their help and cooperation throughout the development of this report was greatly appreciated. The following individuals and organizations are singled out for their special contributions to the fruition of the Fort Ord Regional Transportation Study:

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Fort Ord Reuse Plan/EIR Consulting Team, headed by EMC Planning
Fort Ord Reuse Infrastructure Study Consulting Team, headed by Reimer Associates
Bestor Engineers

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EXECUTIVE SUMMARY

INTRODUCTION

This report represents the results of the Fort Ord Transportation Study being conducted for the Transportation Agency for Monterey County (TAMC). The purpose of the TAMC Study was to develop a multimodal transportation system that could serve expected traffic conditions through the year 2015 based on the *1994 Regional Population and Employment Forecast* prepared by the Association of Monterey Bay Area Governments (AMBAG) and the draft *Fort Ord Reuse Plan* prepared by the Fort Ord Reuse Authority (FORA). A secondary purpose was to examine issues related to the financing of proposed transportation improvements. The costs of individual transportation projects needed to meet LOS standards will be estimated, and the equitable share of the cost will be attributed to proposed development within and beyond the geographic boundaries of former Fort Ord.

Most recurring congestion on the regional roadway system (depicted in Figure E-1) is attributable to commutes occurring during the peak hour. This study attempts to minimize the impact of these weekday peak-hour auto trips on the regional transportation system. Projects promoting the use of alternative modes of transportation (e.g., transit, rail, car pool and bike) were included in this study that could delay or eliminate expensive roadway projects and minimize costs and environmental impacts. Alternative transportation projects utilizing transit and rail service were emphasized along the most congested corridors. However, given the current reliance on auto use, the transportation system developed for this study attempts to find a balance between optimistic shifts to alternative modes of transportation and historical data.

LAND USES

In order to assess the regional transportation needs, it is important not only to study the draft Fort Ord Reuse Plan, but understand existing and future regional land use characteristics. That is, residents on former Fort Ord are not obligated to work on former Fort Ord, therefore most commute trips associated with the reuse of Fort Ord will be generated throughout Monterey County. The following land uses were input to the Monterey County Transportation Analysis Model (MCTAM) to forecast traffic conditions. MCTAM results are subsequently the basis for the preliminary nexus analysis which assigned financial responsibility for the proposed transportation projects.

Draft Fort Ord Reuse Plan: By the year 2015, the draft Reuse Plan calls for more than 18,000 jobs and 13,500 housing units (inclusive of 2,550 on-campus housing units). For Fort Ord, this represents a growth of 7,400 housing units, but a decrease of 2,000 jobs versus 1990 when the site was a military base. To aid in the analysis of Fort Ord's travel demand and transit potential, the reuse area was divided into six districts representing distinct geographical areas and common land uses. These districts are illustrated in Figure E-2 while the housing, employment and typical residential development density characteristics of each district are presented in Table E-1. A summary of each Fort Ord district follows.

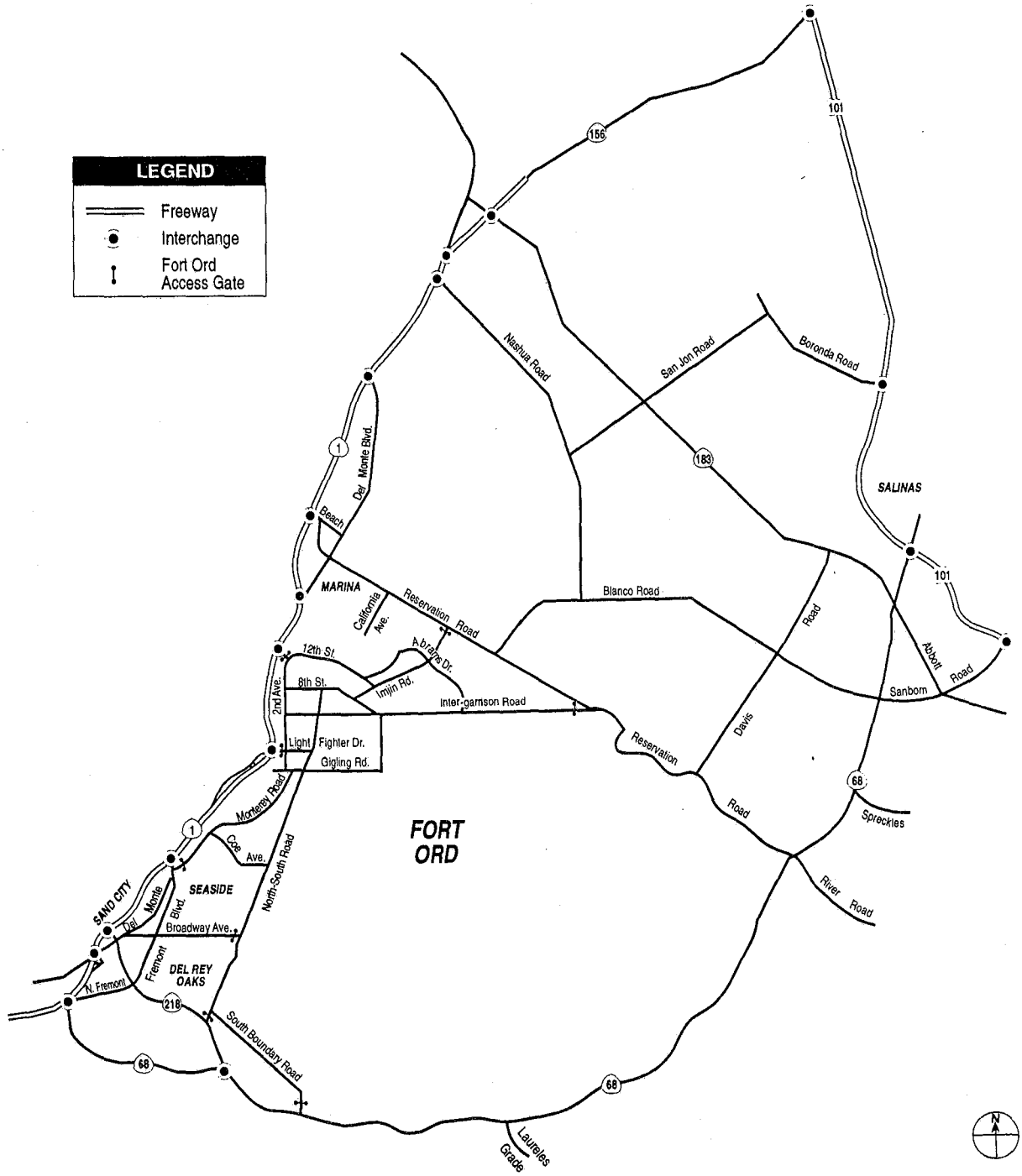

Figure E-1
Existing Transportation Network

50068 Exstng Trns E-1

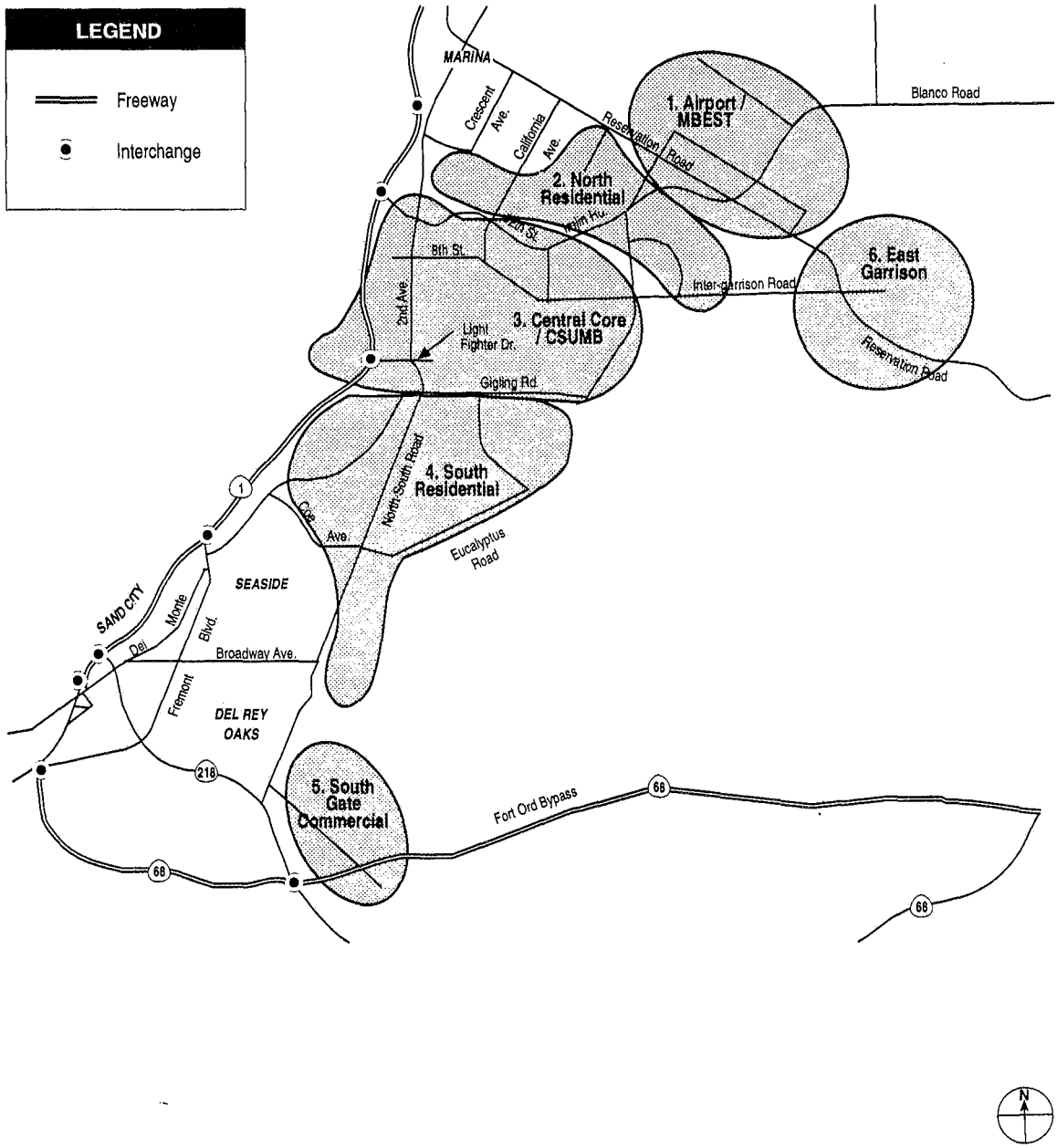

Figure E-2
Fort Ord Analysis Districts

Source: JHK, 1996

50068 TAMC Exstng Trns

Table E-1
2015 FORT ORD LAND USE CHARACTERISTICS

DISTRICT	HOUSING UNITS	JOBS	HOUSING DENSITY (dwelling units per acre)	DAILY TRIP ENDS GENERATED
1. Airport/MBEST	0	7,640	NA	63,940
2. Northern Residential	4,112	69	8-10	32,760
3. Central Core/CSUMB	3,650*	6,983	8-10	104,690**
4. Southern Residential	5,751	1,198	4-8	67,840
5. South Gate (Comm. & Ind.)	0	1,392	NA	10,820
6. East Garrison	0	1,058	NA	23,170
TOTAL	**13,513**	**18,340**	--	**303,220**

* Includes 2,550 on-campus student housing units.
** Includes 12,310 school trip ends for students housed on-campus.
Source: FORA Reuse Plan

Fort Ord Analysis Districts

1. **Airport/MBEST** - This district represents a major employment center within Fort Ord, attracting employees from throughout the region. By the year 2015, this district is expected to generate more than 60,000 trips per day with more than 15% work trips. It will be important to serve commuter needs from residential areas within Fort Ord, as well as major employee source locations (Salinas, Marina, Seaside, Peninsula) in the county. With nearly 60% of trips being non-home-based, connections to other non-residential centers are also important. Within these trips, a large number between MBEST and the CSUMB campus are expected.

2. **Northern Residential** - This largely medium density residential district is forecast to generate a moderate number of trips. This district is expected to include low income, social, and seniors housing areas. It will be important to serve mobility needs of these residents with service to key employment and shopping centers. A specific need for these districts is a connection between the designated CSUMB housing area along Inter-garrison and the campus. This particular connection is being served by the CSUMB shuttle.

3. **Central Core/CSUMB** - The central core consists of the CSUMB campus, as well as areas of proposed higher-density, mixed use development. Although the mixed-use nature of this district suggests a large number of intra-district trips, it is important to recognize that the district will also become a major multi-purpose activity center for the region. It will be important to provide a system that meets a variety of trip purposes and locations.

4. **Southern Residential** - For this largely residential district it is important to provide access to major employment and commercial areas. With the inclusion of the POM Annex, there is also the specific additional need to provide connections to other military facilities in the region. Outside of the POM Annex, the expected lower densities and higher-cost housing suggest that transit may have limited effectiveness, although transit could serve peak-period commute trips to employment centers in Salinas and on the Monterey Peninsula.

5. **South Gate Commercial/Industrial** - This district contains a mix of lower density commercial and industrial uses. These is no current activity in this area, and only 20% of development is expected by 2015.

6. **East Garrison** - Lower-density, mixed use development is proposed for the East Garrison district. This district is expected to be approximately one-quarter developed by 2015. Like the South Commercial/Industrial district, there is no current activity at East Garrison.

AMBAG 1994 Regional Population and Employment Forecast: To assess the regional transportation needs it is important to understand existing and future land use characteristics of the region. According to Census data, Monterey County had a population of 355,000 in 1990. By 2015, Monterey County is expected to grow to a population of 520,000, or 46 percent. A majority of this growth is expected to occur within the Monterey Peninsula and Salinas areas (75% of housing and 70% of the employment growth). The draft Fort Ord Reuse Plan indicates a population of approximately 39,000 (7.5 percent of County total) will reside within the Fort Ord reuse area by 2015. A summary of the socio-economic characteristics of the county, Monterey Peninsula, Salinas, and Fort Ord is provided in TableE-2.

REGIONAL TRANSPORTATION FORECASTS

The land uses reported above were input to the MCTAM computer model to forecast the number of trips that would likely use the regional transportation network in the year 2015. These "person trips" are summarized in Table E-3. Currently 98 percent of the person trips in this region end up using an auto (e.g., car pool, drive alone), while 2 percent use non-auto modes of transportation (e.g., transit, bike). The MCTAM results indicate that almost three million person trips will require the use of the transportation network each weekday by the year 2015. By the year 2015, the MCTAM forecasts that more than 280,000 residents in Monterey County will drive their auto to work each day (based on current mode splits of 2 percent and commute trips representing 10 percent of the daily traffic). Furthermore, almost 16,000 Fort Ord residents will commute to work each day in autos, while more than 14,000 autos will be used to shuttle workers to jobs on the former Fort Ord.

Congestion on the regional roadway network is typically reported as level of service (LOS) ranging from LOS=A through LOS=F. LOS=A generally depicts uncontested conditions, while each letter degradation reflects increased congestion until LOS=F is reached indicating bumper-to-bumper traffic. In general, a roadway section is "deficient" and needing congestion relief once LOS=E has been reached.

Service levels on regionally significant roadways were determined for existing conditions, as well as a number of future year scenarios. The future year scenarios reflect forecast conditions for the year 2015 assuming different sets of roadway improvements. A list of the projects assumed in each of the scenarios examined in this study is included in Table E-4. The LOS results[1] for regional roadways under Existing Conditions and two of the future year scenarios (Financially Constrained, and Financially Unconstrained) are summarized in Table E-5. Forecast service levels for key roadways within the former Fort Ord are presented in Table E-6.

[1] All LOS data in this report is based on an arterial level of service analysis using the 1994 Florida DOT methodology which is consistent with the Highway Capacity Manual.

Table E-2
MONTEREY COUNTY SOCIO-ECONOMIC DATA
COUNTY WIDE AND SUBAREA

	1990 Census		2015 Forecast		1990-2015 Growth (% Growth)	
	Housing Units	Employment	Housing Units	Employment	Housing Units	Employment
Monterey Peninsula	35,900	50,000	45,500	66,000	9,600 (27%)	16,000 (32%)
Salinas	35,000	49,000	61,000	79,000	26,000 (74%)	30,000 (61%)
Fort Ord (includes CSUMB)	6,100	20,000	13,500	18,000	7,400 (121%)	(2,000) (-10%)
Other	43,000	42,000	50,000	61,000	7,000 (16%)	19,000 (45%)
Monterey County	120,000	161,000	170,000	224,000	50,000 (42%)	63,000 (39%)

Sources: AMBAG 1994 Regional Population and Employment Forecast, Draft Fort Ord Reuse Plan

Table E-3
FORECASTED 2015 DAILY PERSON TRIP DISTRIBUTION

ORIGIN	DESTINATION						TOTAL
	1	2	3	4	5	6	
1. Fort Ord	65,622	11,435	14,304	26,356	17,995	24,449	160,161
2. Salinas	19,949	478,152	5,188	4,819	5,876	143,414	657,398
3. Marina	23,863	7,514	18,770	11,140	8,802	19,381	89,470
4. Seaside/DRO/ Sand City	15,838	2,600	3,999	49,106	40,558	27,294	139,395
5. Monterey & Pacific Grove	11,210	2,649	2,237	32,857	134,893	54,228	238,074
6. Other	18,883	64,143	6,815	26,195	59,678	1,433,925	1,609,639
TOTAL	143,055	566,493	51,313	150,473	267,802	1,702,691	2,881,827

Table E-4
2015 TRANSPORTATION INFRASTRUCTURE IMPROVEMENT SUMMARY

FACILITY	SEGMENT		IMPROVEMENT DESCRIPTION	SCENARIO			
	From	To		Financially Unconstrained	Financially Constrained	Fort Ord Source Only	Impact Study Area Source Only
Off-Site Roadway Improvements							
Hwy 1 - Hatton Canyon	Carpenter	Carmel River	Construct new roadway	•	•	•	•
Highway 1	Santa Cruz County Line	Castroville	Upgrade from 2-lane hwy to 4-lane freeway/expy	•			•
	Fremont	Del Monte	Widen to 6 lanes - extend aux. lanes	•			
U.S. 101 - Prunedale By-Pass	Echo Valley	Espinosa	Construct new freeway	•			•
U.S. 101 Interchanges	Boronda	Airport	Improve interchanges	•	•	•	•
Highway 68	Highway 1	Highway 218	Upgrade to 4-lane freeway	•	•	•	•
	Highway 218	San Benancio	Construct 4-lane ByPass freeway	•			
Highway 156	Castroville	U.S. 101	Widen from 2 to 4 lanes (expy)	•		•	•
Highway 183	Near Salinas	Castroville	Widen from 2 to 4 lanes (expy)	•			
Highway 218	North-South	Hwy 68	Widen from 2 to 4 lanes	•	•	•	•
Davis Road	U.S. 101	Rossi	Widen from 4 to 6 lanes	•			
	Rossi	Blanco	Widen from 2 to 4 lanes	•			
	Blanco	Reservation	4-lane Bridge - to avoid wash-outs	•		•	•
Blanco Road	Reservation	Alisal	Widen from 2 to 4 lanes (to Davis)	•		•	•
			Widen from 3 to 4 lanes (to Alisal)	•		•	•
			Bridge	•		•	•
Reservation Road	Highway 1	Del Monte	Widen from 2 to 4 lanes				
	Del Monte	Crescent	Widen from 4 to 6 lanes	•	•	•	•
	Fort Ord Boundary	Blanco	Widen from 4 to 6 lanes	•	•	•	•
	Blanco	Inter-garrison	Construct new 4-lane connection	•	•	•	•
	Inter-garrison	Watkins Gate	Widen from 2 to 4 lanes (create couplet)	•	•	•	•
	Davis	Highway 68	Widen from 2 to 4 lanes				
Del Monte	In Seaside/Monterey		Widen from 4/5 to 6 lanes	•	•	•	•
	2nd Avenue	Highway 1 I/C	See 2nd Avenue				
	Highway 1 - South	Reservation	Widen to 6 lanes	•			
Hwy 1/Fremont I/C			Reconstruct				
On-Site Roadway Improvements							
12th/Imjin	Highway 1	California	Construct 4-lane arterial (exc. Gateway)	•	•	•	•
	California	Reservation	Widen to 4 lanes	•	•	•	•
	Reservation	Blanco	Construct new 4-lane connector	•		•	•
8th Street	Highway 1 Overcrossing	2nd Avenue	Upgrade as 2-lane arterial	•	•	•	•
	2nd Avenue	Inter-garrison	Upgrade as 2-lane arterial	•	•	•	•
Inter-Garrison	8th St Cutoff	Reservation	Upgrade as 2-lane arterial	•	•	•	•
Lightfighter	North-South Road	Hwy 1	Widen from 4 to 6 lanes				
Gigling	North-South Road	DFAS	Upgrade as 4-lane arterial	•	•	•	•
	DFAS	Eastside	Construct new 4-lane arterial	•	•	•	•

Table E-4
2015 TRANSPORTATION INFRASTRUCTURE IMPROVEMENT SUMMARY

FACILITY	SEGMENT		IMPROVEMENT DESCRIPTION	SCENARIO			
	From	To		Financially Unconstrained	Financially Constrained	Fort Ord Source Only	Impact Study Area Source Only
2nd Avenue	Del Monte	12th	Construct as 4-lane arterial	•	•	•	•
	12th	Lightfighter	Widen from 2 to 4-lane arterial	•	•	•	•
North-South Road	Normandy	Coe	Widen to 4 lanes	•	•	•	•
	Coe	Broadway	Reconstruct as 2-lane arterial	•	•	•	•
	Broadway	Highway 218	Reconstruct to 2-lane arterial	•	•	•	•
California	3rd	8th Street	Construct 2-lane arterial	•	•	•	•
Eastside Road	Imjin	Inter-garrison	Construct 2-lane arterial	•	•	•	•
	Inter-garrison	Gigling	Construct 2-lane arterial	•	•	•	•
Airport/MBEST Loop Road			Construct 2-lane collector	•	•	•	•
Misc. Rehab/Safety & Minor Street Improvements				•	•	•	•
Transit Capital Improvements							
Multimodal Rail	Salinas	Highway 1	Construct Heavy Rail Link - Post-2015				
			Reserve ROW within Fort Ord	•	•	•	•
Fleet Purchase and Replacement			Vehicles to serve new development (30)	•	•	•	•
			Replacements for existing fleet	•	•	•	•
Intermodal Centers			Construct center for bus and future rail	•	•	•	•
			P'n'R lot - 12th/Imjin	•	•	•	•
			P'n'R lot - 8th/Gigling	•	•	•	•
On-Site Bicycle/Pedestrian Improvements							
Include sidewalks on all reconstructed or new roadways				•	•	•	•
Include bike paths on all reconstructed or new arterial roadways				•	•	•	•

Table E-5
OFF-SITE REGIONAL FACILITIES LOS SUMMARY

Roadway	Segment	Daily Volume/LOS		
		Existing (1993/94) Condition	Financially Constrained	Financially Unconstrained
State Highway 1	State Highway 68 to Del Monte Blvd (Seaside)	56,000/D	65,000/E	65,000/E
	Del Monte Blvd (Seaside) to State Highway 218	60,000/D	72,200/F	71,900/D
	State Highway 218 to Fremont Blvd	59,000/D	87,500/F	89,000/D
	Fremont Blvd to Main Gate	75,000/D	101,200/E	99,700/E
	Main Gate to 12th Street	65,000/C	80,200/D	79,700/D
	12th Street to S. Marina (Del Monte Blvd)	71,000/C	75,100/D	75,600/D
	S. Marina (Del Monte Blvd) to Reservation Road	35,500/C	48,400/D	48,900/D
	Reservation Road to N. Marina (Del Monte Blvd)	35,500/C	47,400/C	47,600/C
	N. Marina (Del Monte Blvd) to State Highway 156	37,500/C	53,800/D	52,800/D
	State Highway 156 to Santa Cruz County line	30,000/E	60,200/F	70,700/F
State Highway 68	State Highway 1 to State Highway 218	22,800/F	36,300/F	38,700/C
	State Highway 218 to San Benancio Road (Highway)	20,600/F	30,200/F	10,000/B
	State Highway 218 to San Benancio (Freeway Bypass)	N/A	N/A	21,900/B
	San Benancio Road to Reservation Road	25,000/B	36,000/C	34,600/C
	Reservation Road to E. Blanco Road	29,500/B	43,900/C	42,500/C
State Highway 156	Hwy 1 to 0.1 miles East of Castroville Blvd.	22,000/B	35,600/C	30,900/B
	0.1 miles East of Castroville Blvd. to US 101	25,000/E	26,500/E	35,500/C
State Highway 183	US 101 to Davis Road	29,500/E	37,900/F	38,900/F
	Davis Road to Espinosa Road	16,000/C	32,900/F	30,700/B
	Espinosa Road to State Highway 156	22,000/D	53,300/F	50,900/D
State Highway 218	State Highway 1 to Fremont Boulevard	14,000/D	19,700/D	22,600/D
	Fremont Boulevard to North-South Road	10,850/B	10,900/B	12,200/C
	North-South Road to Hwy 68	10,850/B	16,500/B	17,800/B

Table E-5
OFF-SITE REGIONAL FACILITIES LOS SUMMARY

Roadway	Segment	Daily Volume/LOS		
		Existing (1993/94) Condition	Financially Constrained	Financially Unconstrained
Del Monte Boulevard	El Estero to Highway 1	34,300/F	50,000/F	49,300/D
	State Highway 1 to Broadway Ave	27,026/D	29,500/D	29,400/D
	Broadway Ave to Fremont Blvd	9,757/C	9,400/C	10,000/C
	State Highway 1 (S. Marina) to Reservation Road	28,836/D	29,700/D	29,600/D
	Reservation Road to State Highway 1 (N. Marina)	4,825/A	10,800/B	9,800/B
Fremont Blvd	State Highway 1/State Highway 68 to Broadway Ave	25,166/D	27,200/D	27,500/D
	Broadway Ave to State Highway 1	16,363/C	31,300/F	28,200/D
Broadway Avenue	Del Monte Blvd to Noche Buena Street	13,895/C	16,800/C	16,800/C
	Noche Buena Street to North-South Road	8,742/C	15,100/C	15,000/C
Reservation Road	Hwy 1 to Del Monte Boulevard	10,205/B	14,800/D	14,800/D
	Del Monte Boulevard to Crescent Ave	26,046/E	31,600/D	30,000/D
	Crescent Ave to Imjin Road	22,874/B	32,300/D	32,300/D
	Imjin Road to Blanco Road	N/A	47,500/D	29,700/C
	Blanco Road to Inter-garrison Road	3,700/A	22,700/B	15,600/B
	Intergarrison Road to Davis Road	4,700/A	24,200/E	16,000/C
	Davis Road to State Highway 68	6,200/A	9,600/B	12,100/B
Blanco Rd	Reservation Road to Davis Road	20,252/E	18,300/D	35,700/C
	Davis Road to State Highway 68	18,836/B	18,400/B	23,700/B
Blanco Rd/ Sanborn Rd	State Highway 68 to US 101	26,600/C	31,100/C	30,700/D
Davis Road	Reservation Road to Blanco Road	7,500/A	23,800/E	15,700/C
	Blanco Road to Rossi Street (Hwy 183)	24,000/E	29,000/E	26,300/B
	Rossi Street (Hwy 183) to US 101	34,829/F	35,900/F	38,300/B

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Table E-6
FORT ORD ARTERIAL FACILITIES LOS SUMMARY

Roadway	Segment	Daily Volume/LOS	
		Financially Constrained	Financially Unconstrained
12th/Imjin	State Highway 1 to California Avenue	20,800/D	19,900/D
	California Avenue to Eastside Road	12,800/B	12,500/B
	Eastside Road to Reservation Road	19,400/B	7,400/B
Blanco/Imjin Connector	Eastside to Reservation	N/A	10,800/B
8th Street	State Highway 1 Overpass to 2nd Avenue	300/C	300/C
	2nd Avenue to Inter-garrison	2,800/C	2,500/C
Inter-garrison Road	8th Street to Gigling Connector	3,500/B	3,000/B
	Gigling Connector to Reservation Road	13,100/C	7,400/A
Lightfighter	State Highway 1 to North-South Road	24,400/D	23,500/D
Gigling	North-South Road to Eastside	16,900/B	15,200/B
2nd Avenue	Del Monte Blvd to 12th Street	3,900/C	3,900/C
	12th Street to Lightfighter	12,100/D	11,800/D
North-South Road	Lightfighter to Gigling	19,700/D	18,400/D
	Gigling to Coe/Eucalyptus	16,900/B	16,200/B
	Coe to Broadway	15,500/E	14,900/D
	Broadway to State Highway 218	5,500/A	5,400/A
California Avenue	Reservation Road to 12th Street	9,600/D	13,200/D
	12th Street to 8th Street	1,700/D	2,100/D
Eastside Road	Imjin to Gigling	9,900/B	12,100/C

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Existing Conditions: This scenario reflects traffic conditions based on data reported for the regional network when most roads were last monitored for the Congestion Management Program (CMP) in 1993. The following roadway sections had exceeded the LOS=E threshold in 1993:

- Highway 1 north of Castroville
- Highway 68
- Highway 156
- Highway 183
- Del Monte Avenue in Monterey
- Reservation Road in Marina
- Blanco Road
- Davis Road in Salinas

Financially Constrained: This scenario is consistent with the EIR for the draft Fort Ord Reuse Plan. Transportation projects included in this model run reflect currently committed funds, plus limited funds generated from a flexible development-related financing program implemented on former Fort Ord. The Fort Ord financing program is defined to fund only projects within Fort Ord and those directly adjacent to the base and where improvements are needed primarily as a result of base reuse. The following roadway sections are expected to exceed the LOS=E threshold by 2015 under this funding scenario:

- Highway 1 north of Castroville
- Highway 1 from Highway 68 to Fort Ord Main Gate Entrance
- Highway 68
- Highway 156
- Highway 183
- Del Monte Avenue
- Fremont Boulevard in Seaside
- Reservation Road adjacent to former Fort Ord
- Davis Road adjacent to former Fort Ord
- Davis Road in Salinas
- North-South Road in former Fort Ord

Fort Ord Source Only: This scenario was not included in the EIR and assumes Fort Ord generated funding to the level indicated in the Fort Ord PFIP. The proposed fee equates to an $8,199 per EDU (source: draft Fort Ord Reuse Plan PFIP). The regional improvements added in this scenario are those deemed most important to base reuse and include Highway 156 upgrade; widening of Blanco Road and Reservation; a new bridge on Davis; and the extension of California Avenue. Under this scenario, it can be expected that the service levels on these improved roadway segments would be higher than those found under the Financially Constrained scenario. Additionally, these facilities would likely attract trips from other unimproved and congested routes. The net result being the potential for reduced congestion on some unimproved routes. For example, Highway 68 is likely to benefit from the improvements to Blanco, Davis and Reservation. However, in this case, it is still likely to operate at LOS F. Other poorly operating road segments where no direct or parallel route improvements are made, including Highways 1 and 183, would be expected to remain at LOS F as forecast under the Financially Constrained scenario.

Financially Unconstrained: This scenario is generally consistent with the *Optimistic Financing Scenario* reported in the draft Fort Ord Reuse Plan and EIR. Transportation projects included in this model run reflect a goal to achieve acceptable LOS in the year 2015 on all roads impacted by Fort Ord Reuse. However, the Financially Unconstrained scenario used in the TAMC Study includes the following two projects that were

not included in the costs reported in the Fort Ord Reuse Plan: 1)widening of Highway 1 between Highway 68 and Fremont Boulevard interchange in Seaside, and 2) widening of Davis Road in Salinas. The following roadway sections are expected to exceed the LOS=E threshold by 2015 under this funding scenario[2]:

- State Highway 1 north of Castroville
- State Highway 183

TRANSIT/RAIL USE

The reuse of Fort Ord will place increased demands on the internal and regional transportation systems. Mass transit (rail/transit) will play a vital role in meeting these demands, both as a primary mode of travel for those without access to autos (transit dependent), and as an alternative to the auto travel for those that have a choice (discretionary travelers). From a regional perspective, transit may help accommodate travel and minimize congestion pressures along key regional roadway corridors leading to and around Fort Ord.

Land use and urban form are important factors contributing to the design and effectiveness of transit service. In general, transit is most effective in urban settings where densities are higher, and where development occurs along a corridor. With its large area and low population, Monterey County is largely rural in character. According to the land use data reported above, current densities in the Peninsula and Salinas areas are low to moderate for urban settings and may be typical of a suburban location outside a major metropolitan center, although there are areas of concentrated housing and employment development. These densities, however, are expected to increase significantly by the year 2015, up to 40% on average in Salinas, and this should lead to higher transit ridership potential.

Based on the MCTAM results and the land use characteristics for each Fort Ord Analysis District, the primary inter-regional travel corridors are defined as:

- Fort Ord-Marina,
- Fort Ord-Salinas (Blanco, Davis, and Reservation Roads), and
- Fort Ord-Seaside-Monterey Peninsula (Highway 1, Broadway, and Del Monte Boulevard).

These corridors represent prime candidates for high-quality transit service. The above assessment indicates that the Fort Ord districts with the highest transit potential are the Airport/MBEST and Central Core/CSUMB districts. Proposed development densities and levels of activity are highest in these districts. The Northern Residential district may also be a key transit area because it lies between these two districts, and thus could be served by a transit route connecting MBEST and CSUMB. For the Southern Residential district, it would be natural to provide connections between the POM Annex and other military facilities in the region. Outside of the POM Annex, peak-period commute service to employment centers in Salinas and on the Monterey Peninsula may be appropriate.

Bus transit service typically sustains relatively higher operation and maintenance costs than does rail. However, rail service often requires significantly higher capital costs compared to equivalent bus service. Ridership on rail lines must be relatively high before the capital costs are justified, and it becomes a more cost effective service than bus service. Rail is thought to be a feasible alternative once the bus

[2]The draft Fort Ord Reuse Plan EIR indicates Davis Road in Salinas and sections of State Highway 1 between Highway 68 and Fort Ord Main Gate Entrance are expected to exceed LOS=E conditions under the Financially Optimistic Scenario.

headways on a given route or along a corridor approach 4 trips per hour. Because rail service involves a large initial capital investment, a thorough cost analysis should be performed before a decision can be made between using buses or rail service along individual transit corridors.

Based on the previous information, Highway 1 between Monterey and Fort Ord is a candidate corridor for rail service. If rail is implemented between Monterey and Fort Ord, bus routes along this corridor could be realigned to serve as feeder lines to the rail stops. The proposed rail line along this corridor could potentially eliminate or delay the need to widen Highway 1 between Highway 68 and Marina. TAMC has a long term goal for rail service connecting Salinas, Fort Ord and Monterey. A crucial part of this plan is the implementation of rail service between Monterey and Fort Ord. Rail service to Fort Ord may initially terminate at CSUMB and eventually extend to the MBEST Center. Rail connection from MBEST to Salinas is expected to be a viable alternative to widening Blanco Road beyond the 4-lane expansion called for in the Fort Ord Reuse Plan by the Year 2015.

PROPOSED REGIONAL TRANSPORTATION SYSTEM

The proposed regional transportation system generally reflects the Financially Unconstrained Scenario explained in the previous section of this report. The proposed 2015 transportation network is illustrated in Figure E-3, and the bicycle network is illustrated in Figure E-4. In addition to the roadway improvements described previously, the proposed transportation system includes several transit-related improvements. Proposed improvements include the construction of three intermodal centers within the boundaries of the former Fort Ord, and the expansion of bus service to accommodate the demand generated by projected growth in Fort Ord and the surrounding region. However, this system reflects a worst case scenario in terms of cost because it assumes historical use of alternative modes of transportation. For example, the historical transit mode share in Monterey County is 2 percent. The number of person trips in Monterey is expected to increase by approximately 500,000 between 1990 and 2015. Based on historical shares, this would result in an additional 10,000 transit riders. Transit and rail service would significantly reduce the number and cost of the proposed roadway projects if the transit mode share is increased.

The estimated costs for the individual roadway and transit capital improvements are listed in Table E-7. It must be recognized that this table does not include all potential transportation projects within the region through the year 2015. It includes only major improvements to the regional system and those within the former Fort Ord.

To support the possible implementation of a development-related financing mechanism, a preliminary nexus analysis of the proposed improvements was conducted. The purpose of this analysis was to identify the "fair share" of each proposed improvement that could be allocated to future development. As part of this process, dedicated or expected funding for each improvement was identified, and the remaining balance distributed between Fort Ord development, non-Fort Ord development and public shares. These shares were determined based upon the projected relative contribution to the demand for an improvement. The preliminary nature of this analysis is reflected in the use of only two "zones" for the nexus determination - inside the boundaries of Fort Ord versus outside (see Figure E-5). Prior to the implementation of a development-related financing mechanism, a more detailed nexus analysis involving multiple zones outside Fort Ord would likely be required. The results of the preliminary nexus analysis for individual capital projects are presented in Table E-7. A summary of these results is presented below:

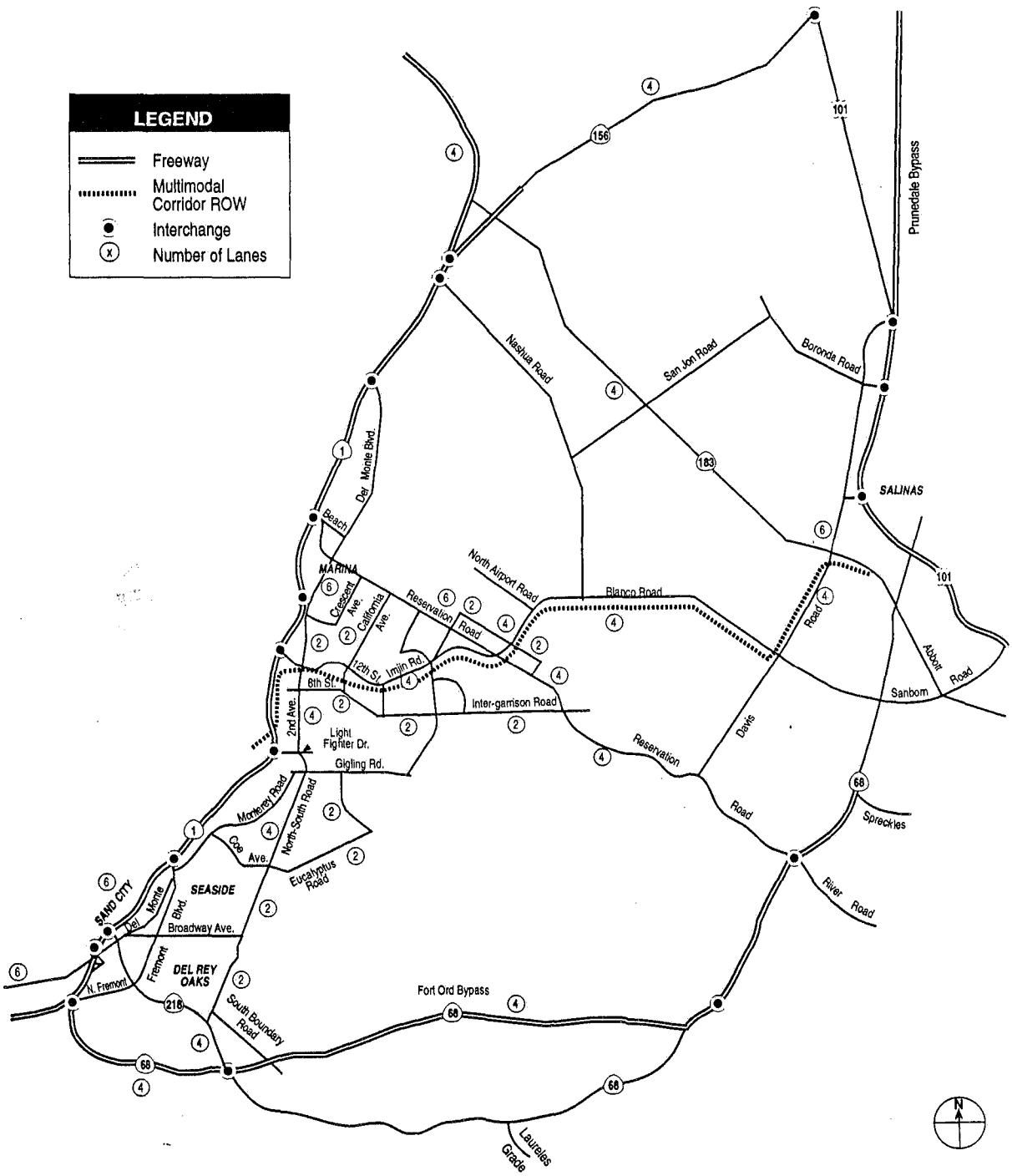


Figure E-3
Financially Unconstrained Scenario — 2015 Transportation Network

50068 Fncl'ly Prpsd 2015

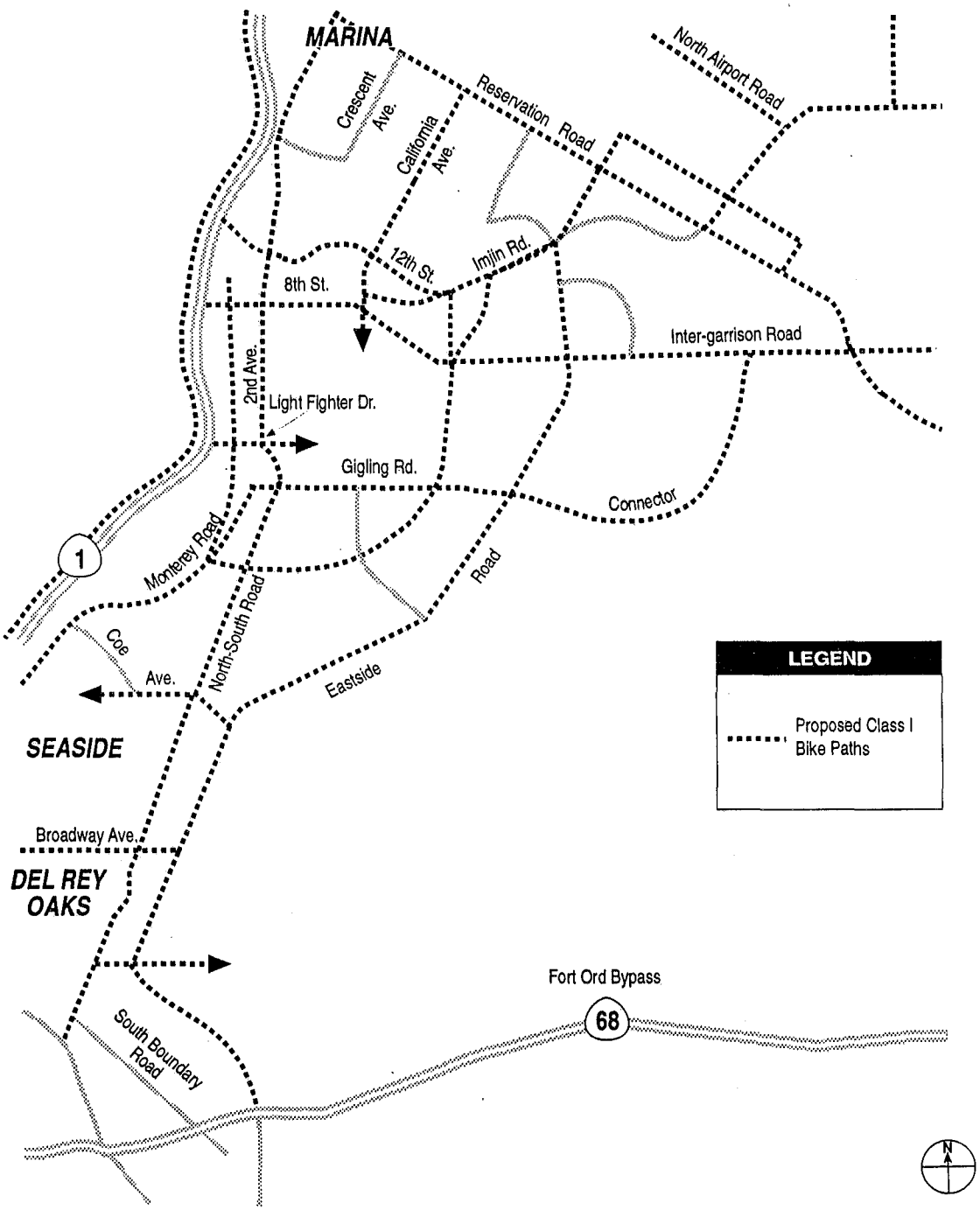
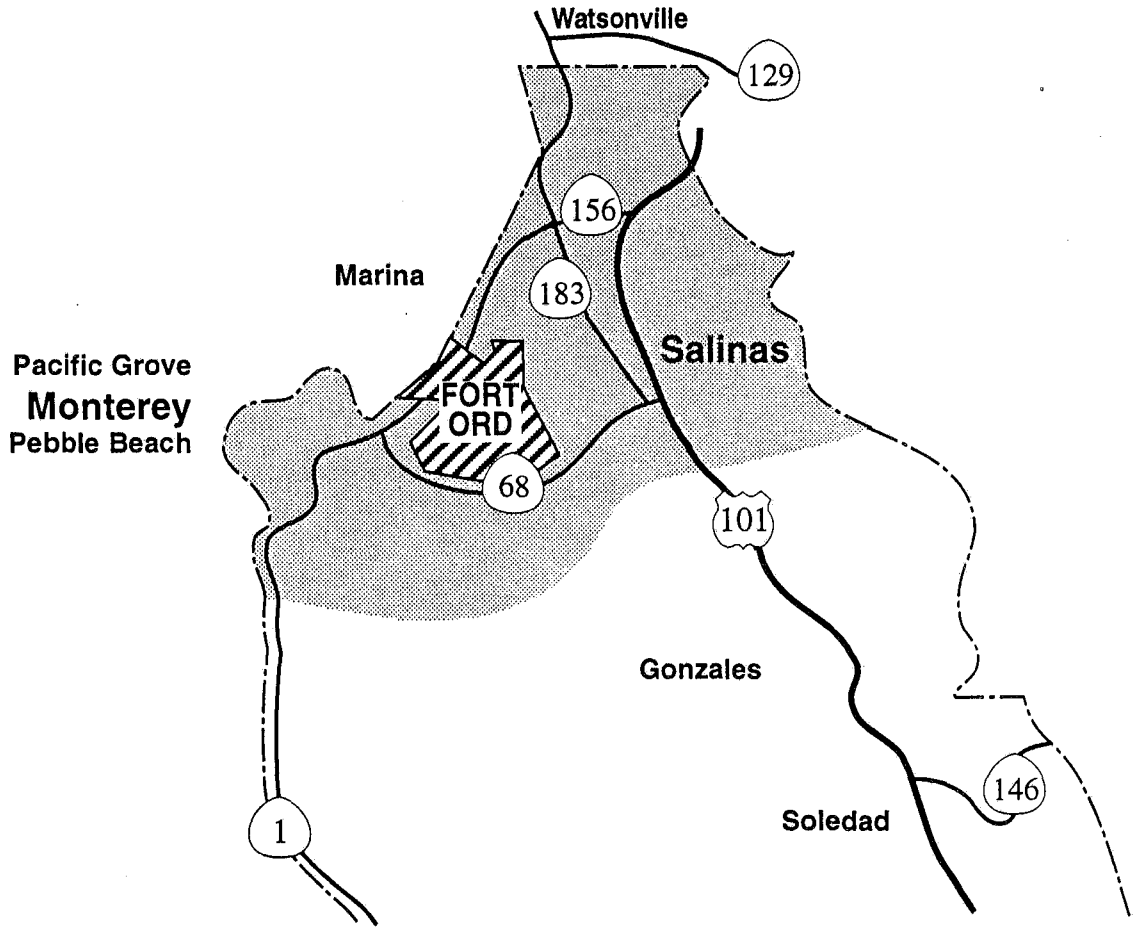


Figure E-4
Proposed Bicycle Network

EDAW, Inc. March, 1996

Source: JHK, 1996

50068 FORA Prpsd Bkc



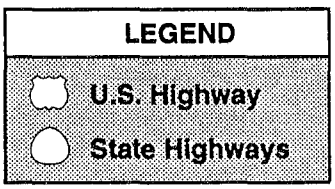


Figure E-5
Impact Study Area

50068 Impct Stdy

Table E-7
2015 FORT ORD REGIONAL TRANSPORTATION STUDY
PRELIMINARY NEXUS ANALYSIS RESULTS

FACILITY	ESTIMATED COST	DEDICATED/EXPECTED FUNDING (1)		UNFUNDED COST ALLOCATION(2)		
		Amount	Source	Fort Ord Development	Impact Study Area Development	PUBLIC(3)
Regional Highway Projects						
Highway 1 - Hatton Canyon	$36,000,000	$36,000,000	STIP	$0	$0	$0
Highway 1 - North of Castroville	$60,000,000	$0		$0	$0	$60,000,000
Highway 1 - Seaside/Sand City	$20,000,000	$0		$6,400,000	$13,600,000	$0
U.S. 101 - Prunedale By-Pass	$236,000,000	$107,000,000	STIP	$0	$0	$129,000,000
U.S. 101 Interchanges	$63,000,000	$0		$0	$0	$63,000,000
Highway 68 - Bypass Freeway	$177,000,000	$0		$18,054,000	$138,768,000	$20,178,000
Highway 156 Widening	$50,000,000	$0		$0	$0	$50,000,000
Highway 183 Widening	$59,000,000	$0		$0	$56,050,000	$2,950,000
Highway 218 - North-South to Hwy 68	$3,590,000	$0		$1,629,860	$1,960,140	$0
Expected STIP County Minimum Funds (4)	$0	$56,000,000	STIP	$0	$0	($56,000,000
SUBTOTAL	$704,590,000	$199,000,000		$26,083,860	$210,378,140	$269,128,000
Off-Site Arterial Improvements						
Davis Road - Widening n/o Blanco	$10,000,000	$0		$5,570,000	$3,720,000	$710,000
Davis Road - New bridge	$5,000,000	$0		$2,030,000	$2,970,000	$0
Blanco Road - Widening and bridge	$12,378,000	$0		$6,337,536	$5,520,588	$519,876
Reservation Road - Widening	$12,664,400	$0		$9,068,973	$3,431,417	$164,010
Del Monte - Seaside/Monterey	$10,000,000	$0		$3,420,000	$3,460,000	$3,120,000
Del Monte - Marina	$5,576,300	$0		$4,488,922	$1,087,379	$0
California	$2,460,000	$0		$697,500	$1,162,500	$600,000
Crescent	$720,000	$0		$720,000	$0	$0
SUBTOTAL	$58,798,700	$0		$32,332,931	$21,351,884	$5,113,886
On-Site Improvements						
Gateway and Misc Safety Improvements/Rehab	$20,300,364	$9,780,000	DOAG	$10,520,364	$0	$0
Abrams	$603,000	$0		$603,000	$0	$0
12th/Imjin	$9,065,000	$0		$4,532,500	$4,532,500	$0
Blanco/Imjin Connector	$4,080,000	$0		$4,080,000	$0	$0
8th Street	$3,821,900	$0		$3,248,615	$573,285	$0
Inter-Garrison	$4,480,000	$0		$3,808,000	$672,000	$0
Gigling	$4,537,800	$0		$3,221,838	$1,315,962	$0
2nd Avenue	$7,232,500	$0		$5,398,068	$1,834,432	$0
North-South Road	$6,160,600	$0		$3,326,724	$2,833,876	$0
California	$2,769,200	$0		$1,038,450	$1,730,750	$0
Salinas Ave.	$2,412,000	$0		$2,412,000	$0	$0
Eucalyptus Road	$2,880,000	$0		$2,880,000	$0	$0
Eastside Road	$6,020,000	$0		$4,358,480	$1,661,520	$0
SUBTOTAL	$74,362,364	$9,780,000		$49,428,039	$15,154,325	$0
Transit Capital Improvements						
Transit Vehicle Purchase & Replacement	$15,000,000	$0		$5,000,000	$5,000,000	$5,000,000
Intermodal Centers	$3,800,000	$0		$3,800,000	$0	$0
SUBTOTAL	$18,800,000	$0		$8,800,000	$5,000,000	$5,000,000
TOTAL CAPITAL COSTS/SHARES	$856,551,064	$208,780,000		$116,644,830	$251,884,349	$279,241,886

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(1) Includes $56 million in expected STIP funds not yet allocated. Does not include traffic impact fees already collected, that may be used for some of these projects.
(2) Allocation of costs based on a "Nexus" assessment of individual improvements. Fort Ord and Impact Study Area Development shares based on relative contribution to traffic volume growth on subject facility.
(3) "Public" includes share for existing congestion and portion of traffic growth attributable to trips outside the study area. (Note: in some instances, where the percentage of trips with one or both ends are external to Fort Ord and the study area is significant, the Nexus requirement cannot be met and the full cost must be covered by non-development sources).
(4) Assume that STIP County Minimum funds will be allocated to highway improvements. Specific projects not yet specified.

Table E-9
POTENTIAL FUNDING STRATEGIES

Improvement Type	Costs/ Expected Funding	Unfunded Share/Potential Funding Level		
		Public	Fort Ord Development	Other Development
ROADWAY CAPITAL IMPROVEMENTS				
Total Estimated Costs	$838 million			
Funds from Expected Sources	$209 million			
Shortfall	$629 million	$274 million	$108 million	$247 million
Potential Funding Sources/Strategies:				
Increased federal/state funding (Demonstration funds, STIP)		✓	✓	✓
Local-option Tax		✓	✓	✓
Development-related Financing Program			✓	✓
Tax Increment Financing			✓	✓
Toll Road Financing		✓	✓	✓
TRANSIT CAPITAL IMPROVEMENTS				
Total Estimated Costs	$19 million			
Funds from Expected Sources	$0			
Shortfall	$19 million	$5 million	$9 million	$5 million
Potential Funding Sources/Strategies				
Increased federal/state funding (Section 3, TCI, TDA)		✓	✓	✓
Local-option Tax		✓	✓	✓
Development-related Financing Program			✓	✓
Tax Increment Financing			✓	✓
TRANSIT OPERATIONAL IMPROVEMENTS				
Total Estimated Costs	$112 million			
Funds from Expected Sources	$36.1 million			
Shortfall	$75.9 million	$0	$38.5 million	$37.5 million
Potential Funding Sources/Strategies:				
Increased federal/state funding (FTA Section 9, LTF, TDA)		✓	✓	✓
Local-option Tax		✓	✓	✓

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1. INTRODUCTION

This report represents the Draft Fort Ord Regional Transportation Study being conducted for the Transportation Agency for Monterey County (TAMC). The purpose of this study was to define the transportation system needs within the northern portion of Monterey County, and to identify feasible funding sources. The study considered regional growth through the Year 2015 defined by the AMBAG 1994 Regional Population and Employment Forecast, which is consistent with the current draft Fort Ord Reuse Plan. In particular, this study focused on the portions of the regional system most impacted by the reuse of Fort Ord.

The Regional Transportation Study followed the development of the draft Fort Ord Reuse Plan for the Fort Ord Reuse Authority (FORA). This sequencing was necessary because the land use element of the draft Reuse Plan was a critical input to this transportation planning study. It should be noted, however, that the transportation analysis was conducted concurrently for both studies, to the extent possible. This ensured a maximum level of consistency in the assumptions and results used in both efforts. A difference between the studies was that the draft Reuse Plan focused on the transportation needs within the former Fort Ord, whereas the Regional Transportation Study focused on the regional system outside of the fort's boundaries. Furthermore, the Regional Transportation Study reflects the evolution of the regional transportation plan that has occurred, in part, in response to the comments received on the draft Reuse Plan.

At its peak, Fort Ord was home to 17,700 military personnel and employed 2,700 civilians from the neighboring communities. Access to the base was limited to a small number of gates, and the internal road system was a collage of roadways and parking facilities scattered about to serve the Army's unique needs. The proposed reuse plan for the former Fort Ord includes approximately 45,000 jobs and over 22,000 housing units at buildout, as well as a 25,000-student California State University at Monterey Bay (CSUMB) campus. By the year 2015, 18,000 jobs, 13,000 housing units, and 12,500 CSUMB students are expected to occupy the former Fort Ord area.

It is clear that the redevelopment of the former Fort Ord, combined with growth throughout the remainder of Monterey County and the region, will significantly increase the demand placed on the region's transportation infrastructure and services. These increases in travel demand may be managed by building or improving transportation facilities, as well as through a variety of concepts and strategies intended to minimize the demand for vehicle trips as an alternative to increasing roadway capacity. This multi-strategy approach is reflected in both the draft Fort Ord Reuse Plan and this study. The resulting transportation plan is comprised of several key elements: increasing capacity on existing and new roadway facilities, enhancements to the regional transit/rail system, development of an extensive on-base bicycle and pedestrian network, and a demand management program. Furthermore, the draft Reuse Plan incorporates several land-use-related concepts that are intended to minimize the transportation impacts of base reuse. The approach taken seeks to balance these components to achieve a transportation system that is both financially feasible and operationally acceptable.

The plan presented in this paper expands on the results from the draft Fort Ord Reuse Plan, and focuses on the regional roadway network for the year 2015. This forecast year was chosen because it represents the latest year for which regional land use data and network forecasts are available. These forecasts, along with similar information for the former Fort Ord, were used to model travel demand for 2015 and estimate performance levels of the regional network. This plan includes an overview of the key

Costs of Proposed Transportation System:

Existing funds ($143 + $56 M from STIP; $9.8 M from DCAG):	$209 million (24%)
Unfunded On-Base transportation capital3 improvements:	$73 million (9%)
Unfunded Off-Base transportation capital4 improvements:	$574 million (67%)
Total Cost of Proposed Transportation Capital Improvements:	$856 million (100%)

Funds Expected to be Generated From Revenue Sources:

Existing funds ($143 + $56 M from STIP; $10 M from DCAG):	$209 million (24%)
Ford Ord Development:	$116 million (14%)
Study Area Development (Cities/County Outside of Fort Ord):	$252 million (29%)
Unfunded (additional Fed/State funds or sales tax):	$279 million (33%)
Total:	$856 million (100%)

In order to implement a successful transit service, operation and maintenance costs must be included in the financing discussions. The estimated cost to implement adequate transit service to former Fort Ord and other proposed growth throughout the region in listed in Table E-8. In terms of cost breakdown over the next 20 years, the capital costs for regional improvements to the transit system are expected to exceed $18 million, while the incremental 20-year operations and maintenance costs are estimated to equal $112 million (or $5.6 million per year). Capital improvements represent 14 percent of the anticipated transit improvement costs, while operation and maintenance will represent 86 percent of the costs to provide the proposed transit service.

The capital costs for the proposed regional transit service listed in Table E-8 were included in the nexus analysis. It is the consultant's opinion that operating and maintenance funds for public mass transit systems should rely on a funding mechanism other than traditional development impact fees. In general, this conclusion was reached because the nexus test associated with traditional impact fees is difficult to defend for transit projects. However, it should be noted that it is possible to have new development fund transit opertations as part of mitigation measures. For example, the Monterey Bay Aquarium agreed to partially fund the WAVE ransit system as part of their recent expansion.

As the cost and expected funding assessments indicate, there is a potential $724 million (including a $76 million shortfall for transit operations) funding shortfall for the set of transportation system improvements identified in this study; a number that does not include minor improvements to the regional system nor local improvement projects. Options for filling this shortfall include securing additional funds from traditional federal and state programs, or establishing new revenue-generating mechanisms. Potential new funding programs include local-option taxes, development-related financing, and tax increment financing.

[3]Includes purchase of 15 new busses to serve Fort Ord over 20 years, but does not include operations & maintenance costs to run busses.

[4]Includes purchase of 15 new busses to serve regional development over 20 years, but does not include operations & maintenance costs to run busses.

Table E-8
2015 FORT ORD REGIONAL TRANSPORTATION PLAN
TRANSIT IMPROVEMENT SUMMARY

Improvement Description		Estimated Cost
Capital Costs		
Vehicle Purchase and Replacement	Vehicles to Serve New Development	$10,000,000
	Replacement Vehicles	$5,000,000
Intermodal Centers	Construct Bus/rail Center on Fort Ord	$1,800,000
	Construct Park and Ride Lot North of CSUMB	$900,000
	Construct Park and Ride Lot South of CSUMB	$1,100,000
Capital Cost Subtotal		$18,800,000
Operational Costs		
Expand Transit service within Former Fort Ord		$56,000,000
Expand Regional Transit Service		$56,000,000
Operational Cost Subtotal		$112,000,000
TOTAL TRANSIT COSTS		**$130,800,000**

In trying to match the identified funding sources with the suggested improvements, there are two facts that are important to consider. First, some sources, both existing and potential, are constrained with respect to the types of projects that may be funded from that source. For example, funds from sources may only be used for roadway capital projects, while those from other sources may only be used for transit operational expenditures. Second, development-related financing, identified as a likely potential source of funding, is limited in the amount or share of a project's cost that it may cover. Typically, development-related financing is limited to covering that portion of a project's costs equal to the share that the development contributes to the need for a particular improvement project Additionally, development-related financing cannot be used when a large percentage of new trips start or end outside the assessment area and, therefore, could not be charged. Thus, improvements to major facilities serving a high percentage of inter-regional trips cannot be included in a development-related fee program. These constraints greatly impact the amount that can be generated through such programs, and how the funds may be used.

Knowledge of these limitations or constraints, combined with the cost allocation and nexus analysis presented previously, may be used to identify potential funding sources or strategies for the transportation system presented in this report. Consistent with these limitations, the potential funding strategies may be differentiated according to the type of improvement: roadway capital, transit capital, and transit operational. A summary of the potential funding strategies is provided in Table E-9. In reviewing these strategies, it must be recognized that the intent of this study was to identify the funding needs and options. The implementation of any potential financing program requires policy decisions that are beyond the scope of this study.

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links in the transportation network and the improvements needed to meet the forecasted demands. This plan also examines the implications of the uncertainty in the funding of transportation improvements.

The findings, results and recommendations presented in this report are derived from a series of working papers prepared for this study. These papers included:

- #1: Literature Review and Study Database
- #2: Funding Sources Available for Transportation Projects
- #3: Roadway Transportation Plan for Year 2015
- #4: Public Transportation Issues

Presentations were made on these working papers to the TAMC Board, TAMC Technical Advisory Committee (TAC), TAMC Citizen's Advisory Committee (CAC), FORA Infrastructure TAC, and FORA Administrative Committee. These documents are available for public review at the TAMC office. This report pulls together information from these working papers, and reflects revisions made in response to the comments received.

The following chapter provides a summary of previous Fort Ord planning activities and describes the relationship between the current FORA draft Reuse Plan and TAMC Transportation Study efforts. Chapter 3 provides background information on the current socio-economic and transportation setting, as well as on the projected socio-economic changes for the year 2015. The relationship between land use and transportation is also discussed, including the land use element of the draft Fort Ord Reuse Plan. The preferred transportation plan is described in Chapter 6, while the financing requirements for this plan are discussed in Chapter 7. Issues requiring further discussion or study are presented in Chapter 8.

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2. FORT ORD PLANNING PROCESS

The current TAMC Study builds upon previous work conducted as part of the closure and reuse of former Fort Ord. A number of efforts have been undertaken by a variety of parties, including community groups, local jurisdictions and the U.S. Army. This chapter provides an overview of the recent planning efforts for Fort Ord, with an emphasis on transportation.

2.1 PAST ACTIVITIES

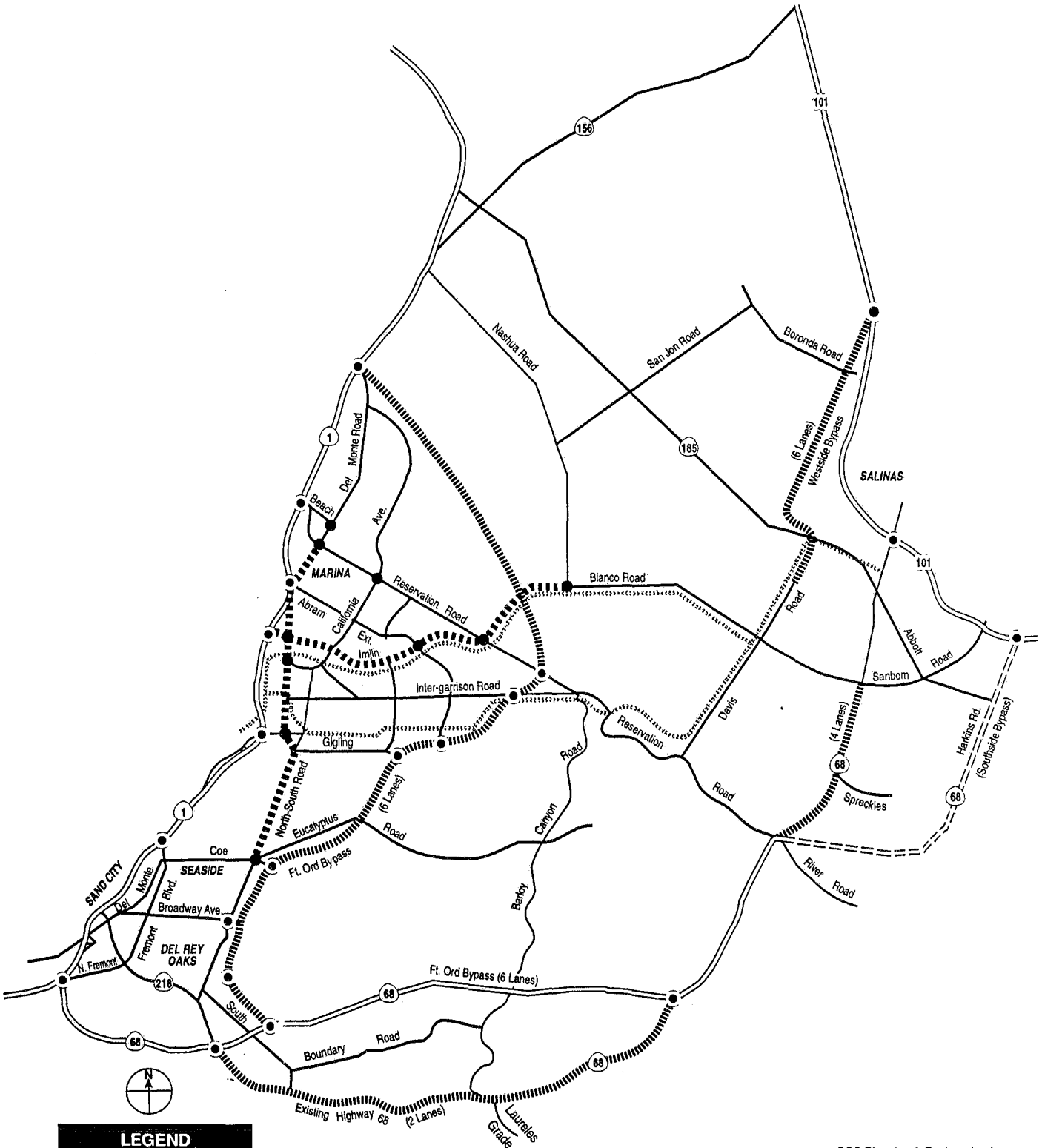
Plans for the closure of Fort Ord were first announced in January 1990. In response, a community task force composed of county supervisors, mayors, and community members with special knowledge of the area was appointed to review the recommendations. The task force, led by retired General James Moore, produced a sixty-page report on March 23, 1990, recommending against closure of the base. Later in 1990, the Base Closure Commission was established by Congress to review the Department of Defense recommendations for base closures. In April 1991, the Commission recommended over 100 bases across the country be closed and Fort Ord was again included among those bases. The original task force that had been appointed to review the base closure recommendation was reorganized into seven advisory groups to cover the following topics:

- Land Use
- Economic Development
- Education
- Housing
- Health and Human Services
- Utilities and Infrastructure
- Pollution Cleanup

The work by these subgroups culminated in a publication of a 760-page *Fort Ord Community Task Force Strategy Report* in June 1992.

On October 1, 1992, the Fort Ord Reuse Group (FORG) was formed, composed of the cities of Marina, Seaside, Del Rey Oaks, Sand City, and Monterey, and Monterey County. A working group was organized consisting of the planners of the represented jurisdictions with the charge to formulate the initial base reuse plan and ultimately a final plan. The initial base reuse plan was approved by all of the jurisdictions in April 1993 and became the basis for an Environmental Impact Statement (EIS) prepared by the U.S. Army and completed in July 1993. After completion of the EIS by the Army, FORG prepared a revised reuse plan that was completed in October 1993.

One of the significant activities of FORG was the preparation of an evaluation of the infrastructure needs that matched the base reuse plan that was emerging. In October 1993, the Fort Ord Reuse Infrastructure Study (FORIS) was initiated. The study resulted in the FORIS report (Reimer Associates, September 1994). Included within the scope of the FORIS was evaluation of the transportation infrastructure needs of the reuse plan. The transportation plan was developed by CCSPlanning and Engineering, Inc. (CCS Planning, June 1994) with supporting engineering analysis and documentation by HMH, Inc. (HMH, Inc., 1993, February 1994, and May 1994). Six major transportation alternatives were evaluated in the CCS study, and a recommended highway network was identified. The ultimate roadway network proposed in the FORIS is illustrated in Figure 2-1.



Source: CCS Planning & Engineering Inc. **Transportation Planning Study,** June 4, 1994, part of the **Fort Ord Reuse Infrastructure Master Plan Working Paper** prepared by Reimer and Associates, September 1994.

Figure 2-1
FORIS Proposed Ultimate Roadway Network

50068 Ultmt Ntwrk

Because of limited funding and the limited capabilities of the special travel demand model runs, no evaluation of transit or demand management alternatives were included in the FORIS transportation analysis. However, the networks presented in this study did include a fixed guideway to link the reuse area and Salinas. Two alignment options are shown in each roadway network map: Blanco-Imjin and Davis-Intergarrison-Gigling. No discussion of this fixed guideway service are provided in the FORIS report.

In a parallel effort, TAMC initiated an effort to identify and design a multimodal corridor to link the Fort Ord reuse area with U.S. 101. The study, begun in February 1993, was completed in July 1993 (Wilbur Smith and Associates, July 1993). Five major corridors were evaluated in the study. The study included alternative routings for a Westside Bypass of the City of Salinas and alternative routings from the south end of Salinas into and through the reuse area. The study identified Blanco/Gigling and Blanco/Imjin corridors as having the highest ranking with no fatal flaws. The study's authors found that it was impossible to clearly identify a preferred alternative between these two without a final land use plan. They also could not produce a final recommendation for alignment of the Westside Bypass on the basis of information available at the time of the study.

Both the TAMC and FORG studies documented a significant deficiency in the existing roadway network of the county for providing access to the reuse area. Wilbur Smith & Associates states:

> There is unacceptable congestion today on most roads serving northern Monterey County travel demand. Highways 1, 101 and 183 operate at level-of-service(LOS) D, Highway 68 at level-of-service E, and Highway 156 at level-of-service F. Interchanges and intersections on these roads operate at even lower levels of service. Local roads such as Blanco, Davis, and Reservation Roads are convenient local routes between Highways 1 and 101, and some sections of these routes operate at LOS F today. (page ES-3ff)

2.2 CURRENT ACTIVITIES

In May 1994, the Fort Ord Reuse Authority (FORA) was established as a successor to FORG in response to state legislation sponsored by Senator Henry Mello. FORA was charged with the responsibility to prepare, adopt, finance, and implement a plan for the land occupied by Fort Ord. The FORA Act authorized the FORA Board to prepare and adopt a Reuse Plan for the former Fort Ord. Key elements of the draft Fort Ord Reuse Plan include land use, transportation, conservation, recreation, and a five-year capital improvement program. In May 1995, work on the draft Reuse Plan began using the FORG-initiated Interim Base Reuse Plan as a foundation. This effort has led to the development of an updated plan that has been documented in the draft Fort Ord Reuse Plan (May 1996) and Environmental Impact Report (May 1996). Both the Plan and EIR have been distributed and are undergoing public review. As described in the introduction of this report, the Regional Transportation Study expands on the results from the draft Fort Ord Reuse Plan.

The planning process for these two studies involved a number of key steps. First, as part of the draft Reuse Plan activity, a number of land use and design characteristics were incorporated into the draft Reuse Plan with the goal of reducing demand placed on regional transportation system. The demand generated by the resulting land use plan was then modelled to identify needs and improvements based on existing mode choice levels. This analysis formed the basis for both studies.

While consistency in the transportation analysis was emphasized, differences in the two studies must be recognized. The first, affecting primarily format rather than content, is that the draft Reuse Plan focused on the transportation needs within the former Fort Ord, whereas the Transportation Study focuses on the

regional system outside of the fort's boundaries. Second, the Transportation Study includes a more detailed examination of where transit might be most effective and how it might eliminate or delay the need for roadway improvements. Third, the Transportation Study reflects the evolution of the regional transportation plan that has occurred, in part, in response to the comments received on the draft Reuse Plan and the working papers that preceded this report.

As noted earlier, the analysis conducted for this study was based on the land use assumptions for Fort Ord that were contained in the draft Fort Ord Reuse Plan. Subsequent to this analysis, but prior to the preparation of the final Regional Transportation study report, the final Reuse Plan and EIR were adopted by the FORA Board. As part of the Reuse Plan's review and adoption process, the land use assumptions for Fort Ord were revised. The following is a comparison of the land use levels contained in the adopted Reuse Plan and those used as part of this study:

Development Level Reported in Draft Reuse Plan/DEIR in May, 1996	**Development Level Reported in Final Reuse Plan/FEIR in March, 1997**
22,200 Housing Units	10,816 Housing Units
45,400 Jobs	18,342 Jobs
71,000 Population	37,370 Population

As the summary above indicates, the expected development levels for Fort Ord have decreased. Consistent with these modifications, it may be assumed that level of demand for transportation services and facilities would also decrease. Thus the level-of-service results and recommended improvements identified in this report may differ from those included in the Final Reuse Plan.

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3. SETTING

The primary goal of this study was to identify a set of transportation improvements and strategies that would help accommodate future travel demand in the most efficient and effective manner. To accomplish this goal it, is important to have an understanding of the existing transportation system and its operating condition. It is equally important to understand the socio-economic characteristics that drive travel demand, both currently and the future. In addition to these topics, this chapter addresses the transportation-land use connection, with particular emphasis on how these concepts were incorporated into the land use element of the draft Fort Ord Reuse Plan.

3.1 EXISTING TRANSPORTATION SYSTEM

Accessibility and mobility in the region depend primarily upon a system of regionally significant roadways and transit services. This system, along with an internal network that includes bicycle and pedestrian facilities, is critical to the reuse of Fort Ord. Figure 3-1 illustrates the primary existing roadway facilities within Fort Ord, as well as the elements of the regional roadway network considered most relevant to Fort Ord. This regional network includes state highways and major arterial roads that serve intra- and inter-regional travel needs of the former Fort Ord and northern Monterey County. Key features of the existing roadway, transit, pedestrian, and bicycle networks are described below.

3.1.1 Internal Roadway Network

The existing road system is a collage of roadways and parking facilities scattered about to serve the Army's unique needs. This roadway network consists of a mix of arterial and local roads that generally fall into one of four types: 2-lane Rural Local, Residential Local, Urban Arterial and Rural Arterial. The 2-lane rural roads primarily serve the artillery ranges and remote areas of the Base. These roads are paved but not engineered to any specific standard. The residential streets serve permanent housing areas as well as several mobile home park facilities such as Marshall Park Family Housing and Patton Park Family Housing. Urban arterials are multi-lane facilities having curbs and, in some cases, sidewalks and a median. Rural arterials have no curbs, sidewalks, or medians.

The current road system was developed by the Army as the base expanded over the past fifty years. In many instances, the land use patterns created by the Army do not produce the same types of traffic patterns as those that might be found in a civilian urban population. Thus, the existing roadway network is, in some cases, not compatible with the proposed civilian land uses.

In other cases, however, existing roadways provide the foundation for planning the future network within the reuse area. The key existing arterial roadways within Fort Ord include 2nd Avenue, Light Fighter Drive, Gigling Road, Imjin Road, Inter-garrison Road, North-South Road, and 12th Street.

Another important characteristic of the internal network is its connectivity with the regional system. As a military installation, access into Fort Ord was limited to a small number of entry gate locations. Since the closure of the base, many of the gates have remained closed, further limiting access into the Fort Ord area. As the transition to civilian use has begun, some of the gates have been reopened. The gates that are most relevant to the reuse of the former Fort Ord include those on Lightfighter Drive (Main Gate), 12th Street, Imjin Road, Inter-garrison Road (East Garrison), North-South Road north of Highway 218, Broadway Avenue, and Ord Avenue.

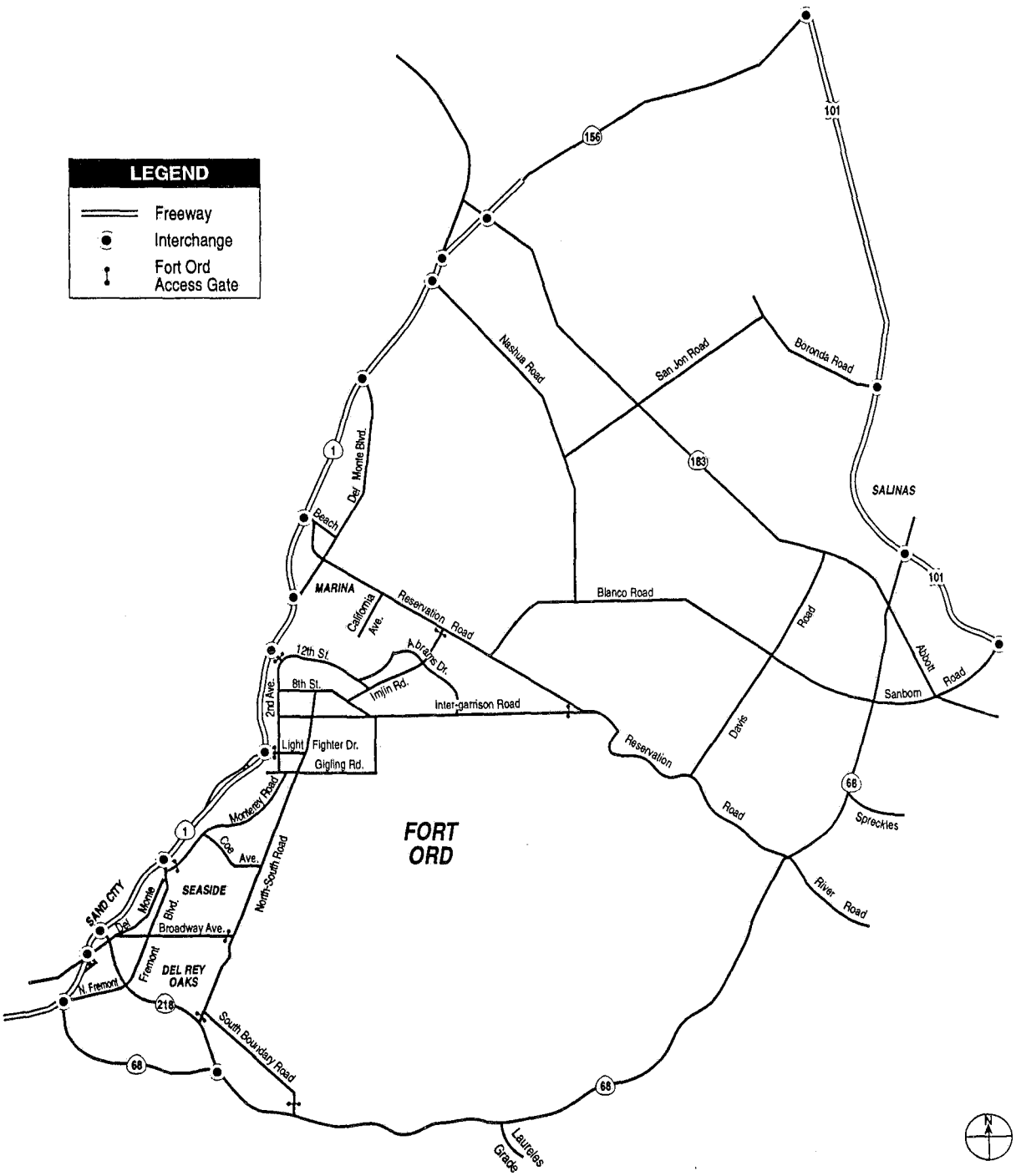

Figure 3-1
Existing Transportation Network

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3.1.2 Regional Roadway Network

For this study, the regional network is comprised of all major arterials and state facilities includedin the CMP network in the vicinity of the Fort Ord area. This network is vital to the area's mobility and serves both intra- and inter-regional travel. State Highway 68 runs along the south and east sides of the base connecting Salinas with the Monterey Peninsula. Reservation Road extends through the base on the north between Marina and East Garrison. Blanco and Davis Roads intersect Reservation Road, providing connections to Salinas. Entrances to Fort Ord are provided off of Highway 1 and Reservation Road, as well as Fremont, Broadway, and State Highway 218. The major regional roadways within the impact study area are summarized below.

State Highway 1 - State Highway 1 is a major north-south roadway that roughly follows the Pacific Coast from Northern California to Los Angeles and points south. The roadway is aligned immediately to the west of Fort Ord, providing access to Watsonville and Santa Cruz (to the north) and Monterey and Carmel (to the south). State Highway 1 is a limited access (freeway) facility from Castroville to just north of Carmel. In the project vicinity, there are freeway interchanges at Reservation Road, Del Monte Boulevard, 1st Ave (12th Street Gate), Light Fighter Drive (Main Gate), and Fremont Boulevard in Seaside. The primary entrances to Fort Ord are accessed from State Highway 1.

State Highway 68 - Within the study area, State Highway 68 is aligned to the south and east of Fort Ord, from State Highway 1 to Salinas. State Highway 68 primarily provides access from Salinas to Monterey and areas south of Seaside. Further to the south, State Highway 68 extends west of State Highway 1 into Pacific Grove and is known as Holman Highway.

State Highway 156 - State Highway 156 links State Highway 1 (north of Marina) with U.S. 101 to the northeast.

State Highway 183 - State Highway 183 is aligned roughly east-west to the north of Fort Ord.

State Highway 218 - State Highway 218 starts at State Highway 1 in Sand City and provides access through Del Rey Oaks to the southeast where it joins State Highway 68. State Highway 218 is an alternative route to the westernmost segment of Route 68. It also serves areas on the south side of the City of Seaside.

U.S. 101 - The U.S. 101 freeway is a major north-south route in California. It is aligned to the east of State Highway 1, through Prunedale and Salinas in the vicinity of Fort Ord.

Del Monte Avenue/Boulevard - Del Monte Avenue/Boulevard is a non-continuous roadway, roughly parallel to State Highway 1, extending from Washington Avenue in Monterey to the interchange with State Highway 1 on the north side of Marina.

Fremont Street/Boulevard - Fremont Street/Boulevard is a key four-lane arterial providing an important link through Seaside. It runs north-south, roughly parallel to State Highway 1, and has interchanges with State Highway 1 at either end.

Broadway Avenue - Broadway Avenue is a four-lane arterial that provides an east-west connection between Del Monte Boulevard, Fremont Boulevard, and North-South Road.

Reservation Road - This facility is aligned approximately east-west, from State Highway 1 past the northern boundary of Fort Ord to State Highway 68 south of Salinas. It is currently classified as a rural highway east of Imjin Road, and a signalized arterial from Imjin Road west to State Highway1.

Blanco Road - Blanco Road is an east-west route north of Fort Ord that provides a connection between Highway 101 and Reservation Road. This facility currently provides an important link between Fort Ord and Salinas.

Davis Road - Davis Road is an arterial between Salinas and Reservation Road, aligned approximately parallel to State Highway 68.

3.1.3 Current Roadway Operating Conditions

With the closure of Fort Ord as a military base, roadways within Fort Ord carry only low volumes of traffic. For this reason, level-of-service (LOS) analysis of current conditions on these roadways was not performed. However, many of the regional roadways that provide access to and from Fort Ord continue to carry high volumes of traffic. The existing (1993/94) daily volumes and LOS for the relevant regional road segments are presented in Table 3-1. The LOS analysis was based on traffic volumes obtained from TAMC.

As shown in the table, most segments on the regional network operate at LOS D or better with a few notable exceptions. Roadway segments currently operating at LOS E or worse include: State Highway 1 north of Castroville (LOS E), State Highway 68 from State Highway 1 to San Benancio Road (LOS F), State Highway 156 (LOS E), State Highway 183 in Salinas (LOS E), portions of Del Monte Boulevard in Monterey (LOS F), Reservation Road in Marina (LOS E), Blanco Road (LOS E), and Davis Road in Salinas (LOS E and F).

3.1.4 Transit System

Public transit service in Monterey County is provided by Monterey-Salinas Transit (MST). MST's service area includes Fort Ord as well as Seaside, Monterey, Marina, Carmel, and other Peninsula cities. MST also provides connecting service to Santa Cruz County (Watsonville). Service originates from two primary locations: the Monterey Transit Plaza in central Monterey, and the Salinas Transit Center in downtown Salinas. In general, service is designed to meet the needs of both commute and mid-day, non-work travelers. Almost all routes begin service around 6:00 or 7:00 A.M., with the majority ending service around 6:00 or 7:00 P.M. and operate with one-hour headways.

MST's current ridership is 11,000 boardings per day. This represents approximately 2.2% of all daily trips within MST's service area. Information supplied by MST indicates that approximately 33% of these boardings are work trips, 12% are school-related, with the remainder (55%) being a variety of trip purposes. The MST Ridership Survey completed this year indicates that MST's biggest markets are Monterey-Seaside and East Salinas-Downtown Salinas. MST's most successful routes, Line 34 and Line 9, are those that connect densely developed residential areas with the key employment and commercial centers.

At present, two MST routes provide service to portions of Fort Ord. Line 7 provides service between Monterey and Marina. In October 1995, this line was modified to include service to Fort Ord, including the POM Annex, the Commissary/PX, and CSUMB. This route operates with hourly headways. Line 20 provides connecting service between Monterey and Salinas via Marina, with a stop located near the airport. Service along this route is provided every hour, with additional runs in the mornings before 9:00 A.M.

Table 3-1
EXISTING (1993/94) CONDITION LEVEL-OF-SERVICE ANALYSIS

Roadway	Segment	Roadway Attributes					LOS
		Facility Type	Lanes	Div/ Und	Left Turn Bays?[1]	Daily Volume	
State Highway 1	State Highway 68 to Del Monte Blvd (Seaside)	Freeway	4	N/A	N/A	56,000	D
	Del Monte Blvd (Seaside) to State Highway 218	Freeway	4	N/A	N/A	60,000	D
	State Highway 218 to Fremont Blvd	Freeway	4	N/A	N/A	59,000	D
	Fremont Blvd to Main Gate	Freeway	6	N/A	N/A	75,000	D
	Main Gate to 12th Street	Freeway	6	N/A	N/A	65,000	C
	12th Street to S. Marina (Del Monte Blvd)	Freeway	6	N/A	N/A	71,000	C
	S. Marina (Del Monte Blvd) to Reservation Road	Freeway	4	N/A	N/A	35,500	C
	Reservation Road to N. Marina (Del Monte Blvd)	Freeway	4	N/A	N/A	35,500	C
	N. Marina (Del Monte Blvd) to State Highway 156	Freeway	4	N/A	N/A	37,500	C
	State Highway 156 to Santa Cruz County line	Highway	2	U	Y	30,000	E
State Highway 68	State Highway 1 to State Highway 218	Arterial-Class Ia	2	U	Y	22,800	F
	State Highway 218 to San Benancio Road	Arterial-Class Ia	2	U	Y	20,600	F
	San Benancio Road to Reservation Road	Freeway	4	N/A	N/A	25,000	B
	Reservation Road to E. Blanco Road	Freeway	4	N/A	N/A	29,500	B
State Highway 156	Hwy 1 to 0.1 miles East of Castroville Blvd.	Freeway	4	N/A	N/A	22,000	B
	0.1 miles East of Castroville Blvd. to US 101	Uninterrupted Arterial	2	U	Y	25,000	E
State Highway 183	US 101 to Davis Road	Arterial-Class Ib	4	D	Y	29,500	E
	Davis Road to Espinosa Road	Uninterrupted Arterial	2	U	Y	16,000	C
	Espinosa Road to State Highway 156	Uninterrupted Arterial	2	U	Y	22,000	D
State Highway 218	State Highway 1 to Fremont Boulevard	Arterial-Class II	4	D	Y	14,000	D
	Fremont Boulevard to State Highway 68	Arterial-Class Ia	2	U	Y	10,850	B

Table 3-1
EXISTING (1993/94) CONDITION LEVEL-OF-SERVICE ANALYSIS

Roadway	Segment	Roadway Attributes					LOS
		Facility Type	Lanes	Div/ Und	Left Turn Bays?[1]	Daily Volume	
Del Monte Boulevard	El Estero to State Highway 1	Arterial-Class Ib	4	D	Y	34,300	F
	State Highway 1 to Broadway Ave	Arterial-Class Ib	4	D	Y	27,026	D
	Broadway Ave to Fremont Blvd	Arterial-Class Ib	4	D	Y	9,757	C
	State Highway 1 (S. Marina) to Reservation Road	Arterial-Class Ib	4	D	Y	28,836	D
	Reservation Road to State Highway 1 (N. Marina)	Uninterrupted Arterial	2	U	Y	4,825	A
Fremont Blvd	State Highway 1/State Highway 68 to Broadway Ave	Arterial-Class Ib	4	D	Y	25,166	D
	Broadway Ave to State Highway 1	Arterial-Class Ib	4	D	Y	16,363	C
Broadway Avenue	Del Monte Blvd to Noche Buena Street	Arterial-Class Ib	4	D	Y	13,985	C
	Noche Buena Street to North-South Road	Arterial-Class Ib	4	D	Y	8,742	C
Reservation Road	Hwy 1 to Del Monte Boulevard	Arterial-Class Ia	2	U	Y	10,205	B
	Del Monte Boulevard to Crescent Ave	Arterial-Class II	4	D	Y	26,046	E
	Crescent Ave to Blanco Road	Arterial-Class Ia	4	D	Y	22,874	B
	Blanco Road to Intergarrison Road	Uninterrupted Arterial	2	U	Y	3,700	A
	Intergarrison Road to Davis Road	Uninterrupted Arterial	2	U	Y	4,700	A
	Davis Road to State Highway 68	Uninterrupted Arterial	2	U	Y	6,200	A
Blanco Road	Reservation Road to Davis Road	Uninterrupted Arterial	2	U	N	20,252	E
	Davis Road to State Highway 68	Arterial-Class Ia	4	U	Y	18,836	B
Blanco Rd/Sanborn Rd	State Highway 68 to US 101	Arterial-Class Ia	4	U	Y	26,600	C

Table 3-1
EXISTING (1993/94) CONDITION LEVEL-OF-SERVICE ANALYSIS

Roadway	Segment	Roadway Attributes					LOS
		Facility Type	Lanes	Div/ Und	Left Turn Bays?[1]	Daily Volume	
Davis Road	Reservation Road to Blanco Road	Uninterrupted Arterial	2	U	Y	7,500	A
	Blanco Road to Rossi Street	Uninterrupted Arterial	2	U	Y	24,000	E
	Rossi Street to US 101	Arterial-Class Ia	4	D	Y	34,829	F

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Note:

[1] Roadway segments with very few or no left turn movements have been classified as having left turn bays.

In addition to the MST bus service, CSUMB has begun operating a shuttle service connecting points on campus with the faculty/staff housing area to the east. The shuttle operates weekdays from 7:00 A.M. to 10:00 P.M. There is also limited service on weekends that includes a connection to Seacrest Plaza in the City of Marina. The bus and shuttle routes serving Fort Ord are illustrated in Figure 3-2.

The region also features limited rail service and paratransit service. Passenger train service is currently only available through Amtrak's Coast Starlight Service in Salinas, with connections to the San Francisco Bay Area and beyond. The MST RIDES program provides paratransit service for persons with disabilities who cannot use MST's fixed route transit service.

3.1.5 Pedestrian and Bicycle Networks

Sidewalks currently exist on some Fort Ord roadways, but a comprehensive network of pedestrian facilities is not in place. Also, on many Fort Ord roadways, there are no shoulders or parking lanes, so vehicular traffic may pass close to pedestrians even where sidewalks do exist. The limited pedestrian infrastructure is due to the development of the Fort Ord to meet the needs of Army personnel and not civilians.

As with vehicular access, pedestrian access to Fort Ord from adjacent communities was limited to the entry gates described previously. The location of these gates served to further restrict pedestrian access, as many of the gates are located off of roadway facilities, such as State Highways 1, 218, and 68, which are not designed for pedestrian use. In addition, most gates are located where there is little or no development nearby to which pedestrian trips may be attracted. The two best gates for pedestrians are the Imjin Gate (on Imjin Road south of Reservation Road) that provides access to Marina; and the Broadway Gate (on Broadway Avenue west of North-South Road) that provides access to Seaside. Unfortunately, there are no sidewalks in Fort Ord on the main roads (Imjin Road and North-South Road) in the vicinity of these gates.

As defined in the Caltrans *Highway Design Manual*, there are three types of bikeways (bikeway is the general term for any marked bicycle facility):

- **Class I (Bike Path)**: Bicycles travel on a right of way completely separated from any street or highway.
- **Class II (Bike Lane)**: Bicycles travel in a one-way striped lane on a street or expressway.
- **Class III (Bike Route)**: Bicycles share the road with pedestrians and motor vehicle traffic. Bike routes are marked only with signs.

Currently, there are no separate bicycle facilities within Fort Ord or connecting to Marina or Seaside. TAMC has developed a General Bikeways Plan (January, 1994), which describes current and proposed bicycle facilities in Monterey County. There are a limited number of high class bicycle facilities in the vicinity of Fort Ord. The most significant is the Caltrans Pacific Coast Bikeway, which roughly follows the coastline. It is aligned along Del Monte Boulevard through Marina, and then it follows State Highway 1 past Fort Ord and into Seaside and Sand City. There are, however, no connections to the Pacific Coast Highway from Fort Ord. Outside of Fort Ord in Marina and Seaside, there are no Class I facilities; however, both cities have designated bicycle networks and efforts have been made to accommodate bicycles. There are also current planning activities underway to enhance the bicycle networks in these communities.

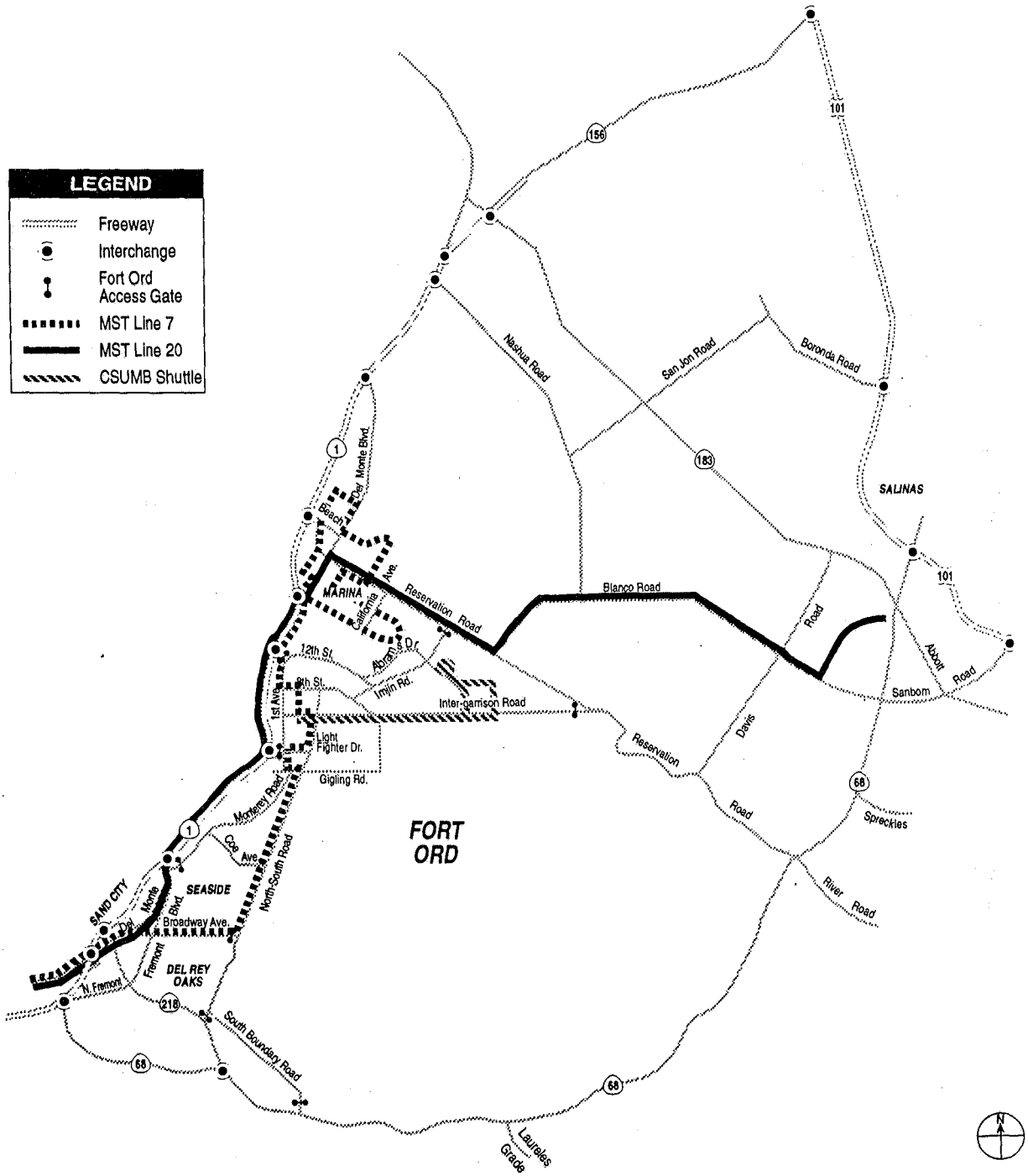

Figure 3-2
Existing Transit Service

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3.2 SOCIO-ECONOMIC SETTING AND FORECASTS

3.2.1 Fort Ord

At its peak, Fort Ord was home to 17,700 military personnel and employed 2,700 civilians from the neighboring communities. As of 1994, most facilities within the base were closed, the exceptions being some housing for the DLI, limited office space for FORA, the Commissary, and the Post Exchange. In September of 1995, California State University - Monterey Bay (CSUMB) began operation with enrollment of approximately 600 students.

The proposed land use plan for Fort Ord includes approximately 45,000 jobs and over 22,000 housing units at buildout. Within this plan, the Army will retain roughly 2,000 acres near the existing golf courses for its Presidio of Monterey (POM) Annex to support the Defense Language Institute, the Naval Graduate School, and the Coast Guard and troops in the area. The California State University system has received approximately 1,300 acres to establish a campus for the Monterey Bay area. CSUMB is expected to have 25,000 full-time equivalent students at buildout (12,500 by the year 2015), with on-campus housing for 80% of these students. University of California at Santa Cruz plans to redevelop roughly 1,100 acres near the airport to establish a technology center - the Monterey Bay Engineering, Science and Technology Center (MBEST). Of the remaining acreage, approximately 2,000 acres will be available for private commercial development and 16,000 acres will be committed to nature preserves and habitat resource management.

By the year 2015, the Fort Ord Reuse plan calls for over 18,000 jobs and 13,500 housing units (inclusive of 2550 on-campus housing units). For Fort Ord, this represents a growth of 7,400 housing units but a decrease of 2,000 jobs versus 1990. Although the number of jobs associated with the Fort Ord area decreases, it is important to recognize the shift from military to civilian land uses significantly alters the types of jobs and associated travel characteristics. With the reuse of Fort Ord, the Peninsula will eventually become one contiguous urban area from Marina to Pacific Grove.

3.2.2 Regional

According to Census data, Monterey County had a population of 355,000 in 1990. A majority of the county's development is concentrated in two areas: the Monterey Peninsula and Salinas. Defined for this study as running from Pacific Grove to Marina and including Fort Ord, the greater Monterey Peninsula had a population of 115,000 in 1990. Salinas, Monterey County's largest city, had a population of nearly 110,000. Both the County and Peninsula numbers include a population of over 28,000 within Fort Ord which was serving as a fully-operating military base at the time.

By 2015, Monterey County is expected to grow to a population of 520,000. In addition, Monterey County is forecast to grow by 50,000 housing units and over 60,000 jobs between 1990 and 2015. These numbers include the reuse of the former Fort Ord, and reflect the job and population loss due to its post-1990 closure. A majority of this growth is expected to occur within the Monterey Peninsula and Salinas areas (75% of housing and 70% of the employment growth). The countywide forecast includes a population of approximately 39,000 within the Fort Ord reuse area by 2015. A summary of the socio-economic characteristics of the county, Monterey Peninsula, Salinas, and Fort Ord is provided in Table3-2.

Table 3-2
MONTEREY COUNTY SOCIO-ECONOMIC DATA
COUNTYWIDE AND SUBAREA

	1990 Census			2015 Forecast		
	Population	Housing Units	Employment	Population	Housing Units	Employment
Monterey County	355,000	120,000	161,000	520,000	170,000	224,000
Monterey Peninsula	115,000	42,000	70,000	148,000	59,000	84,000
Salinas	109,000	35,000	49,000	195,000	61,000	79,000
Fort Ord* (includes CSUMB)	28,600	6,100	20,000	39,000	13,500	18,000

*Fort Ord numbers are included in both the County and Peninsula values.

Sources: 1994 Regional Population and Employment Forecast, AMBAG
Draft Fort Ord Reuse Plan

In addition to size, density and urban form are important factors contributing to the design and effectiveness of a transportation system. For example, transit is most effective where densities are higher and where development occurs along a corridor. With its large area and low population, Monterey County is largely rural in character. Development, however, is concentrated in two urban centers -- the Monterey Peninsula and Salinas. Development densities for these two areas are presented in Appendix A. In general, densities in the Peninsula and Salinas areas are low to moderate for urban settings and may be typical of a suburban location outside a major metropolitan center, although there are areas of concentrated housing and employment development. These densities, however, are expected to increase significantly by the year 2015, up to 40% on average in Salinas.

With respect to urban form, the land use pattern in Monterey County does not specifically follow a corridor form. Additionally, the size and density of development in Monterey County does not reach those levels typically found along major transit corridors in urban locations. However, one may view Salinas-Fort Ord-Seaside-Monterey as a loose corridor with lower density development. This corridor would link Monterey County's two largest cities and connect to several additional trip generators. Within the endpoints of Salinas and Monterey, there are several shorter corridors with higher density development. These shorter segments, such as those fully within Fort Ord or linking Fort Ord to adjacent communities, may be successfully served by transit. Equally important to the form and density of development, is the mix of land uses (e.g., residential, employment, shopping, etc.) within this area.

3.3 Land Use and Transportation

In general, this study and the Circulation Element of the draft Fort Ord Reuse Plan focused specifically on elements of the transportation system. It is important to note, however, the strong relationship between land use and transportation, and coordination that occurred in developing the land use and transportation plans for the former Fort Ord. As noted in the previous section, the number of houses and jobs, densities, and urban form all play a significant role in the design and effectiveness of the transportation system. In recognition of this relationship, and with the objective of minimizing the impacts and costs related to reuse, a number of key concepts were employed in the development of the land use element of the draft Reuse Plan. A brief description of these concepts is provided below. A more detailed discussion of these concepts was provided in Working Paper #1.

Jobs/Housing Balance

Providing a jobs/housing balance is intended to encourage employers to locate in areas where there are significantly more residents than jobs and to add housing development near employment centers. Efforts to create a jobs/housing balance should ensure that the jobs provided are compatible with the skill-levels and income expectations of nearby residents. Developing jobs and housing in proximity to each other provides an opportunity to reduce the travel demands on key regional facilities by reducing the length of the trip and/or shifting a vehicle trip to an alternative mode. The currently proposed reuse plan seeks to achieve a better job/housing balance within Fort Ord. The desired result of this balance is the reduced demand on those regional roadways connecting employees living off-base with employment centers on-base.

Mixed-Use Development/Increased Densities

In a mixed-use development, a variety of compatible land uses are located in proximity to one another. If a mixed-use development includes commercial uses that serve offices and/or residences, employees and residents can patronize the commercial uses without making a vehicle trip. Another development may include a variety of commercial land uses, such as restaurants and entertainment facilities, that make it possible for those that do drive to make a single vehicle trip to the mixed-use development rather than multiple vehicle trips. Regardless of how persons arrive at such a center, they will be able to make many trips by walking once they arrive at such a mixed-use center; such trip linkage would not be possible in a single-purpose area. For example, the commercial area nearest the university could be developed to focus on the types of goods and services likely to capture trips from the student population. Increasing the density of a mixed-use development results in a decrease in the distances between uses, further encouraging walking and reducing vehicle travel. In single-use developments, higher densities can mean greater opportunities for carpooling and transit service. The proposed plan includes the designation of mixed-use, high-density areas adjacent to the CSUMB campus.

Design of the Street Networks

Effective street design can also promote reductions in vehicle trips. In particular, grid networks can reduce vehicle miles traveled (VMT) by reducing the distance that needs to be traveled between two points (as compared to networks where cul-de-sacs predominate). A grid network also provides more direct routes for pedestrians and bicyclists. In all cases, the proposed road designs/rights-of-way should accommodate sidewalks, bike paths, and transit features, such as pullouts. Traffic calming measures should also be considered to slow vehicle speeds to levels that are compatible with pedestrian and bicycle use. Some examples of traffic calming measures are street narrowing, vehicle diverters, speed humps, and other pavement treatments. As the Fort Ord transportation plan is defined in greater detail, the gridded street networks will be applied where appropriate.

Transit-Oriented Design

Transit-Oriented Design (TOD) is a deliberate alteration of post-World War II suburban patterns. It assumes a sizeable parcel of developing/redeveloping land (at least one-third of a mile in radius) centered on a current or planned major transit station. Development in a TOD would include a range of housing densities and mix of land uses. Pedestrian facilities are provided to the transit station and between the land uses to make it convenient for residents and employees to walk and bicycle. Vehicle travel is reduced within the TOD as a result of the clustering of land uses. Regionally, transit use would be increased as a result of more residences and employment sites being located near a transit station. TOD principles will be incorporated into the final reuse where deemed appropriate and reasonable.

Incorporation of these concepts serves to minimize the transportation impacts of Fort Ord reuse in two key ways: by encouraging the use of alternative modes, and by maximizing the number of trips

captured completely within the boundaries of the former fort. To the extent that these concepts can influence trips to shift to alternative modes or remove an off-base trip altogether, roadways throughout the region will be impacted. During peak periods, those roads that are oriented to commute trips will be the most directly impacted. In off-peak periods, roads near major activity centers may be directly impacted. Finally, by implementing these land-use-based strategies, and integrating them with the transit, bicycle, and pedestrian systems, regional travel may be impacted as a result of the increase in potential transit ridership and use of bicycle and walking modes. The specific impacts of these strategies on regional travel will vary with the amount of implementation, the geographic focus of the programs, and the availability of alternative travel modes.

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4. FUNDING SOURCES

Transportation planning and design is based on the concept of demand for facilities and services. This demand is derived from the projected land use and socio-economic characteristics of the study area. In the past, this planning was often done with the assumption that highway or transit capacity and level of service was not financially constrained. In recent years, however, the consideration of financial constraints has become an important, and often required factor in long range planning. These constraints are a function of the financial resources that can reasonably be expected to be available to construct, operate, and maintain the transportation facility or service. This chapter is intended to identify the limits on the financial resources that can be expected to be available to finance transportation improvements needed to support regional growth including the reuse of Fort Ord.

For the purposes of this chapter, funding sources have been broken into two categories.

- **Existing Funds** - The list of available funds includes only sources of financing that are currently established and available.
- **Potential Sources** - This includes most likely and optimistically available sources. The list of financing sources within this category includes "...reasonably optimistic trends, taxes and innovative expectations."

The following section of this chapter deals with existing sources of financing that can be considered secure and dependable for the future. Potential funding sources are discussed in Section 4.2. These first two sections of this chapter focus primarily on sources available for the financing of roadway capital improvements. The key issues of transit and maintenance funding are discussed in Sections 4.3 and 4.4, respectively. A more extensive discussion of these topics is presented in *Working Paper #2: Funding Sources Available for Transportation Projects* that was prepared for this project.

4.1 EXISTING AND SECURED FUNDING SOURCES

This section provides a brief description of existing road funding sources, and comments on the practical availability of these sources to finance new transportation capacity in the region. A more complete listing of existing sources is presented in Table 4-1.

4.1.1 Conventional Federal and State Funding

Financing for roadway projects made available by the federal government and the State of California is generated primarily by the tax on motor fuel. The portion of gas tax going into the State Highway Account is allocated by the California Transportation Commission (CTC). Allocations are made via the State Transportation Improvement Program (STIP). In spite of a significant recent increase in the fuel tax rate in 1990, competition for funding from the STIP is extreme. Current estimates of funds available reveal a significant shortfall between pre-existing commitments in prior-year STIPs and current funds available. Public officials in Monterey County are striving aggressively to receive CTC support for the Prunedale Bypass and to protect other projects now in the STIP. Additional requests from other agencies to CTC may dilute these efforts.

Table 4-1
SUMMARY OF SOURCES OF FINANCING FOR TRANSPORTATION IMPROVEMENTS

Fund Source	Eligible Projects	Key Criteria
FEDERAL FUNDS		
Surface Transportation Program (STP)	Roads, transit, bike, pedestrian, bridges, safety, etc.	Congestion relief, Maintenance needs, Cost-effectiveness, Regional objectives
Transportation Enhancements Activities (TEA-part of STP. above)	Pedestrian, bicycle, historic preservation, scenic/aesthetic beautification, mitigation	Local support, one-time opportunity, degree of problem/opportunity, degree of solution/enhancement of opportunity
Congestion Mitigation & Air Quality (CMAQ)	Projects and programs that will improve air quality and decrease congestion	Emissions reduction, congestion relief, regional objectives
Federal Transit Administration (FTA) Section 3	Discretionary grants	
a) Fixed Guideway	Rail vehicles, guideways, and other equipment	Maintenance of existing system, efficiency, regional goals
b) Bus and Bus Facilities	Buses and other transit equipment	Accessibility, improved suburban mobility, efficiency
c) New Rail Starts	Rolling stock, guideways, and other transit	FTA cost-effectiveness (cost per new rider)
FTA Section 5307	Transit operating assistance; transit capital projects; by formula	Maintenance of existing system, efficiency , regional goals
FTA Section 16 (b) (2)	Paratransit services	Need, coordination efforts, project effectiveness
FTA Section 18	Rural transit service	Maintenance of existing system, efficiency, regional goals
Economic Development Act (EDA) Grants	Public infrastructure improvements	Must promote economic development and job growth
STATE FUNDS		
Flexible Congestion Relief (FCR) - State STP - State Highway Account	Roads, transit (traditionally, other modes eligible) - National Highway System - Interstate Completion	Degree of congestion relief on transportation system. Inclusion in the STIP
State Transit Assistance (STA) - Revenue Based	Operating and capital support of fixed-route service, paratransit	Funds programmed according to the revenues generated by the transit operators
State Transit Assistance (STA) - Population Based	Paratransit operations and capital, regional coordination, productivity improvement, intercity service, unmet capital replace	First apportioned to Northern/Southern counties based on population; remaining funds go to paratransit operations and capital
Transit Capital Improvement (TCI)	Rail transit capital projects; bus rehabilitation; right-of-way	Statewide value; County minimum shares; California Transportation Commission multi-year agreements
Transportation Development Act (TDA)	Transit operations; contract rail service; capital improvements, ped/bike improvements, local streets/roads, community transit; transportation planning	Allocated to Local Transportation Fund based on population within counties; RTPAs approve projects
Transportation Systems Management (TSM) - Match	CMAQ eligible projects - no roadway rehabilitation or projects increasing single-occupancy vehicles	CMAQ eligibility, see above
Transportation Systems Management (TSM) - Residual	After CMAQ (and STP eligible) match, for system management	TSM; Traffic congestion relief; roadway time travel savings

Table 4-1
SUMMARY OF SOURCES OF FINANCING FOR TRANSPORTATION IMPROVEMENTS

Fund Source	Eligible Projects	Key Criteria
	projects, such as signalization	
Bridge Replacement & Rehab. Program	Bridge replacement, rehabilitation, seismic retrofit, rail replacement, and painting	Inclusion on the federal deficient bridge list
State Highway Operation and Protection Program (SHOPP)	Bridge/highway rehabilitation, seismic retrofit and capital safety improvements	Programmed according to rehabilitation need; must have a project study report; Caltrans nominates
State Local Partnership Program (SLPP)	Roadway and transit projects with roadway improvements	No criteria. All funds divided up proportionately to all who apply.
Inter-Regional Road System (IRRS)	Road/highway improvements outside urbanized areas of over 50,000 population	Capacity improvements for inter-regional travel only - not due to growth
Prop. 116	Railroad right-of-way, grade separations, terminals, stations, maintenance facilities	Most projects defined in the Bond Act.
Environmental Enhancement	Projects to mitigate environmental impacts of transportation facilities.	Projects must cost less than $500,000
AB 2766	Ridesharing, clean fuel buses, shuttles, traffic management, rail/bus integration, regional transit information, various demonstration projects.	Projects must reduce air pollution
Subvention/Gas Tax (Portion of State fuel tax returned to cities and counties)	Local streets and roads maintenance and rehabilitation	Local priorities
LOCAL FUNDS		
Farebox Revenue	Transit system expenditures	See Section 4.3
Development-related Financing	See Section 4.2.1	See Section 4.2.1
Local Option Tax	See Section 4.2.3	See Section 4.2.3
Toll Road Revenues	See Section 4.2.4	See Section 4.2.4

Source: This exhibit was derived from [Oakland, CA: Metropolitan Transportation Commission.] *Transportation Funding Sources in the Bay Area (Draft).* June, 1995.

Although every effort should be devoted to securing federal and state financing, a conservative assumption should be made that funding from these sources may be limited to that currently identified within the STIP for the Hatton Canyon and Prunedale projects, until the Prunedale Bypass is fully funded by the annual county minimum allocations and local sources.

4.1.2 Federal Demonstration Projects

Financing for "demonstration" projects from the federal government can be allocated directly through the Congressional Authorization and annual Appropriations process. No state or local matching funds are usually required. There are currently no federal demonstration projects that would provide additional capacity to serve the region and Fort Ord. Availability of funding from federal demonstration projects is highly unpredictable and depends entirely on the political process.

The Federal Government is describing Fort Ord reuse as a model to be emulated nationally and political support for projects serving the area may be strong. Monterey County representatives are encouraged to pursue federal demonstration funding. However, success is unpredictable and, therefore, demonstration funds were not considered an expected source for the purposes of this study.

4.1.3 Local Share of Fuel Tax

A portion of the fuel tax collected by the State of California is shared with cities and counties based on a statutory formula. It is increasingly common in California that the local share of the fuel tax is consumed by requirements to maintain and rehabilitate existing roads. Further, since the fuel tax rate is levied per gallon, and not tied to any price or cost index, improved gasoline mileage puts a downward pressure on funding available per vehicle miles traveled. Currently, existing maintenance demands more than consume the local share of fuel tax in Monterey County.

4.1.4 Conclusions About Existing Sources

Discussions with key professionals in the field of transportation finance throughout California gave no reason whatsoever to be optimistic about increased availability of existing conventional sources of financing. The situation in Monterey County is such that there will be extreme competition for existing sources of financing to pay for existing deficiencies and for currently proposed projects throughout the region. The recommendation was made previously that the financing plan for increased capacity to serve Fort Ord should offer certainty. Accordingly, financial planning for transportation should consider the potential revenue sources described in the subsequent section.

4.2 POTENTIAL REVENUE SOURCES

A number of potential new sources of revenue are described in the following sections. These sources are presented in the general order of the relative certainty that they could be enacted.

4.2.1 Development-Related Financing

The term "development-related financing" refers to any source of financing where revenues are directly generated by growth and development. There are three basic forms of development-related financing currently used on California: impact fees, benefit assessments and special taxes.

A **development impact fee** is a fee collected from a developer at or near the time of development, e.g. when a building permit is being issued. Before a development impact fee can be levied, a jurisdiction must make findings specified in Government Code §66001 (a) and (b). These findings generally require that a reasonable relationship be demonstrated between a land development project and the demand for a public improvement project. Determination of this relationship is referred to as a "nexus analysis". Under this analysis, the demand for an improvement must be defined, and then a portion of the cost is assigned to all land development or sources that contribute to this need. The fee assessed to an individual land development project must be in direct proportion to its share of the public improvement project's demand. This analysis must recognize that a portion of a project's cost must be funded by non-development sources, if the project is needed, in part, to address an existing deficiency.

Development impact fees are collected under the general legal power of cities or counties to regulate land use. Development impact fees must be used for the purposes established when the fee is enacted, and

must not be used for general governmental purposes. In other words, revenues generated from development impact fees must be used only for those improvements for which the nexus analysis was conducted.

Benefit assessments have been used in California for generations. The theory is that the land that benefits from a particular public improvement is charged for the cost of that improvement in proportion to benefit received. There is extensive case law holding that:

- The special benefit to an individual parcel of land must be clear and demonstrable.
- All land that benefits from the improvement must be within the assessment district and there is virtually no room for exceptions.

However attractive a land development project may be (e.g. a project that would bring economic development and a stronger tax base), if the property benefits from improvement, the property must be assessed. Recently, an initiative was passed that will require land owner approval of benefit assessments which may sharply reduce the ability to implement this form of revenue generation.

A more recent financing innovation in California is the use of a **special tax** to finance public improvements. The most common form of financing with a special tax involves the formation of a Mello-Roos Community Facilities District. A jurisdiction that authorizes a special tax must make a finding that all the properties within the taxing district benefit in a general way from the improvement. The strict finding of a rational nexus (as required for a development impact fee) or special benefit (as required for a special assessment) is not required for the implementation of a special tax.

Another advantage of a special tax is the flexibility in setting the tax rate for different categories of land use. The flexibility to set a special tax at a rate other than that required by strict nexus findings is very useful. If the burden on one or another land use category is excessive compared to the value of the land, it is possible to lower the rate for one category and raise the rate for another. In practice this shifting of burden is frequently done to attract an economically desirable land use by offering a lower tax rate for that land use. However, a special tax does require a two-thirds majority vote. If the area covered by the financing district is not inhabited, the landowners can approve the special tax with a two-thirds majority based on a proportional vote by size of property or parcel.

In addition to development impact fees, redevelopment projects such as Fort Ord can be accomplished using **Development Dispensation Agreements** (DDAs). No nexus test is required, only agreement between the jurisdiction (FORA) and the developer. A considerable amount of local infrastructure has been built using DDAs and redevelopment law.

4.2.1.1 The Economics of Development-Related Financing

There is a finite economic limit on the extent to which development-related sources of financing will be available for funding transportation improvements. This limit is established by the realities of the real estate marketplace.

An initial principle of economics must first be established. In terms of who bears the ultimate financial burden, there is little basic difference between a development impact fee collected at the time of development and a development-related tax or assessment collected over many years to repay bonded debt. The ability to pay an impact fee or pay an annual assessment/special tax depends on there being economic use of land for which public improvements are being provided.

In the most simple economic model, development-related charges, whether impact fees, assessments, or special taxes, are capitalized by the marketplace in terms of a lower value of undeveloped land. The reasoning is as follows:

- In a perfect market, with perfect information, the value of land ready for development is set by the marketplace. Competing land development projects throughout the region (whether or not they are burdened by development charges) establish market value.

- Both financial capital and entrepreneurial skills are highly mobile. A developer has no incentive to accept reduced profit margins at any one location if other development locations are available.

- Accordingly, sophisticated developers will buy land at a price that permits them to pay development-related charges, maintain profit margins, and sell land in a ready-to-build state at the prevailing market price.

This simple economic model is summarized in Figure 4-1. The residual value of the land is the market value minus the costs that must be incurred to make the land marketable. Market values of land in a ready-to-build state are set by market forces, not by wishes. Costs to achieve this ready-to-build state are statements of fact, once a level of service for transportation and other public services has been established. Thus, the Residual Land Value (RLV) is the value of the land after subtracting from the market value an allowance for profit, a sales commission, allowance for on-site development costs, and all forms of development-related financing that will be imposed to pay for infrastructure and other public improvements.

There is an absolute upper limit to the total financing capacity available from development-related financing for all public improvements that are competing for development-related financing. That upper limit is the amount of financing that would drive the Residual Land Value down to zero. In most circumstances, neither the market place nor political realities would permit a financing plan that literally consumes the residual market value of undeveloped land. In the special case of Fort Ord, however, it may be practical to devote all or virtually all of the value of undeveloped land to finance the public improvements that will make the reuse of Fort Ord possible. An assessment of financial implications completed as part of FORA's Fort Ord Reuse Plan effort suggests a positive RLV for lands on the former Fort Ord after the allowance for on-site and development-related financing costs. It should be noted, however, that the RLV for individual sites will vary depending upon location and proposed land use.

4.2.1.2 Timing of Cash Flow

Financing for public improvements is generally of two types. First, "pay as you go" financing refers to a financing plan where the source of revenue is used directly to pay for the public improvement. Classic examples are development impact fees and gas tax. Impact fees can be accrued in a special account until funding for a particular improvement has been accumulated. A special tax can also be used on a "pay as you go" basis. The tax is levied once, at the time of building permit issuance. In economic terms the special tax is used exactly the same way as a development impact fee.

If major public improvements are necessary early in a capital improvement plan, then "pay as you go" financing becomes impractical. The cash simply is not there yet when demand for the improvement first occurs. An alternative is for a public agency to issue municipal bonds that are sold to bond holders. The proceeds of the bond sale are then used to construct the public improvement. The bond holders are paid back by a benefit assessment or a special tax that is collected annually over a number of years. (A common bond term is 25 years.

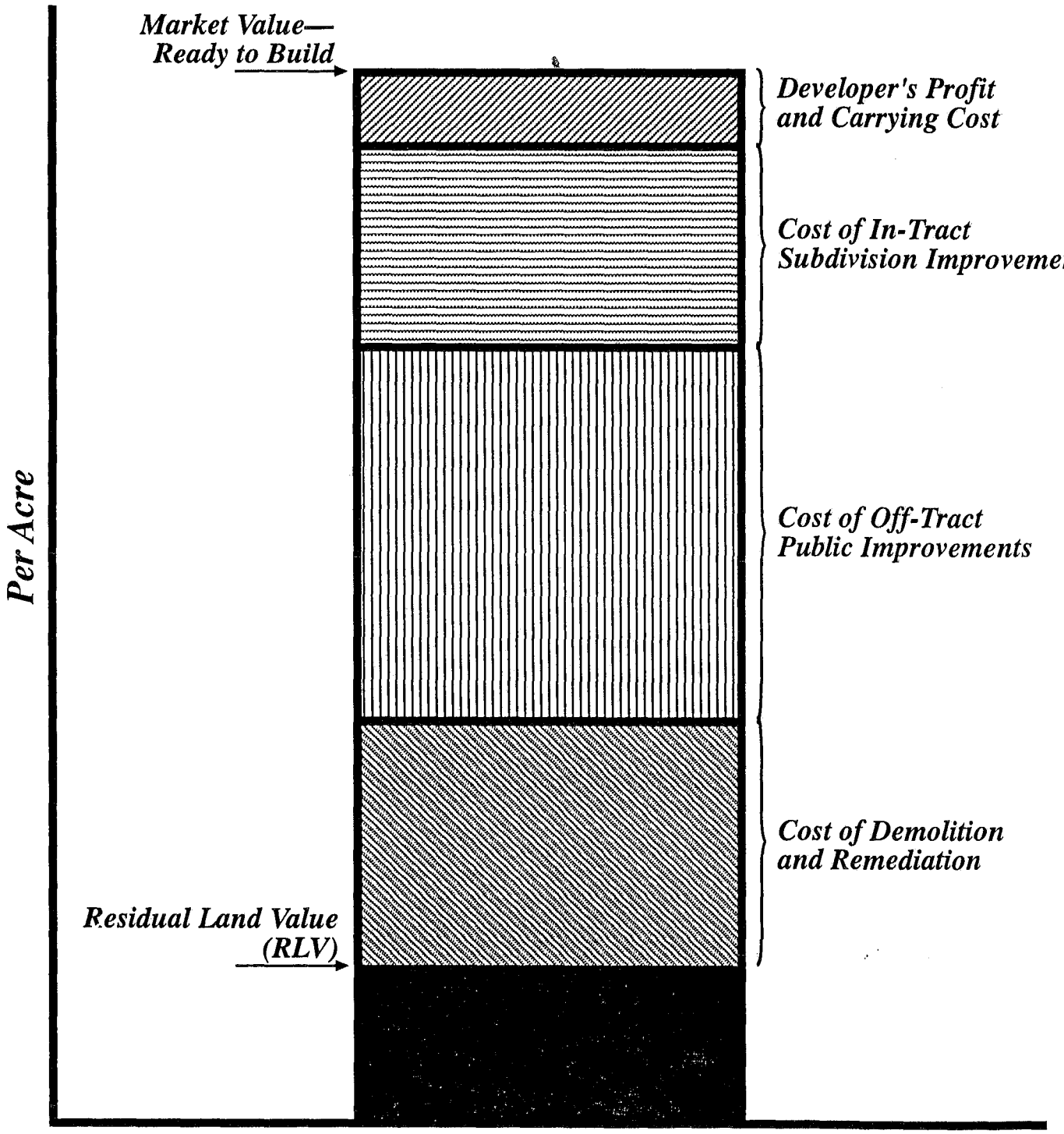

Figure 4-1
Hypothetical Value of Land

SKK68 Value of Land

The distinction being made is that "pay as you go" financing involves a one-time collection of money. Bond financing, sometimes referred to as "pay as you use" financing involves a collection of monies over a number of years to repay bond holders who initially advanced funds. The fact that monies are collected over a number of years does not alter the requirements for the use of the revenue. A benefit assessment collected over a number of years must meet the strict test of special benefit. There is much greater flexibility with regard to a special tax.

Development impact fees (particularly water and sewer connection fees) are frequently mentioned as a source of repayment of bonded debt. However, the bond market will not accept the uncertainty as to when development will occur. Development impact fees are not usable solely as security to repay bonds. A fall-back source of repayment, (e.g. the rate base of a water or sewer agency), is necessary to secure water or sewer bonds. There is no such source for repayment for transportation projects. Accordingly transportation impact fees can be used only for "pay-as-you-go" financing.

4.2.1.3 Competing Demands for Development-Related Financing

The TAMC Fort Ord Regional Transportation Study is concerned with the planning and financing of transportation improvements. It is an unfortunate fact of life, however, that there is significant competition for funds if development-related financing is used. The same reasoning that leads to dependence on development-related financing for roadway improvements also applies to other classes of public improvements such as water supply and distribution, wastewater collection and treatment, drainage, parks, etc. This competition for financing from development-related sources can greatly limit the funding available for transportation improvements.

4.2.1.4 Establishing The Impact Fee Area

As noted earlier, a key requirement in California for a development impact fee is that a valid nexus exists (in this case) between a transportation capital improvement and all of the development that contributes to the demand for this improvement. It may be reasonably assumed that major transportation projects to serve the territory within Fort Ord are not necessarily located physically within the boundaries of the former Fort Ord military base. Similarly, transportation facilities that are located physically on Fort Ord may also serve new development in other jurisdictions (i.e. off the Fort Ord territory) in northern Monterey County. Accordingly, if development impact fees are to be used to finance transportation improvements both within and outside Fort Ord, it will be necessary to establish a Cities-County development impact fee involving the participation of all the cities in northern Monterey County and the County of Monterey itself.

A cooperative Cities-County impact fee has precedent in California. A cooperative arrangement exists between Stanislaus County and its cities to collect a road impact fee designed to mitigate impacts on both county roads and city streets. This precedent does not translate into a statement that a Cities-County fee program can be implemented easily. The County of Monterey and a total of twelve cities must each approve such a development impact fee.

4.2.1.5 Special Taxes Levied Only on Territory Within Fort Ord

Although it is preferred that all new development pay its share, a city-county fee may be difficult to implement, or there may be pre-existing agreements that effectively invalidate the necessary nexus between transportation demand and responsibility to pay. In this situation, the special circumstances surrounding Fort Ord allow that some form of development-related financing may still be implemented. It would be possible for FORA under its own authority to enact a Mello-Roos Special Tax applicable only to development on the territory formerly within Fort Ord. This tax could be set at a rate to pay for many or all of the transportation projects, inside and outside of the base's boundaries, deemed necessary to

support the reuse of the former Fort Ord without depending on a charge against development elsewhere. This tax could also be used if a Cities-County Transportation Impact Fee is acceptable, but pre-existing development agreements significantly reduce the amount of funds that could be collected. The tax would be used to replace the funds that would otherwise have been paid by exempt projects.

As noted earlier, there are critical differences between a special tax and a development impact fee that make a Fort Ord-only tax viable. Whereas for a development impact fee to be valid there must be a strict nexus between the demand for capacity created by new development and the responsibility to pay for this capacity, a special tax requires only that a finding of general benefit be established for the governing body that will levy the tax. This tax can then be used to finance all of the transportation improvements that would otherwise be charged in part to development at Fort Ord and in part to new development outside of Fort Ord.

The second difference is the flexibility to set a special tax at a rate other than that required by strict nexus findings. Shifting the burden of a tax from one land use category to another may appear inequitable. In the special circumstance of Fort Ord the inequity of levying a tax on new development within Fort Ord that is used to pay another development's share is significantly more apparent than real. First, the Fort Ord Reuse Authority's planning team has already concluded that certain roadway improvements outside the jurisdiction of Fort Ord are absolutely essential to the successful redevelopment of Fort Ord. If the roadway improvement does not occur, the reuse of Fort Ord may not occur, at least not as visualized in the current draft Fort Ord Reuse Plan. Secondly, as noted above, the home buyer or other purchaser is not directly involved in the payment of the Mello-Roos tax. It is collected at the same time and in exactly the same manner as a development impact fee.

4.2.1.6 Transportation Impact Fees In Monterey County

The existing levels of transportation impact fees in Monterey County and in the cities are summarized in Table 4-2. In theory, comparisons among jurisdictions are of limited use. As noted elsewhere, an impact fee can be calculated almost deterministically, once a Level of Service Standard/Timing Standard and a Capital Improvement Plan have been adopted. Theoretically, fee levels in adjoining jurisdictions should have no effect on this calculation.

In practice, impact fee comparisons between jurisdictions are almost inevitable because of concerns about aversion impact on economic development if development impact fees are adopted or appear excessive compared to other jurisdictions in the market area. However, because fees are intended to ensure that needed infrastructure improvements are funded, the areas covered by these improvements may be more attractive to potential developers. Thus the market value of these lands may increase.

4.2.2 Tax Increment Financing

California has decades of experience with a form of financingthat is particularly applicable to areas undergoing redevelopment. Total property tax collected in Monterey County is shared between the applicable city (if the area is in a city), the County of Monterey, the applicable school districts, and a number of Special Districts. A complex formula, developed after Proposition 13 was passed, controls the manner in which annual changes in taxable value and resulting property tax is shared among the taxing agencies.

Table 4-2
TRANSPORTATION IMPACT FEES IN MONTEREY COUNTY

Agency	Existing Transportation Impact Fee (Per Single-Family Residence or Equivalent)[1]
Carmel-by-the-Sea	none
Del Rey Oaks	none
Marina	none
Monterey	none
Pacific Grove	none
Salinas	$1,230
Sand City	none
Seaside	none
Monterey County	
Carmel Valley Master Plan Area	$16,000
- Expanded Area	$8,000
Las Palmas	
- Highway 68	$792
- River Road	$1,732
Bishop Ranch	$9,750
Monterra Ranch	$3,900

Notes: 1) Transportation Impact Fee (TIF) amounts are as of June 1996

Redevelopment tax increment is based on the following sequence of steps:

- At a given point in time (normally when a redevelopment area is established), the allocation of property tax revenues among the taxing entities is noted. The revenues allocated to each agency are referred to as the "frozen base".

- From that point forward, any increase in total property tax revenues goes not to the various local governments but to a redevelopment agency. The redevelopment agency then uses this tax increment to accomplish the purposes of the agency's redevelopment plan. Normally, twenty percent of revenues must be allocated to housing programs.

There is an apparent advantage to the use of redevelopment tax increment to finance roadways and other public improvements on Fort Ord. The property tax base is currently zero because the land is owned by a federal agency. If a redevelopment area is formed prior to a sale to a private owner or other entity subject to property taxation, the entire property tax revenue (measured from a frozen base of zero) would apparently be available for purposes of the redevelopment agency. A redevelopment agency may then use the local "tax increment" to match federal and state redevelopment funds, EDA grants, and enter into DDAs with developers.

There is, however, one note of caution that must be sounded with this approach. The redevelopment agency may indeed have a fruitful stream of tax increment to use for redevelopment purposes, but the other local governments continue to be responsible to provide for ongoing operations. There are numerous examples in California where a city with a redevelopment agency finds itself to be facility-rich and funding program-poor. For example, funding may be adequate to finance a new police station, but funding may not be adequate to pay the police officers who staff this new station. To avoid this situation, the redevelopment agency must also find a way to fund ongoing operations.

4.2.3 Local-Option Taxes

TAMC has recently devoted extensive effort to evaluating alternative sources of additional funding for transportation. The TAMC's *Transportation Financial Options Ad-Hoc Committee* has considered both conventional sources (a local option sales tax and a gas tax) and innovative sources (e.g. a tax based on vehicle miles traveled) to augment available financial resources. The Transportation Financial Options Study includes estimates of the amount of additional funding that would be produced by rates of additional taxation that would be politically realistic. It now appears clear that revenues produced by a local option tax would be more than consumed by currently unfunded transportation projects that are necessary to serve the existing Monterey County population.

However, a successful effort to produce a local option tax may still be crucial to the successful reuse of Fort Ord. For example, currently-needed improvements to Route 156 and the Prunedale Bypass are very important if the draft Fort Ord Reuse Plan is to be implemented successfully, according to the FORA consultants. A local-option tax could be used to cover the share of improvement costs that may be attributed to the existing population. Unfortunately, as noted above, that share of the costs is expected to consume this additional resource, leaving no additional funds to serve growth at Fort Ord or elsewhere in the region.

4.2.4 Toll Roads

Interest has been increasing recently in the use of toll roads in California, in part because of interest in congestion pricing and in part because of the increasing practicality of automatic toll collection. The California Legislature recently passed legislation enabling the implementation of toll roads in four locations within the state. Through this legislation, it became possible in California for a private sector firm to finance a toll road and recover costs and a reasonable profit from toll collections. Examples of toll roads that are now in operation include the Foothill Corridor project in Orange County and a project in State Route 91 in Orange and Riverside Counties. This latter project involves the ability of a single-occupant vehicle to use a High Occupancy Vehicle (HOV) lane if a toll is paid. The implementation of a toll road in a location other than that identified in the initial legislation would require additional legislative approval.

A toll facility may be funded through mechanisms not available for other public facilities. First, a public entity may finance construction through the sale of bonds. These bonds, in turn, would be repaid with toll revenues. Second, toll roads may be privately financed. Under this scenario, the toll facility typically reverts to control of a public agency after a designated period of time. In either case, demand for the facility and revenue projections must be carefully assessed. For public financing, there must be a high level of certainty that toll revenues will cover bond repayment. For private financing, investors must be confident that revenues will cover costs plus a reasonable profit.

Toll roads become financially feasible when there are large numbers of motorists traveling a particular route who are willing to pay a toll in order to save travel time. The amount of the toll collected must be sufficient to finance the construction cost and the operating and maintenance costs of the toll facility. Since there are always alternate routes available, the toll route must offer a significant travel time advantage to motorists in order to be utilized. Toll routes can provide significant travel time advantages under the following conditions:

- The toll roadway provides a shorter, more direct route for travelers than alternate routes. In this case, travelers could save time and travel distance by using the toll roadway.

- The toll roadway provides an alternative to roadways which are free, but experience significant traffic congestion. In this case, travelers could save time by using the toll roadway and avoiding traffic congestion.

- The toll roadway provides a high-speed facility in comparison to alternative roadways which are traveled at slower speed. The most common example is a multi-lane limited access toll roadway which parallels a two-lane free roadway. The limited access tollway allows travelers to save travel time by allowing significantly higher travel speeds.

The determination of whether a particular toll roadway is financially feasible is dependent upon local conditions related to the cost of the toll roadway, the travel time advantage provided by the new facility, and the willingness of local travelers to pay a toll in order to save travel time. Currently available studies in the State of California have shown that toll roads are financially feasible only in densely-developed areas, with a high degree of traffic congestion.

4.3 FINANCING FOR TRANSIT SYSTEM DEVELOPMENT AND OPERATIONS

At present, the primary form of public transportation in Monterey County is bus transit. Financing for bus transit is provided by a combination of federal funding, state funding, local funds, developer exactions, and fare-box revenues. It is now well understood that, with certain very specialized exceptions, it is impossible to support the operations of a transit system from farebox revenues, let alone provide financing capacity for purchase or replacement of the vehicle fleet and other required capital facilities. Financial support in addition to farebox revenues now comes from federal funds administered by the Federal Transit Administration (FTA), State Transit Assistance (STA), and a portion of the retail sales tax administered under the Transportation Development Act (TDA). As a practical matter, the ability to finance expanded bus transit operations is limited by the ability to finance operating expenses.

The transportation finance experts interviewed for this project expressed great pessimism about the long term future of transit operating subsidies from the federal government. These professionals, however, were confident that both STA and TDA were dependable and steady sources of revenue for transit operations and fleet replacement. Based upon this input and an assessment of recent trends, it is assumed that the total funds available for transit operations per capita, measured in terms of real purchasing power, will equal the per capita levels that are budgeted for the 1996/97 fiscal year. Furthermore, it is assumed that future farebox recovery rates will remain near current levels. The practical results of these assumptions are reflected in the following estimates of transit service costs and funding that were provided by TAMC and MST:

- the annual cost to operate a bus is $320,000;

- a farebox recovery of 30% is expected to reduce funding needs for operating costs;

- the transit funding from LTF was assumed for this study to remain constant at $22 per capita;

- additional LTF funds generated by Fort Ord population growth to the year 2015 is forecast to be $703,736, while that generated by off-site growth is $1,793,540;

In addition to funds directed at bus transit, limited and project-specific financing for rail transit capital investment is available through the Proposition 116 bond measure. This proposition includes $6.0

million for capital improvements related to rail facilities on Fort Ord. Ability to finance rail transit operations will be limited by availability of subsidies for rail transportation.

At this time, expectations for new funding sources, especially those for transit operations, are limited. A Transit Impact Development Fee (TIDF) to fund transit operations as well as the purchase of the initial fleet of vehicles[1] has passed judicial scrutiny in California. However, the facts in this case pertain specifically to downtown San Francisco where transit ridership by office employees is quite high. It is questionable whether facts necessary to support Russ Building-type findings could be made for the Fort Ord Redevelopment area or the Monterey Peninsula.

Development-related financing will be most effective as a means to fund transit capital improvements. The Capital Improvement Plan (CIP) that will be an element of the draft Fort Ord Reuse Plan includes funding for the acquisition of 15 buses and financing for an intermodal transit center and Park and Ride facilities. The intent is to include the capital financing needs of the first increment of transit service in the Fort Ord CIP. It is assumed that these improvements will be financed from some form of development-related financing. There is no provision, however, for the operation of these buses.

As a supplement to public bus and rail service, a modest amount of privately-supported transit service may emerge within the Fort Ord area. Typically, such a service will connect a major activity center with the nearest transit stop or station. In instances where the activity center covers a large area, these services will also transport passengers between internal locations. Within Fort Ord, CSUMB has already implemented such service. The CSUMB shuttle connects the campus core with an MST transit stop to the west, and to the faculty/staff housing area to the east off of Abrams/Inter-garrison. A similar shuttle service has also been discussed in relation to the MBEST Center. These discussions have included proposed service between MBEST and the CSUMB campus.

4.4 ROADWAY MAINTENANCE

In addition to the financing of capital improvements, financing of facility maintenance must be considered. Financing for the new roadway capacity required to meet the travel demand generated by regional growth and the reuse of Fort Ord should not be at the expense of the existing road network. Further, recognition must be given to the fact that roadway capacity added to serve the region will itself require maintenance during the planning period through the year 2015/16. It is recommended that the current level of road maintenance be continued. This current level would be measured in expenditures per lane/mile in each of the relevant jurisdictions and would consider both the maintenance requirements for added roadway capacity and the necessity to maintain the purchasing power of expenditures for maintenance.

The maintenance requirement should be financed first from the local fuel tax before an estimate is made of whether fuel tax revenues are available to finance capital improvements. Experience with fiscal studies that have been done previously by the consulting team in Monterey County leads to pessimism about whether fuel tax revenues will be available or sufficient to finance capital improvements.

[1] For a discussion of the relevant cases, see Abbott, William W., Marian E. Moe, and Marilee Hanson. *Public Needs and Private Dollars: A Guide to Dedications and Development Fees.* Solano Press Books. Point Arena: July 19, 1993. pages 65-68. The citations to the cases are as follows: *Russ Building Partnership v. City and County of San Francisco* (1st Dist. 1987) 199 Cal.App.3d 1496 [246 Cal.Rptr.21] and *Russ Building Partnership v. City and County of San Francisco* (1988) 44 Cal.3d 839 [244 Cal.Rptr.682].

4.5 CONCLUSIONS

This chapter has provided an overview of the many existing and potential funding sources for the financing of transportation improvements. While there are a number of existing funding programs or sources that may provide funds for the types of improvements identified within this study, an assessment of these existing sources suggests a limited capacity for financing future improvements. This review suggests that available funding will be limited to that currently dedicated through the STIP and DCAG programs, as well as reasonably expected funds generated through the STIP County Minimum program, the LTF program and transit farebox revenue.

For roadway improvements, currently dedicated funds include $143 million in the STIP for Highway 1 - Hatton Canyon and the Prunedale By-Pass, plus $10 million in DCAG funds for various improvements within the boundaries of the former Fort Ord. In addition to these dedicated funds, the county is expected to continue receiving its' STIP County Minimum allocation. As estimated by TAMC, this allocation is expected to be $4 million per year for a total of $80 million over the twenty year planning horizon for this study. However, revenues for the next 6 years are already committed, leaving only $56 million excess funds for allocation to the improvements identified in this study. It is also assumed for this study that funds received through state gas tax revenues are expected to cover roadway maintenance costs, and will not provide a significant contribution to the financing of the proposed improvements. With respect to transit operations and maintenance, expected funds for service improvements include those derived from the population-based LTF program, and from farebox revenues. These sources, however, are expected to cover less than one-third of projected operations and maintenance costs.

Recognizing the limited levels of dedicated and expected transportation funds in the region, additional sources will almost certainly be needed to finance desired and needed improvements over the next 20 years. As a first step, efforts to secure additional federal and state transportation monies should be undertaken. However, discussions with key sources in transportation finance throughout California gave no reason whatsoever to be optimistic about increased availability of existing conventional sources of financing. The situation in Monterey County is such that there will be extreme competition for existing sources of financing to pay for existing deficiencies and for projects throughout the region. Accordingly, potential new revenue sources for financing transportation improvements may also be necessary. Potential financing mechanisms described in this chapter include development-related financing, local-option taxes, tax increment financing, and toll roads.

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5. TRAVEL DEMAND FORECASTS

Development of the transportation plan presented in this report required the preparation of future year travel demand forecasts. Future year conditions in this study were forecasted using the Monterey County Traffic Analysis Model (MCTAM), maintained by TAMC. It covers the Monterey Bay region but is focused specifically for Monterey County.

As with all travel demand forecasting models, the MCTAM uses forecasts or assumptions regarding future year land uses and the transportation network as inputs to estimate future travel demand. Using a set of mathematical formulas, the number of trips generated by each traffic analysis zone (TAZ) is calculated. These trips are then distributed to destination zones based on their relative "attractiveness" (for example, a zone with a significant amount of housing would produce a large number of work trips, while a zone with a large number of jobs would attract such trips). The trips are then assigned to the transportation network.

To reflect the planned development of Fort Ord, a number of modifications or enhancements were made to the existing 2015 MCTAM. These included revisions to the network and zone structures, as well as the land use or zonal database. For Trip Generation, a number of new special generators within the former Fort Ord were added. Minor adjustments to the Trip Distribution process were also made. A more detailed discussion of these modifications was presented in Appendix A of Working Paper #3.

5.1 LAND USE INPUTS

Land use inputs for MCTAM include the number of households and jobs by TAZ. A TAZ is a small geographic area, often bounded by major roadways. Because MCTAM is a regional model, these land use inputs were required for TAZs both inside Fort Ord and the region. Land use forecasts for the area outside Fort Ord were provided by the Association of Monterey Bay Area Governments (AMBAG).

Land use forecasts for the former Fort Ord were derived from the land use element of the draft Fort Ord Reuse Plan. For residential uses, the dwelling unit values provided in the draft Reuse Plan were distributed among the appropriate TAZs and entered into the model. For non-residential uses, the acre and square footage values in the Plan were converted to number of employees. Buildout of Fort Ord is expected to occur in the year 2040, and, ideally, transportation conditions for this year would be modeled. However, regional land use forecasts from AMBAG were not available for the Year 2040, only for 2015. By the year 2015, approximately 13,000 housing units and 18,000 jobs are expected on Fort Ord.

To aid in the analysis of Fort Ord's travel demand and transit potential, the reuse area was divided into six districts representing distinct geographical areas and common land uses. These districts are illustrated in Figure 5-1 and described below, while the housing, employment and typical residential development density characteristics of each district are presented in Table5-1.

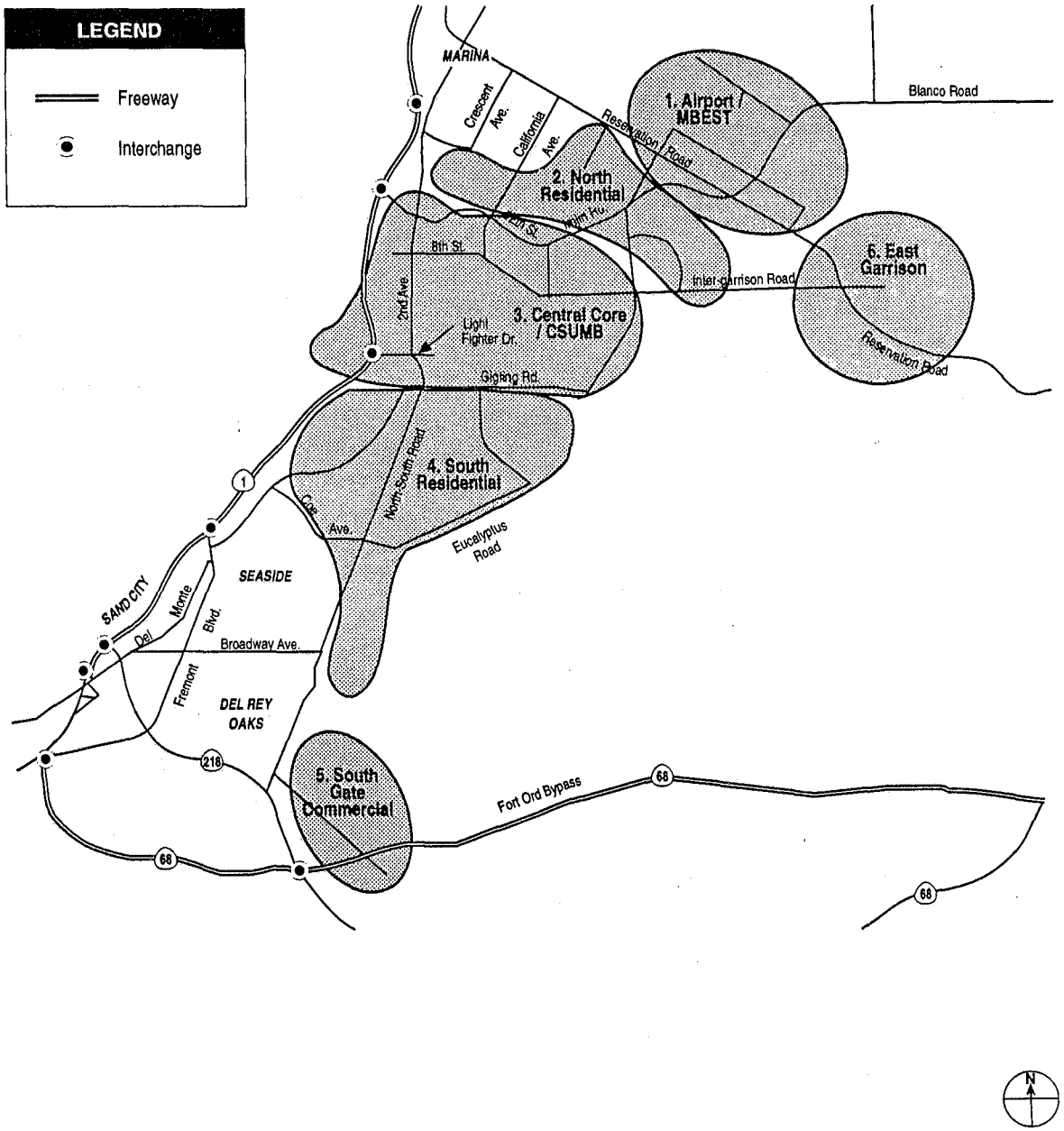

Figure 5-1
Fort Ord Analysis Districts

Source: JHK, 1996

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Table 5-1
2015 FORT ORD LAND USE CHARACTERISTICS

DISTRICT		HOUSING UNITS	JOBS	TYPICAL HOUSING DEVELOPMENT DENSITY (dwelling units per acre)	DAILY TRIP ENDS GENERATED
1.	Airport/MBEST	0	7,640	NA	63,940
2.	Northern Residential	4,112	69	8-10	32,760
3.	Central Core/CSUMB	3,650*	6,983	8-10	104,690**
4.	Southern Residential	5,751	1,198	4-8	67,840
5.	South Gate Commercial/ Industrial	0	1,392	NA	10,820
6.	East Garrison	0	1,058	NA	23,170
TOTAL		**13,513**	**18,340**	--	**303,220**

* Includes 2,550 on-campus student housing units.
** Includes 12,310 school trip ends for students housed on-campus.

1. **Airport/MBEST** - This district represents a major employment center within Fort Ord and includes the airport, related industrial uses, a proposed industrial/office park and the MBEST. This district will have a high concentration of jobs, attracting employees from throughout the region. By 2015, this district is expected to reach approximately one-third of its ultimate development level. At present, the airport is operating, but there is limited additional activity in this area.

2. **Northern Residential** - Located adjacent to existing City of Marina areas, and between the airport and central core of Fort Ord, this district is primarily medium to high density residential. The draft Fort Ord Reuse Plan calls for housing developments with 8-10 dwelling units per acre. Key components of this district include the CSUMB-related housing area east of campus, and the low income, social, seniors housing areas along California Avenue between the central core and the City of Marina. This district is forecast to be largely built out by 2015, with some additional in-fill after this time. Only a small portion of the housing in this district is currently being used.

3. **Central Core/CSUMB** - The central core of Fort Ord consists of the CSUMB campus, mixed-use "villages" to the north and south, and a high-density retail/office/residential area to the west near Highway 1. For the year 2015, housing developments with densities of 8-10 dwelling units per acre are expected. Higher density residential development is planned for beyond 2015. The mixed-use nature of this development, combined with the large percentage of students expected to live on-campus, suggests a large number of intra-district trips for all purposes. It is important to recognize, however, that the district will also become a major employment/commercial/education center for the region. By 2015, both the university and private development in this district are expected to reach roughly one-half of full buildout levels. In 1995, CSUMB began operation with approximately 850 full-time and part-time students. Other current activity in this district includes the POM Annex commercial services and the DFAS Center.

4. **Southern Residential** - This largely residential district envelopes the existing Fort Ord golf courses and includes the POM Annex residential area. It consists primarily of low to medium density residential development (4-8 dwelling units per acre). The POM Annex represents a specific service center. Although the Seaside portion of this district will be largely built out by 2015, development in the County portion will result in a near doubling of dwelling units in the ultimate plan. At this time, activity is limited to the POM Annex residences and the golf courses.

5. **SouthGate Commercial/Industrial** - This district contains a mix of lower density commercial and industrial uses. These is no current activity in this area, and only 20% of development is expected by 2015.

6. **East Garrison** - Lower-density, mixed use development is proposed for the East Garrison district. This district is expected to be approximately one-quarter developed by 2015. Like the South Commercial/Industrial district, there is no current activity at East Garrison.

In general, Fort Ord development densities for 2015 are consistent with those in the surrounding area. However, the mixed-use villages, CSUMB, and MBEST do represent significant, concentrated activity centers.

5.2 TRIP GENERATION AND DISTRIBUTION

For the year 2015, Fort Ord reuses are forecast to generate over 300,000 daily trip ends. In developing a transportation system to accommodate these trips, it is important to know not only the number, but also the distribution of these trips. To provide this information, the daily person trip table from the model was compressed to look at the volume of trips between key groups of zones or districts. These districts represent portions of the urbanized areas in Monterey County, including Fort Ord, where development and trip generation is most concentrated. Additional districts were created consisting of the less developed and external zones. A total of twenty-three districts were initially created for this analysis. As part of this step, the first four of Fort Ord districts were combined (the South Gate Commercial/Industrial and East Garrison districts were excluded because of their spatial separation from the other districts in Fort Ord). A summary of the trip interactions between these district groups is provided in Table 5-2. Figure 5-2 illustrates the trip volume between the north-central portion of Fort Ord and selected communities in Monterey County.

It is important to note that over 43% of the daily trips generated by base reuses are expected to be captured internally. The communities with which Fort Ord is forecast to have the highest level of interaction are Seaside and Marina, although the Peninsula and Salinas represent larger activity centers. A key element of this finding is recognition that trips to these communities, as well as internally in Fort Ord, would also be well served by pedestrian and bicycle networks. Based on the trip results presented in Table 5-2, the trip end pairs with the greatest transit potential include:

- internal;
- Fort Ord to adjacent communities (Marina, Seaside);
- Fort Ord - Peninsula; and
- Fort Ord - Salinas.

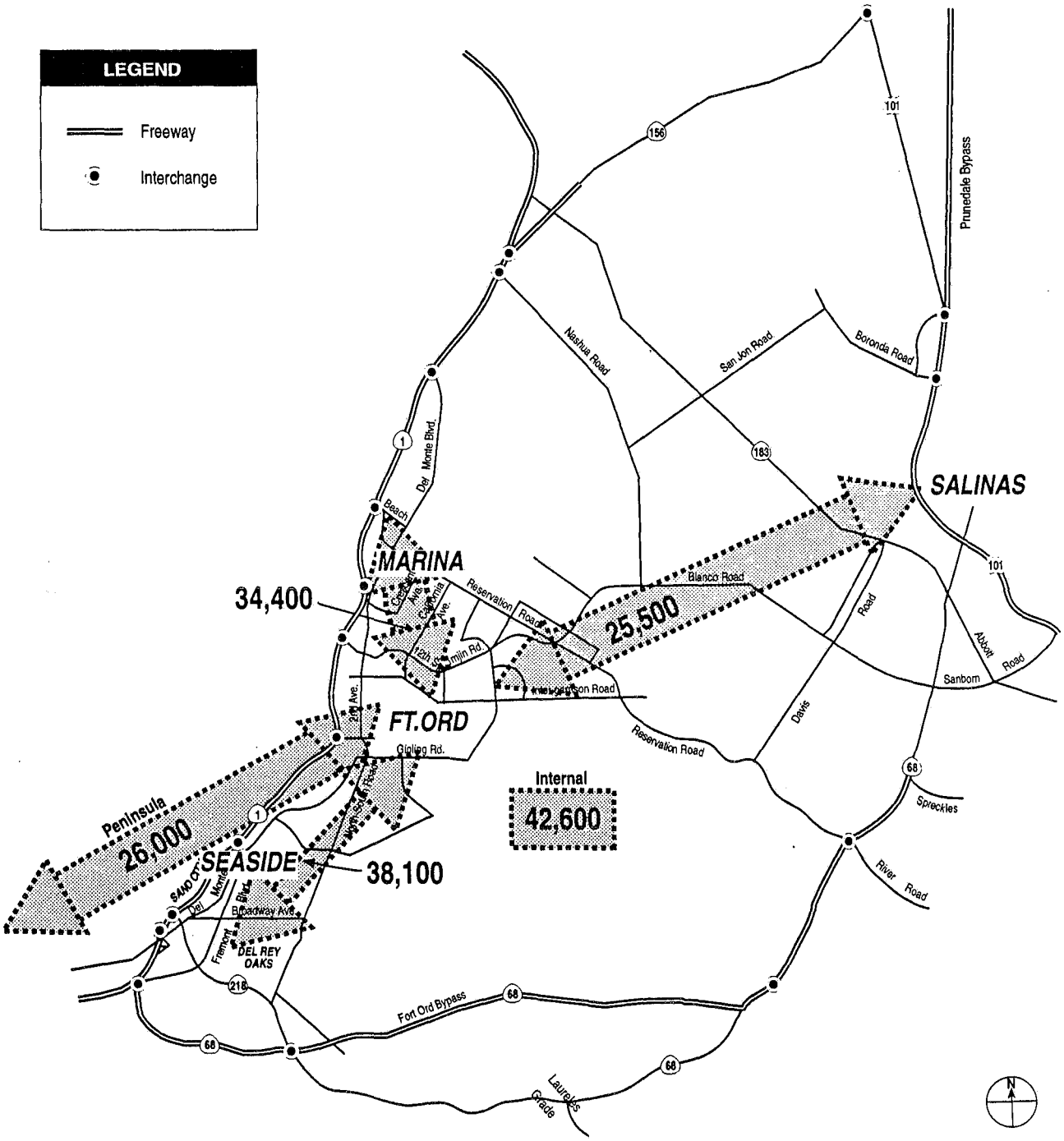

Figure 5-2
Forecasted 2015 Trip Ends Between Core Fort Ord Reuse Area and Primary Destinations

Source: JHK, 1996

50068 Frcstd 2015 Trp

Table 5-2
FORECASTED 2015 DAILY PERSON TRIP DISTRIBUTION

ORIGIN	DESTINATION							TOTAL
	1	2	3	4	5	6	7	
1. Central Fort Ord[1]	54,944	6,306	9,924	13,381	24,981	16,782	22,553	148,871
2. Other Fort Ord[2]	3,678	694	1,511	923	1,375	1,213	1,896	11,290
3. Salinas	15,557	4,392	478,152	5,188	4,819	5,876	143,414	657,398
4. Marina	21,033	2,830	7,514	18,770	11,140	8,802	19,381	89,470
5. Seaside/DRO/ Sand City	13,125	2,713	2,600	3,999	49,106	40,558	27,294	139,395
6. Peninsula[3]	9,197	2,013	2,649	2,237	32,857	134,893	54,228	238,074
7. Other	15,132	3,751	64,143	6,815	26,195	59,678	1,433,925	1,609,639
TOTAL	**120,356**	**22,699**	**566,493**	**51,313**	**150,473**	**267,802**	**1,702,691**	**2,881,827**

Notes: 1. Includes Airport/MBEST, North Residential, Central Core/CSUMB and South Residential districts.
2. Includes Southgate and East Garrison districts.
3. Includes Cities of Monterey and Pacific Grove.

5.3 NETWORK DEFINITION

Within the MCTAM, the transportation network is limited to the roadway network. Thus, assumptions regarding the transportation network include the location, number of lanes, free flow speed and capacity of roadways. The model network does not contain every roadway in Monterey County but does include most collectors, as well as all arterials, highways and freeways. The transit, bicycle and pedestrian networks are not explicitly modeled within the MCTAM, however assumptions regarding the use of these modes, based on historical mode choice, are built into the model. Enhancements to include direct consideration of alternatives modes was not possible for this study. Thus, the travel demand forecasts prepared for this study are based on relatively low levels of alternative mode use. In this manner, the resulting forecasts may be considered "auto-oriented" or "worst case" with respect to identifying future roadway improvement needs.

The definition of the roadway network involved two primary steps. The first step involved the definition of the internal arterial network needed to serve base reuses. This step was conducted concurrently with the development of the land use element for the draft Reuse Plan. Consideration was given to providing sufficient access to areas expected for redevelopment, maximizing the use of existing roads and alignments, and ensuring consistency between roadway class and adjacent land uses.

The second step involved "sizing" (defining the number of lanes) the internal network and identifying improvement to the regional network. The primary goal for this step was to define the roadway network to meet minimum level-of-service requirements while minimizing total infrastructure costs.

Public transportation is planned to be an important element of the multimodal transportation system serving Fort Ord and the adjacent region. It is especially important for the elderly, students, the disabled, and others who cannot drive or who do not have access to an automobile. Also, it can be an attractive transportation alternative for those who want to avoid the cost, stress, and delays of driving, and the nuisance of parking.

Transit vehicles are generally less polluting on a per passenger basis, and can help to lessen roadway congestion. Transit use can delay or eliminate the need for costly roadway capacity improvements.

Financial constraints also played a critical role in determining network improvements. The implementation of transportation improvements to serve the demand created by reuse of the former Fort Ord, combined with growth throughout the region, will involve considerable cost. It is generally agreed that a portion of the costs for future improvements will be derived from fees levied on base reuses. However, there are many uncertainties regarding the availability of funding for transportation infrastructure and service improvements.

The total costs for the year 2015 transportation plan, and the former Fort Ord's share of these costs, are addressed throughout the remainder of this report. However, some uncertainty regarding funding sources remains. For this reason, this study has included the assessment of alternative scenarios that reflect differing funding levels. These scenarios, in turn, reflect differing network assumptions, consistent with the funding levels.

5.4 SCENARIO DESCRIPTIONS AND RESULTS

The primary focus of this study was the development of a transportation plan that adequately and efficiently meets the needs of base reuse and regional growth through to the year 2015. In doing so, numerous 2015 alternatives were modeled reflecting differing roadway network and land use assumptions. The result of this effort was the development of a financially unconstrained, or preferred, transportation plan. In addition, three alternative scenarios have been developed in order to define the implications of different funding levels. Each of these scenarios includes land use assumptions consistent with the preferred plan, but differing roadway network assumptions.

A summary of the specific regional and on-site improvements contained in each scenario is provided in Table 5-3. It should be noted that this includes only major improvements to the regional CMP network. Minor and local improvements that were not expected to influence the travel forecasts are not included. Forecasted 2015 volumes and service levels for key regional roadway segments under the Financially Constrained and Unconstrained scenarios are presented in Table 5-4. Year 2015 volumes and service levels for on-site facilities under these same scenarios are presented in Table 5-5. The two partial funding scenarios were not modeled, thus volume and LOS results for these are not provided.

5.4.1 Financially Unconstrained Scenario

This scenario, with the most optimistic funding assumption, represents the preferred transportation plan for 2015. In defining the network for this scenario, improvements to the internal and regional systems were added in order to achieve service and cost-efficiency goals. Internally, an arterial roadway system designed to meet the Fort's needs for 2015 was incorporated into the network. Outside Fort Ord, a number of major improvement projects that address existing system deficiencies and/or improve access to Fort Ord were added to the model network. A number of alternatives were modeled to identify the preferred roadway network.

Table 5-3
2015 TRANSPORTATION INFRASTRUCTURE IMPROVEMENT SUMMARY

FACILITY	SEGMENT		IMPROVEMENT DESCRIPTION	SCENARIO			
	From	To		Financially Unconstrained	Financially Constrained	Fort Ord Source Only	Impact Study Area Source Only
Off-Site Roadway Improvements							
Hwy 1 - Hatton Canyon	Carpenter	Carmel River	Construct new roadway	•	•	•	•
Highway 1	Santa Cruz County Line	Castroville	Upgrade from 2-lane hwy to 4-lane freeway/expy	•			•
	Fremont	Del Monte	Widen to 6 lanes - extend aux. lanes	•			
U.S. 101 - Prunedale By-Pass	Echo Valley	Espinosa	Construct new freeway	•			•
U.S. 101 Interchanges	Boronda	Airport	Improve interchanges	•	•	•	•
Highway 68	Highway 1	Highway 218	Upgrade to 4-lane freeway	•	•	•	•
	Highway 218	San Benancio	Construct 4-lane ByPass freeway	•			
Highway 156	Castroville	U.S. 101	Widen from 2 to 4 lanes (expy)	•		•	•
Highway 183	Near Salinas	Castroville	Widen from 2 to 4 lanes (expy)	•			
Highway 218	North-South	Hwy 68	Widen from 2 to 4 lanes	•	•	•	•
Davis Road	U.S. 101	Rossi	Widen from 4 to 6 lanes	•			
	Rossi	Blanco	Widen from 2 to 4 lanes	•			
	Blanco	Reservation	4-lane Bridge - to avoid wash-outs	•		•	•
Blanco Road	Reservation	Alisal	Widen from 2 to 4 lanes (to Davis)	•		•	•
			Widen from 3 to 4 lanes (to Alisal)	•		•	•
			Bridge	•		•	•
Reservation Road	Highway 1	Del Monte	Widen from 2 to 4 lanes				
	Del Monte	Crescent	Widen from 4 to 6 lanes	•	•	•	•
	Fort Ord Boundary	Blanco	Widen from 4 to 6 lanes	•	•	•	•
	Blanco	Inter-garrison	Construct new 4-lane connection	•	•	•	•
	Inter-garrison	Watkins Gate	Widen from 2 to 4 lanes (create couplet)	•	•	•	•
	Davis	Highway 68	Widen from 2 to 4 lanes				
Del Monte	In Seaside/Monterey		Widen from 4/5 to 6 lanes	•	•	•	•
	2nd Avenue	Highway 1 I/C	See 2nd Avenue				
	Highway 1 - South	Reservation	Widen to 6 lanes	•			
Hwy 1/Fremont I/C			Reconstruct				
On-Site Roadway Improvements							
12th/Imjin	Highway 1	California	Construct 4-lane arterial (exc. Gateway)	•	•	•	•
	California	Reservation	Widen to 4 lanes	•	•	•	•
	Reservation	Blanco	Construct new 4-lane connector	•		•	•
8th Street	Highway 1 Overcrossing	2nd Avenue	Upgrade as 2-lane arterial	•	•	•	•
	2nd Avenue	Inter-garrison	Upgrade as 2-lane arterial	•	•	•	•
Inter-Garrison	8th St Cutoff	Reservation	Upgrade as 2-lane arterial	•	•	•	•
Lightfighter	North-South Road	Hwy 1	Widen from 4 to 6 lanes				
Gigling	North-South Road	DFAS	Upgrade as 4-lane arterial	•	•	•	•
	DFAS	Eastside	Construct new 4-lane arterial	•	•	•	•

Table 5-3
2015 TRANSPORTATION INFRASTRUCTURE IMPROVEMENT SUMMARY

FACILITY	SEGMENT		IMPROVEMENT DESCRIPTION	SCENARIO			
	From	To		Financially Unconstrained	Financially Constrained	Fort Ord Source Only	Impact Study Area Source Only
2nd Avenue	Del Monte	12th	Construct as 4-lane arterial	•	•	•	•
	12th	Lightfighter	Widen from 2 to 4-lane arterial	•	•	•	•
North-South Road	Normandy	Coe	Widen to 4 lanes	•	•	•	•
	Coe	Broadway	Reconstruct as 2-lane arterial	•	•	•	•
	Broadway	Highway 218	Reconstruct to 2-lane arterial	•	•	•	•
California	3rd	8th Street	Construct 2-lane arterial	•	•	•	•
Eastside Road	Imjin	Inter-garrison	Construct 2-lane arterial	•	•	•	•
	Inter-garrison	Gigling	Construct 2-lane arterial	•	•	•	•
Airport/MBEST Loop Road			Construct 2-lane collector	•	•	•	•
Misc. Rehab/Safety & Minor Street Improvements				•	•	•	•
Transit Capital Improvements							
Multimodal Rail	Salinas	Highway 1	Construct Heavy Rail Link - Post-2015				
			Reserve ROW within Fort Ord	•	•	•	•
Fleet Purchase and Replacement			Vehicles to serve new development (30)	•	•	•	•
			Replacements for existing fleet	•	•	•	•
Intermodal Centers			Construct center for bus and future rail	•	•	•	•
			P'n'R lot - 12th/Imjin	•	•	•	•
			P'n'R lot - 8th/Gigling	•	•	•	•
On-Site Bicycle/Pedestrian Improvements							
Include sidewalks on all reconstructed or new roadways				•	•	•	•
Include bike paths on all reconstructed or new arterial roadways				•	•	•	•

Table 5-4
OFF-SITE REGIONAL FACILITIES SUMMARY

Roadway	Segment	Daily Volume/LOS		
		Existing (1993/94) Condition	Financially Constrained	Financially Unconstrained
State Highway 1	State Highway 68 to Del Monte Blvd (Seaside)	56,000/D	65,000/E	65,000/E
	Del Monte Blvd (Seaside) to State Highway 218	60,000/D	72,200/F	71,900/D
	State Highway 218 to Fremont Blvd	59,000/D	87,500/F	89,000/D
	Fremont Blvd to Main Gate	75,000/D	101,200/E	99,700/E
	Main Gate to 12th Street	65,000/C	80,200/D	79,700/D
	12th Street to S. Marina (Del Monte Blvd)	71,000/C	75,100/D	75,600/D
	S. Marina (Del Monte Blvd) to Reservation Road	35,500/C	48,400/D	48,900/D
	Reservation Road to N. Marina (Del Monte Blvd)	35,500/C	47,400/C	47,600/C
	N. Marina (Del Monte Blvd) to State Highway 156	37,500/C	53,800/D	52,800/D
	State Highway 156 to Santa Cruz County line	30,000/E	60,200/F	70,700/F
State Highway 68	State Highway 1 to State Highway 218	22,800/F	36,300/F	38,700/C
	State Highway 218 to San Benancio Road (Highway)	20,600/F	30,200/F	10,000/B
	State Highway 218 to San Benancio (Freeway Bypass)	N/A	N/A	21,900/B
	San Benancio Road to Reservation Road	25,000/B	36,000/C	34,600/C
	Reservation Road to E. Blanco Road	29,500/B	43,900/C	42,500/C
State Highway 156	Hwy 1 to 0.1 miles East of Castroville Blvd.	22,000/B	35,600/C	30,900/B
	0.1 miles East of Castroville Blvd. to US 101	25,000/E	26,500/E	35,500/C
State Highway 183	US 101 to Davis Road	29,500/E	37,900/F	38,900/F
	Davis Road to Espinosa Road	16,000/C	32,900/F	30,700/B
	Espinosa Road to State Highway 156	22,000/D	53,300/F	50,900/D
State Highway 218	State Highway 1 to Fremont Boulevard	14,000/D	19,700/D	22,600/D
	Fremont Boulevard to North-South Road	10,850/B	10,900/B	12,200/C
	North-South Road to Hwy 68	10,850/B	16,500/B	17,800/B
Del Monte Boulevard	El Estero to Highway 1	34,300/F	50,000/F	49,300/D
	State Highway 1 to Broadway Ave	27,026/D	29,500/D	29,400/D
	Broadway Ave to Fremont Blvd	9,757/C	9,400/C	10,000/C
	State Highway 1 (S. Marina) to Reservation Road	28,836/D	29,700/D	29,600/D
	Reservation Road to State Highway 1 (N. Marina)	4,825/A	10,800/B	9,800/B

Table 5-4
OFF-SITE REGIONAL FACILITIES SUMMARY

Roadway	Segment	Daily Volume/LOS		
		Existing (1993/94) Condition	Financially Constrained	Financially Unconstrained
Fremont Blvd	State Highway 1/State Highway 68 to Broadway Ave	25,166/D	27,200/D	27,500/D
	Broadway Ave to State Highway 1	16,363/C	31,300/F	28,200/D
Broadway Avenue	Del Monte Blvd to Noche Buena Street	13,895/C	16,800/C	16,800/C
	Noche Buena Street to North-South Road	8,742/C	15,100/C	15,000/C
Reservation Road	Hwy 1 to Del Monte Boulevard	10,205/B	14,800/D	14,800/D
	Del Monte Boulevard to Crescent Ave	26,046/E	31,600/D	30,000/D
	Crescent Ave to Imjin Road	22,874/B	32,300/D	32,300/D
	Imjin Road to Blanco Road	N/A	47,500/D	29,700/C
	Blanco Road to Inter-garrison Road	3,700/A	22,700/B	15,600/B
	Intergarrison Road to Davis Road	4,700/A	24,200/E	16,000/C
	Davis Road to State Highway 68	6,200/A	9,600/B	12,100/B
Blanco Rd	Reservation Road to Davis Road	20,252/E	18,300/D	35,700/C
	Davis Road to State Highway 68	18,836/B	18,400/B	23,700/B
Blanco Rd/ Sanborn Rd	State Highway 68 to US 101	26,600/C	31,100/C	30,700/D
Davis Road	Reservation Road to Blanco Road	7,500/A	23,800/E	15,700/C
	Blanco Road to Rossi Street (Hwy 183)	24,000/E	29,000/E	26,300/B
	Rossi Street (Hwy 183) to US 101	34,829/F	35,900/F	38,300/B

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Table 5-5
FORT ORD ARTERIAL FACILITIES SUMMARY

Roadway	Segment	Daily Volume/LOS	
		Financially Constrained	Financially Unconstrained
12th/Imjin	State Highway 1 to California Avenue	20,800/D	19,900/D
	California Avenue to Eastside Road	12,800/B	12,500/B
	Eastside Road to Reservation Road	19,400/B	7,400/B
Blanco/Imjin Connector	Eastside to Reservation	N/A	10,800/B
8th Street	State Highway 1 Overpass to 2nd Avenue	300/C	300/C
	2nd Avenue to Inter-garrison	2,800/C	2,500/C
Inter-garrison Road	8th Street to Gigling Connector	3,500/B	3,000/B
	Gigling Connector to Reservation Road	13,100/C	7,400/A
Lightfighter	State Highway 1 to North-South Road	24,400/D	23,500/D
Gigling	North-South Road to Eastside	16,900/B	15,200/B
2nd Avenue	Del Monte Blvd to 12th Street	3,900/C	3,900/C
	12th Street to Lightfighter	12,100/D	11,800/D
North-South Road	Lightfighter to Gigling	19,700/D	18,400/D
	Gigling to Coe/Eucalyptus	16,900/B	16,200/B
	Coe to Broadway	15,500/E	14,900/D
	Broadway to State Highway 218	5,500/A	5,400/A
California Avenue	Reservation Road to 12th Street	9,600/D	13,200/D
	12th Street to 8th Street	1,700/D	2,100/D
Eastside Road	Imjin to Gigling	9,900/B	12,100/C

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The proposed 2015 roadway network under the Financially Unconstrained scenario, including the number of lanes on key facilities, is illustrated in Figure 5-3. From a regional perspective, the proposed network includes a number of major improvement projects with varying levels of relationship to the reuse of the former Fort Ord. In some instances, these improvements address existing system deficiencies. Others are proposed with the intent of improving access to the former Fort Ord, recognizing the environmental and financial constraints. Improvements to the state highway system include the widening of State Highway 1 in Carmel (Hatton Canyon), Seaside/Sand City and north of Castroville, State Highway 156 east of Castroville, State Highway 183 north of Salinas, and State Highway 218 south of Seaside. Major new state facilities include the State Highway 68 By-pass Freeway and the Prunedale By-pass. Off-base arterial improvements include the widening of Blanco Road west of Salinas, Reservation Road in from Del Monte to Inter-garrison, Davis Road north of Blanco, and Del Monte Boulevard in Monterey/Seaside and in Marina. With the exception of the Davis Road widening, these proposed improvements are consistent with those contained in the draft Fort Ord Reuse Plan. A description of the proposed improvements to regionally significant roadways outside the base boundaries is provided below, along with Fort Ord's forecasted contribution to growth on these roadways.

U.S. 101 - No improvements directly related to the reuse of the former Fort Ord are required, but the proposed network does include the Prunedale Bypass. Funding for this improvement is expected to come from sources other than the development-related financing programs on Fort Ord.

State Highway 1 - This scenario includes the assumption of three improvement projects along State Highway 1. The first is the completion of the Hatton Canyon improvements in the Carmel area. The second project includes the widening of the Highway from four to six lanes between the Fremont Boulevard interchange in Seaside to the Del Monte Boulevard interchange in Seaside. This segment is immediately south of the former Fort Ord and is expected to become significantly congested if unimproved. It should noted that this segment, along with Del Monte Boulevard in Monterey, forms a primary transit corridor that is considered a candidate for potential rail service. The implementation of high level transit service between Fort Ord and the Monterey Peninsula may eliminate or delay the need for roadway widening. The preferred scenario in the draft Fort Ord Reuse Plan projects the former Fort Ord's contribution to added trips on this segment to be 32% in the period to 2015.

The third project is the upgrade of Highway 1 north of Castroville to a 4-lane expressway. The Fort Ord share of traffic growth on this segment was found to be insignificant (less than 2%).

State Highway 68 - For the 2015 network, it is assumed that the Highway 68 By-Pass freeway will be built. This four-lane facility will run through the southern portion of the former Fort Ord. The preferred scenario in the draft Fort Ord Reuse Plan projects the former Fort Ord's contribution to added trips to be 6.5% in the period to 2015.

State Highway 156 - This highway is considered a vital link between the Peninsula, and the former Fort Ord in particular, and the San Francisco Bay Area. Under the proposed network, the two-lane portion of Highway 156 would be upgraded to a four-lane expressway by the year 2015. As a result, this facility would operate at LOS C and would attract trips that otherwise divert to alternative routes in Northern Monterey County. The preferred scenario in the draft Fort Ord Reuse Plan projects the former Fort Ord's contribution to added trips to be 11.7% in the period to 2015. However, the draft Fort Ord Reuse Plan calls for base reuse to contribute over 60% of the necessary funding to reflect the importance of this link.

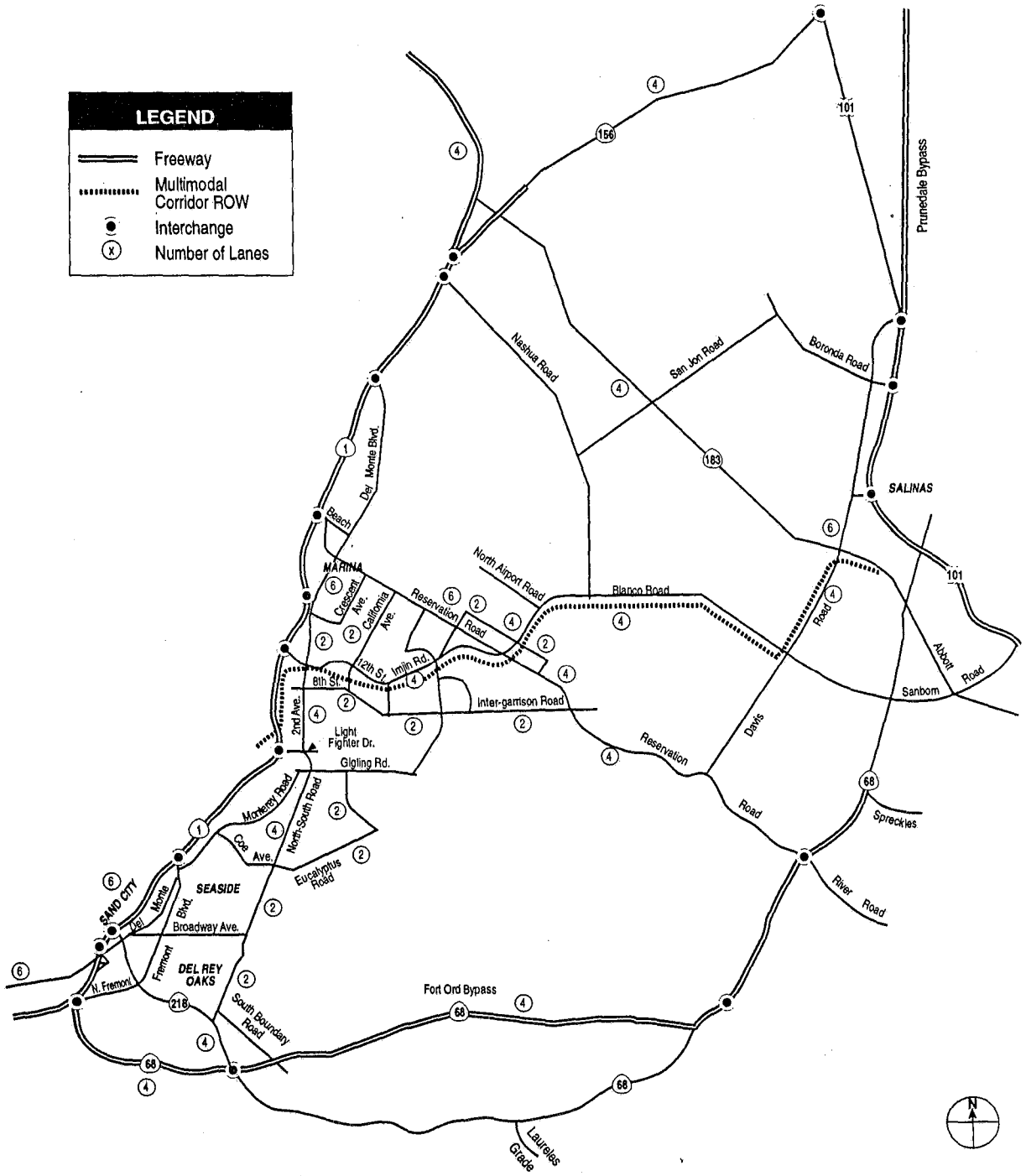

Figure 5-3
Financially Unconstrained Scenario — 2015 Transportation Network

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State Highway 183 - This roadway provides the most direct connection between Salinas and points north on Highway 1 including Castroville and Santa Cruz. To alleviate congestion and provide relief to other routes (U.S. 101 and Highway 1), the proposed network includes widening of Highway 183 to four lanes between Castroville and Salinas by the year 2015. The preferred scenario in the draft Fort Ord Reuse Plan projects the former Fort Ord's contribution to added trips to be 1.5% in the period to 2015.

State Highway 218 - This facility will be improved between State Highway 68 and North-South Road. The preferred scenario in the draft Fort Ord Reuse Plan projects the former Fort Ord's contribution to added trips to be 44% in the period to 2015.

Reservation Road - The preferred plan for 2015 includes improvements along Reservation Road from Del Monte Boulevard to Davis Road. In general, these improvements include the widening of Reservation by 2 additional lanes (from 2 to 4, or from 4 to 6). The upgrading of Reservation between Davis and Inter-garrison, combined with the reconstruction of the Davis Road bridge, is proposed with the intent of establishing this route as an attractive alternative to Blanco between the former Fort Ord and Salinas. The objective of this approach is to lessen the magnitude and impact of improvements along both corridors. The projected contribution of the former Fort Ord to added trips on Reservation varies from 50% near Del Monte to over 80% west of Blanco.

Blanco Road - Upgrading of this facility between Davis and Reservation is proposed, although improvements to other portions of the network (notably Davis, Reservation and Inter-garrison) are intended to provide attractive alternatives and lessen demand on Blanco. The preferred scenario in the draft Fort Ord Reuse Plan projects the former Fort Ord's contribution to added trips to be 60% in the period to 2015.

Davis Road - South of Blanco, improvements to Davis Road are limited to the construction of a new bridge over the Salinas River. This new bridge is intended to ensure that this route will remain open as an alternative to Blanco road. The preferred scenario in the draft Fort Ord Reuse Plan projects the former Fort Ord's contribution to added trips to be 40% in the period to 2015.

North of Blanco Road, the widening of Davis to 4 lanes between Blanco and Rossi, and to 6 lanes between Rossi and U.S. 101 is proposed. This improvement addresses an existing deficiency and provides significant capacity for future growth. It was assumed that the former Fort Ord's contribution to added trips on this portion of Davis was consistent with that on Blanco Road. It should be noted that this improvement, and associated cost, were not included in the draft Fort Ord Reuse Plan.

Del Monte (Monterey) - This facility provides the primary link between the Peninsula and points to the east including Highway 1 and the former Fort Ord. Improvements to sections of this roadway are underway. The 2015 network includes widening of this facility to six lanes from Monterey to Highway 1. The preferred scenario in the draft Fort Ord Reuse Plan projects the former Fort Ord's contribution to added trips to be 50% in the period to 2015. The City of Monterey is currently undertaking a project to widen Del Monte Boulevard to 4 and 5 lanes. The City has stated a preference against further widening, and in support of using development-related financing as a transit in-lieu fee.

This transportation plan also includes the designation of the arterial roadways that will provide circulation within the reuse area. In general, this system of major roads provides access to the regional network via the existing entrance locations at 12th Street, Main Gate (Light Fighter), Imjin Road, Inter-garrison Road, Broadway Avenue and North-South Road at State Highway 218 as well as a new access point via 2nd Ave. Within the base, these roads connect the entrance points and provide for internal circulation. The arterial component of the roadway element within the former Fort Ord consists of the facilities described below.

12th Street/Imjin Road - This remains a key corridor between State Highway 1 and Reservation Road in Fort Ord. For the 2015 proposed network, this facility will be four lanes from State Highway 1 to Reservation Road. Blanco/Imjin Connector - This scenario also includes a new arterial connection within the former Fort Ord boundaries. A new two-lane roadway is proposed connecting the Reservation/Blanco intersection with Imjin near the Eastside Road intersection. This roadway, termed the Blanco/Imjin Connector, would provide direct access onto the former Fort Ord from Blanco.

Gigling Road/Inter-garrison Connector - Gigling Road would serve as the major roadway serving the area immediately south of the CSUMB campus. In the 2015 proposed network, this facility would exist as a four lane arterial from North-South Road to Eastside Road.

Inter-garrison Road/8th Street - This facility is intended to be more attractive to drivers for accessing the southern portion of the reuse area from the east, thus reducing the demand on Blanco Road and the 12th Street/Imjin Road corridor. West of the connection to Eastside Road, however, Inter-garrison Road would be de-emphasized as major vehicular route with greater emphasis placed on pedestrian and bicycle traffic. This entire facility is two lanes in the 2015 proposed network and four lanes in the ultimate buildout network. Eighth Street would possess design features (i.e., intersection and signal spacing) that reflect an urban, circulatory character.

2nd Ave./North-South Road - This corridor would serve as the north-south spine through the reuse area. It will provide a connection from Del Monte Boulevard in Marina to State Highway 218 in Del Rey Oaks. To do so, Del Monte Boulevard will be extended southward from Marina to 2nd Avenue within Fort Ord. The 2nd Avenue portion of this corridor would serve the key commercial and mixed-use development areas within Fort Ord. This facility would be designed to emphasize its role in serving as the primary circulation and access route for these areas, and de-emphasize it as an alternative to State Highway 1. For the 2015 proposed network, this facility will be two lanes on the 2nd Ave segment from Del Monte to 12th street and on the North-South Road segments from Coe/Eucalyptus to State Highway 218. The remaining segments of 2nd Ave and North-South Road will be four lanes.

Eastside Road - For 2015, a new two lane facility is proposed between Imjin and Gigling along the eastern portion of the primary redevelopment area in Fort Ord. Access to State Highway 68 would be via State Highway 218 and the existing North-South Road. Improvements to each of these segments are proposed to support this circulation pattern. In its ultimate form, this facility would provide a four lane connection between the proposed State Highway 68 freeway, around the east side of the CSUMB campus, to Imjin Road. Eastside Road would serve as a primary southwest-northeast corridor. In this manner, it would serve to reduce demand along State Highway 1, 12th Street and the Del Monte/2nd/North-South corridor.

California Avenue - In the 2015 proposed network, California Ave would be extended south from Marina as far as 8th Street as a two lane arterial. For buildout, this facility will be upgraded to a four lane arterial to serv : as a key access and circulatory route in the Marina Village area.

Right-of-Way Reservation - The draft Reuse Plan includes the preservation of right-of-way for possible improvements beyond the year 2015. These include the widening of various facilities and the extension of Eastside Road from Broadway to State Highway 68. Another feature is the reservation of right-of-way along Blanco Road, Imjin Road, 8th Street and 1st Avenue for a high-capacity transit corridor, referred to as the Multimodal Corridor.

As a result of these roadway network improvements, most regional roadway segments are expected to operate at LOS D or better despite handling traffic volumes that are higher than existing levels. Portions of

Highways 68 and 156 improved from existing LOS E/F to LOS D or better. Reservation, Fremont and Davis also experienced similar improvement. Segments of Highway 1, Highway 183, and Davis Road remain at or fall to LOS E or F due to constraints limiting improvements to these facilities. All on-site arterials are forecast to operate at LOS D or better.

This scenario was used to identify the internal transportation system (a system that would operate at LOS D or better), and to identify the full set of regional improvements. It was also used for the "nexus" assessment described previously and, in turn, to determine the Fort Ord development, non-Fort Ord development and non-development shares of the total improvement costs. This cost assessment is described in detail in Chapter 7. However, because this cost breakdown is used for defining the funding level assumptions in the remaining scenarios, a summary of these results is provided below.

Roadway improvements contained in the Financially Unconstrained scenario are estimated to cost over $838 million. This number includes roadway capital improvements within the boundaries of the former Fort Ord totaling $74 million. The nexus analysis indicates that the shares for the total costs break down as follows:

Dedicated/Expected Funding:	$209 million
Fort Ord Development:	$108 million
Study Area Development Outside Fort Ord:	$252 million
Public:	$279 million

Within the Funded category, $143 million in STIP funds and nearly $10 million in DCAG grants have already been secured for various projects. Secured funds include STIP funds for Highway 1 - Hatton Canyon and the Prunedale By-Pass, and DCAG grant funds for improvements on-site. In addition, $56 million in STIP County minimum funds are expected over the next twenty years.

5.4.2 Financially Constrained Scenario

This scenario was defined as part of the draft Fort Ord Reuse Plan and assumes the most severe funding constraints. Available funding includes currently committed funds, plus limited funds generated from base reuses through a flexible, development-related financing program that allows for this funding to be used to cover the entire cost of selected improvements. This scenario is defined in the draft Fort Ord Reuse Plan EIR and assumes that Fort Ord-generated funds will be implemented to fully finance the internal network, while off-site improvements are limited to those regional facilities directly adjacent to the base and where improvements are needed primarily as a result of base reuse. It is important to note that this Fort Ord-generated fund does not equate to the fair share of contributions established from the nexus test.

Committed off-site improvements included in this scenario are the upgrade of Highway 1/ Hatton Canyon, and the widening of State Highway 68 in Monterey and Del Monte Boulevard in Monterey/Seaside. Off-site improvements assumed to be funded by Fort Ord-generated sources include the widening of State Highway 218 south of Seaside, and Reservation Road in Marina. Changes to the internal network were contemplated as a response to possible shifts in traffic volumes caused by congestion on unimproved regional facilities. However, the internal network remained unchanged from the previous scenario. This scenario identifies the impact of the base's reuse and forecasted regional growth on the regional system if this system remains largely as it currently exists.

The reuse of the former Fort Ord contributes to increased volumes on many of the region's roadways. The addition of an arterial network on Fort Ord, however, results in traffic decreases on some roadways, notably Del Monte and Reservation in Marina. Service levels of LOS D or better are forecast for these

segments. Acceptable service levels on the widened segments of Highway 68 and Highway 218 are also achieved. Roads forecast to operate at LOS E/F include: State Highway 1 in Seaside and north of Castroville, State Highway 68 south of Fort Ord, State Highway 183 north of Salinas, Del Monte Boulevard in Monterey, Davis Road, Fremont Boulevard in Seaside and Reservation Road from Inter-garrison Road to Davis Road. The internal network was designed such that all internal arterials would operate at LOS D or better. Because acceptable service levels were still achieved, the internal roadway network remained unchanged.

5.4.3 Funding from Fort Ord Source

For this scenario, it is again assumed that the funding for improvements is limited to that from committed sources, and that derived from a flexible, development-related program in the former Fort Ord. However, it is further assumed that the funding derived the Fort Ord financing program is increased to a level consistent with the Fort Ord share determined by the nexus analysis. Funding from this program would cover the costs of all internal improvements, as well as an expanded set of off-base, regional improvements.

The funds from this program would be used to cover the entire cost of selected improvements, with the total contribution remaining similar to that determined by the nexus test in the Financially Unconstrained scenario. The regional improvements added in this scenario are those deemed most important to base reuse and include all on-site improvements; Highway 156 upgrade; widening of Highway 213, Blanco Road, and Reservation; new bridge on Davis; and the extension of California Avenue.

Under this scenario, it can be expected that the service levels on improved roadway segments would be higher than those found under the Financially Constrained scenario. Additionally, these facilities would likely attract trips from other unimproved and congested routes. The net result being the potential for reduced congestion on some unimproved routes. For example, Highway 68 is likely to benefit from the improvements to Blanco, Davis and Reservation. However, in this case, it is still likely to operate at LOS F. Other poorly operating road segments where no direct or parallel route improvements are made, including Highways 1 and 183, would be expected to remain at LOS F as forecast under the Financially Constrained scenario.

This scenario is used to illustrate the limits of what fees from Fort Ord development may be reasonably expected to pay for, and the magnitude of the unfunded regional transportation improvements considered necessary to serve the area through 2015. Although the total Fort Ord contribution to these improvements exceeds that determined by the nexus test, this would leave approximately $500 million in unfunded improvements.

5.4.4 Funding from Impact Area Source

Under this scenario, it is assumed that a flexible, development-related financing program is expanded to include the entire impact study area illustrated in Figure 5-4. Funds generated from Fort Ord development is assumed to be allocated to those projects identified in the previous scenario. Funds generated from development outside Fort Ord are used to fully finance the unfunded portion of additional regional projects identified in the Financially Unconstrained scenario.

The amount of funding expected to be generated by non-Fort Ord development is assumed to be that of the non-Fort Ord growth share determined by the nexus analysis. Thus, an additional $252 million is expected to be generated under this scenario. Recognizing that these funds would be insufficient to finance all of the identified improvements, the potential funds were allocated first to those projects identified as being of top

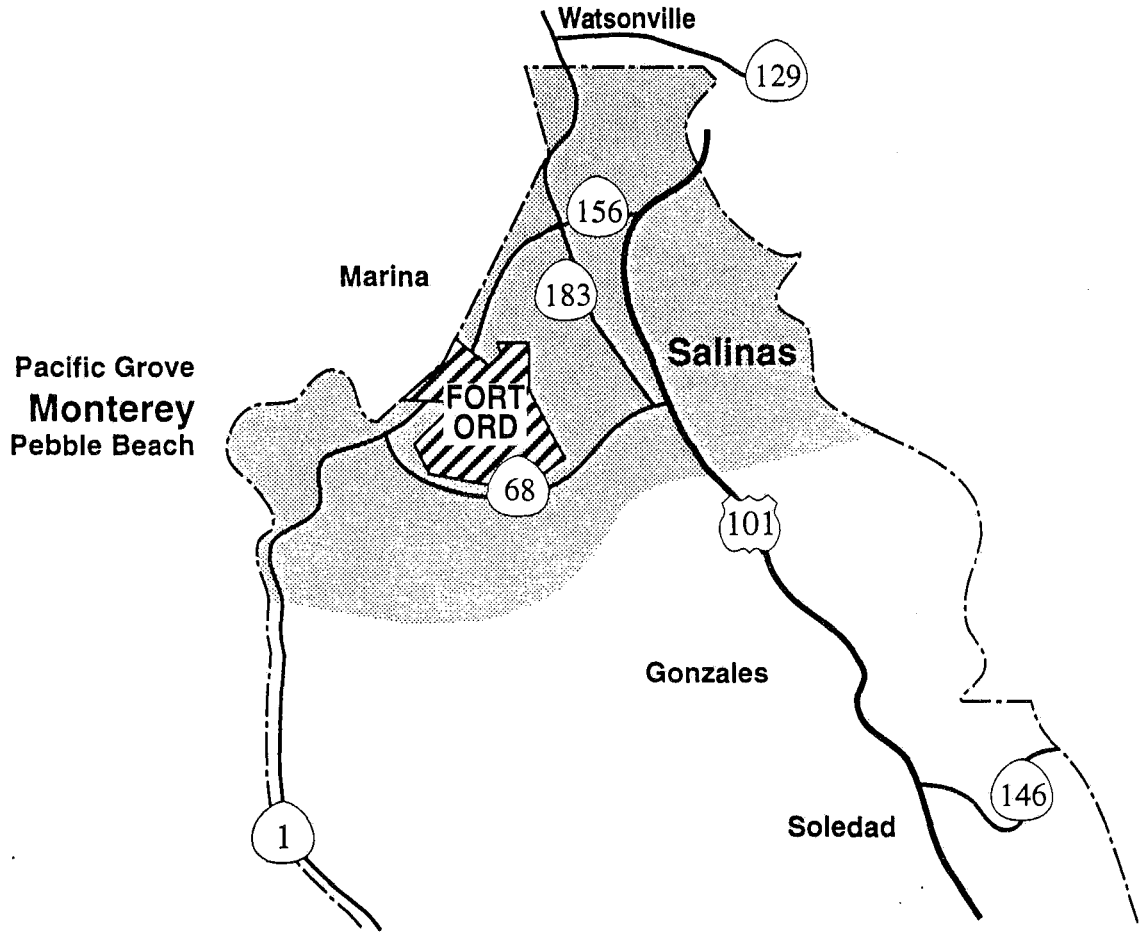

Figure 5-4
Impact Study Area

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priority to the region in the RTP. The additional projects that could be funded include: construction of the Prunedale By-Pass, widening and upgrade of Highway 1 north of Castroville, and the partial funding of the Highway 68 freeway. A portion of these funds may also be used for transit capital expenditures, notably the purchase of additional vehicles needed to serve new development.

Under this scenario, it can be expected that the service levels on improved roadway segments would be higher than those found under the previous scenario. However, these facilities would likely attract trips from other unimproved and congested routes. The result being the potential for reduced congestion on some unimproved routes, and service levels on improved segments that may not be as high as those achieved under the Financially Unconstrained scenario. For example, Highway 68 is likely to benefit from the improvements to Blanco, Davis and Reservation. However, in this case, it is still likely to operate at LOS F. Other poorly operating road segments, such as Highway 183, would be expected to remain at LOS F as forecast under the Financially Constrained scenario.

This scenario illustrates the shortfall in transportation funding that would still exist in the region, even if a development-related fee program was implemented within the entire impact study area (i.e. the northern portion of Monterey County including Fort Ord). Improvements for which complete funding would not be available include those to Highway 68, Highway 183, Del Monte Boulevard. It is important to note that the intent of this study and associated analysis was not to define the specific funding mechanism that would be used for this scenario.

5.5 ALTERNATIVE STRATEGY IMPACTS

The MCTAM is limited in its ability to assess the full range of transportation-related strategies. While it provides valuable information regarding future travel demand and the impacts of roadway improvements, it does not directly measure the impacts of transit, pedestrian, bicycle and TDM strategies. Because land use projections are an input to the model, it does reflect the benefits of various land use-related strategies in trip generation and distribution.

Jobs/housing balance and mixed-use developments concepts are reflected in the model through the number of trips forecast to stay within an individual zone or within the boundaries of the former Fort Ord. Of the 300,000 daily ends forecast to be generated by Fort Ord reuses in the year 2015, nearly 45% are forecast to be for trips completely within the boundaries of the reuse area. As a result, the impact of Fort Ord reuses on the regional transportation system is reduced.

Pedestrian and bicycle measures are an important component of the circulation element for the draft Reuse Plan. These measures are intended to increase the percentage of travel made by these modes. Because trips using these modes are typically short in length, these measures will primarily affect internal trips and those to nearby, adjacent communities. For this reason, the increased use of these modes is not expected to significantly impact the travel demands placed on the regional system.

As with the pedestrian and bicycle measures, transit measures are intended to result in the higher use of this mode. From a regional perspective, higher transit use can significantly affect the demands placed on the regional transportation system. In some areas or corridors, where the land use and transit characteristics allow, transit mode shares in the range of 10 to 15 % may be achieved. This is considerably higher than the current share of approximately 2%. The impact of this shift would be a lessening of the vehicular demands placed on regional roads. The limitation that these high transit mode shares may only be achieved in the most highly travelled corridors suggests that the need for roadway improvement may not be eliminated, but may be delayed. Conversely, achieving these transit shares would require that various transit improvements be implemented.

TDM programs can affect travel demand in 3 primary ways: 1) shift trips to alternative modes, including carpools, 2) eliminate trips completely; and 3) shift trips to different time periods. In the first two cases, the number of vehicle trips generated would be reduced. In turn, the demands placed on both the regional and internal roadways network would be reduced. These programs however, primarily affect only work trips. Reductions in work vehicle trips of 15 to 20% may be achieved at some sites. The overall impact, in terms of daily trips for the entire reuse area is much less significant. The shifting of trips to different period will not impact the number daily trips are forecast by the model, but will impact the number of trips expected to occur during the most congested periods of the day. Again, work trips are the most likely to be affected.

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6. MULTIMODAL TRANSPORTATION SYSTEM

The redevelopment of Fort Ord, combined with growth throughout the region, will increase the demand for transportation infrastructure and services both within the base area and the region. The Fort Ord Regional Transportation Study defines a long-term, comprehensive vision for the movement of people, goods, and vehicles within and through Fort Ord. This transportation plan includes strategies and improvements for the system within the base, as well as for those regionally significant facilities and services that provide access to Fort Ord. It focuses on the system of freeways, arterials, bus and rail transit, and bicycle and pedestrian routes to determine the most effective design possible while enhancing the community and protecting the environment. This plan also recognizes the close relationship between the transportation system and land use plan.

The transportation system described in this chapter consists of several elements: streets and roads, public transit, pedestrian, bicycle, demand management, and linkages to land use plans. This system is intended to serve the long-range needs of Fort Ord and surrounding region. While the roadway and transit elements of the system necessarily incorporate the entire region, the policies and programs related to the pedestrian, bicycle, TDM and land use elements apply principally to the area within the former Fort Ord. Each of these elements within the proposed system is described separately in the following sections.

6.1 ROADWAY SYSTEM

Streets and roads form the basic element of the transportation system. This element consists not only of streets within Fort Ord, but also key regional roads that provide access to and from Fort Ord. This regional network includes state highways and major arterial roads that serve intra- and inter-regional travel needs of Fort Ord and Monterey County.

In developing the roadway network for this transportation plan, there were two basic requirements:

- to define an internal arterial network that would support base reuses; and
- to identify improvements needed to achieve an acceptable level of service.

Table 6-1 provides a listing the roadway improvements identified as necessary to achieve the stated LOS objective for the year 2015. It must be recognized that this table does not include all potential roadway projects within the region. It includes only major improvements to the regional system and those within the former Fort Ord. Included in this table are cost estimates for each of the improvements. The total cost for the proposed roadway improvements is nearly $838 million. A breakdown of these costs by facility type and geographic location is provided in Table 6-2.

6.2 TRANSIT SYSTEM

Public transportation is planned to be an important element of the multimodal transportation system serving Fort Ord and the adjacent region. It is especially important for the elderly, students, the disabled, and others who cannot drive or who do not have access to an automobile. Also, it can be an attractive transportation alternative for those who want to avoid the cost, stress, and delays of driving, and the nuisance of parking. Transit vehicles are generally less polluting on a per passenger basis, and can help to lessen roadway congestion. Transit use can delay or eliminate the need for costly roadway capacity improvements.

Table 6-1
2015 FORT ORD REGIONAL TRANSPORTATION PLAN
ROADWAY CAPITAL IMPROVEMENT COSTS

FACILITY	SEGMENT FROM	SEGMENT TO	IMPROVEMENT DESCRIPTION	ESTIMATED COST
STATE HIGHWAY IMPROVEMENTS				
Highway 1	Carpenter	Carmel River	Construct new Hatton Canyon expressway	$36,000,000
	Santa Cruz County Line	Castroville	Upgrade from 2-lane hwy to 4-lane freeway/expy	$60,000,000
	Fremont	Del Monte	Widen from 4 to 6 lanes - extend aux. lanes	$20,000,000
U.S. 101	Echo Valley	Espinosa	Construct Prunedale ByPass	$236,000,000
	Boronda	Airport	Improve interchanges	$63,000,000
Highway 68	Highway 1	San Benancia	Construct 4-lane ByPass freeway	$177,000,000
Highway 156	Castroville	U.S. 101	Widen from 2 to 4 lanes (expy)	$50,000,000
Highway 183	Near Salinas	Castroville	Widen from 2 to 4 lanes (expy)	$59,000,000
Highway 218	North-South	Hwy 68	Widen from 2 to 4 lanes (including ROW)	$3,590,000
SUBTOTAL				**$704,590,000**
OFF-SITE ARTERIAL IMPROVEMENTS				
Davis Road	U.S. 101	Rossi	Widen from 4 to 6 lanes	$5,000,000
	Rossi	Blanco	Widen from 2 to 4 lanes	$5,000,000
	Blanco	Reservation	4-lane Bridge - to avoid wash-outs	$5,000,000
Blanco Road	Reservation	Alisal	Widen to 4 lanes incl. bridge/ROW	$12,378,000
Reservation Road	Del Monte	Crescent	Widen from 4 to 6 lanes	$1,491,000
	Fort Ord Boundary	Blanco	Widen from 4 to 6 lanes	$4,011,000
	Blanco	Watkins Gate	Construct new 4-lane connection	$7,162,400
Del Monte	In Seaside/Monterey		Widen from 4/5 to 6 lanes or transit alternative	$10,000,000
	2nd Avenue	Highway 1 I/C	See 2nd Avenue	
	Highway 1 - South	Reservation	Widen to 6 lanes (including ROW)	$5,576,300
California	Reservation	3rd	Upgrade as 2-lane arterial, and ROW	$2,460,000
Crescent	Reindollar	Abrams	Extend as 2-lane local street	$720,000
SUBTOTAL				**$58,798,700**
ON-SITE IMPROVEMENTS				
Misc Improvements				$11,100,364
Gateway Improvements				$9,200,000
Abrams	2nd Ave/Del Monte	Patton School	Extend as 2-lane Arterial	$603,000
12th/Imjin	Highway 1	Reservation	Construct 4-lane arterial (exc. Gateway)	$9,065,000
	Abrams	Reservation/Blanco	Construct new 4-lane connector	$4,080,000
8th Street	Highway 1 Overcrossing	Inter-garrison	Upgrade as 2-lane arterial	$3,821,900
Inter-Garrison	8th St Cutoff	Reservation	Upgrade as 2-lane arterial	$4,480,000
Lightfighter	North-South Road	Hwy 1	Widen from 4 to 6 lanes (part of Gateway improvements	$0
Gigling	North-South Road	Eastside	Upgrade as 4-lane arterial	$4,537,800
2nd Avenue	Del Monte	Lightfighter	Construct as 4-lane arterial, and demolition	$7,232,500
North-South Road	Normandy	Coe	Widen to 4 lanes	$2,640,600
	Coe	Highway 218	Reconstruct as 2-lane arterial	$3,520,000
California	3rd	8th Street	Construct 2-lane arterial	$2,769,200
Salinas Ave.	Reservation	Abrams	Upgrade as 2-lane arterial	$2,412,000
Eucalyptus Road	North-South	End	Upgrade as 2-lane arterial	$2,880,000
Eastside Road	Imjin	Gigling	Construct 2-lane arterial	$6,020,000
SUBTOTAL				**$74,362,364**
TOTAL ROADWAY COSTS				**$837,751,064**

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Table 6-2
2015 FORT ORD REGIONAL TRANSPORTATION PLAN
ROADWAY IMPROVEMENT COST SUMMARY

Facility Type	Estimated Cost
State Highways	$704,590,000
Arterials Outside Fort Ord	$58,798,000
Arterials / Other Roadways within Fort Ord	$74,362,364
Total	$837,751,064

Public transportation can take many forms, but may be divided into three basic types of services: rail/fixed guideway transit, bus transit and paratransit. In general, rail services are medium to high capacity systems that operate primarily on right-of-ways separate from automobile traffic, and serve high density or volume corridors. Bus transit is the most common type of transit service. Buses typically operate within the existing street system thus limiting capital costs, but making buses subject to congestion delays. The lower operating speeds and smaller vehicle sizes often result in operating costs greater than that for rail services. Paratransit typically refers to the specialized transit services provided for persons with disabilities and elderly people who cannot ride regular bus transit. All three have potential application to Fort Ord, however this report focuses on rail and bus transit. In all cases, these services can be supported by the construction of various transit facilities ranging from bus shelters to transit transfer centers.

Ideally, transit service would be provided to all areas within Fort Ord, with efficient connections to other communities within the region. In practice, however, funding constraints require that transit service be focused on those areas with the greatest need and potential. It is important to recognize that many factors contribute to the effectiveness of transit. Typically, transit is most effective when tailored to the types of land use and the density of population, employment and commercial development in the areas it serves. Transit's competitiveness with auto travel and the quality of service are also keys to transit's effectiveness.

The planning of transit services and facilities has been an integral part of this study and the draft Reuse Plan. Additionally, TAMC is currently engaged in study that is exploring a range of rail service options for Monterey County, including a proposal to implement service between Monterey and Fort Ord-Marina. This proposed service would make use of existing track, and may include additional track to extend the existing Fort Ord spur further into the reuse area and closer to the CSUMB campus.

Individual jurisdictions within Monterey County are not directly responsible for transit; instead they rely on MST. Thus, the draft Reuse Plan, which provides policies and programs only for land use jurisdictions within Fort Ord, emphasizes actions that these jurisdictions can take to support transit activities. The draft Fort Ord Reuse Plan states that each jurisdiction with lands at Fort Ord shall:

- coordinate with MST to provide regional bus service and facilities to serve the key activity centers and key corridors within Fort Ord;

- assist in identifying key activity centers and key corridors, coordinating with MST to identify bus routes that could serve Fort Ord, and supporting MST to provide service responsive to the local needs;
- develop a program to identify locations for bus facilities, including shelters and turnouts;
- identify the need for transit/paratransit services for the elderly and disabled and coordinate with and support MST to implement the needed transit services;
- support TAMC and other agencies to provide passenger rail service that addresses transportation needs for Fort Ord, including assisting TAMC and other agencies to assess the need, feasibility, design and preservation of rights-of-way for passenger rail service that addresses transportation needs at Fort Ord;
- shall support the establishment of intermodal centers and connections that address the transportation needs at Fort Ord; and
- shall coordinate with and support TAMC and MST to identify the need, location, and physical design of intermodal centers and regional and local transportation routes to connect with the intermodal centers.

Although the draft Fort Ord Reuse Plan does not contain specific service proposals, the related Public Facilities Implementation Plan (PFIP) does include the purchase of 15 buses by the year 2015 in support of service to and within Fort Ord. Furthermore, it states that facilities such as shelters and pullouts shall be funded and constructed through new development and/or other programs in order to support convenient and comprehensive bus service. The Plan also incorporates construction of an intermodal center on 1st Avenue south of 8th Street, and of two park-and-ride lots (at 12th & Imjin, and 8th & Gigling) by the year 2015. The costs for constructing these facilities are included in the Public Facilities Implementation Plan (PFIP).

Within this study, a further examination of was conducted to identify the primary transit needs and potential within Fort Ord. This examination took into account the forecasted land use and travel demand characteristics, existing services, current rail service proposals, transit capital expenditures identified within the draft Fort Ord Reuse Plan, and the reality of funding constraints. For the most part, specific routes were not defined, rather only the corridors or endpoints to be connected were identified.

From the perspective of serving Fort Ord's travel demand, the proposed Monterey-Marina service responds to the need for a connection between the central core of Fort Ord and the Peninsula. With respect to other areas of Fort Ord, direct bus service to the Peninsula would appear to be more efficient than requiring a transfer for the relatively short trip to Monterey. In the long-term, as rail service is expanded, feeder bus service may be more feasible. For this rail to be effective in serving the Fort Ord-Monterey market, however, frequencies and operating hours would need to reflect the needs of the area. Recommendations related to rail service in the Fort Ord area include:

- Continue to explore short-term rail options, notably a connection between Monterey and Fort Ord-Marina, with the emphasis in the shorter-term being placed on connections that utilize existing tracks.
- Pursue a rail connection between Fort Ord and Salinas as a long-term option.

Bus transit provides greater routing flexibility and lower start-up costs than rail transit. For these reasons it is more practical to view bus service as the primary transit mode serving Fort Ord during the first phases of reuse. As the reuse of Fort Ord continue to the year 2015 and beyond, numerous improvements to the bus service in Fort Ord will be needed to respond to the increased demand and to attract new riders. In general, the desired improvements include providing new or more direct connections, and increasing service frequencies. Based on the assessment of potential transit markets and estimated transit mode shares, suggested enhancements to the bus service include:

- add direct service within Fort Ord, most notably between MBEST and other areas;
- add service between the central portion of Fort Ord and Salinas (this could include stops at MBEST, and could be part of a line running from the Peninsula, through Seaside and Fort Ord);
- enhance service between Marina and central Fort Ord (potential to route along Del Monte and California extensions); and
- enhance service levels on all routes, particularly in peak periods.

More general improvements include adding more stops, and encouraging private services such as CSUMB shuttle and proposed MBEST shuttle.

Improvements to transit service beyond the boundaries of the former Fort Ord will also be required by the year 2015. These include:

- purchase of replacement vehicles for the existing fleet;
- initiation of additional service to meet the needs of growth outside of Fort Ord; and
- purchase of new vehicles to meet the requirements of expanded service.

Table 6-3 provides a summary of specific transit-related improvements identified as part of this study and the draft Reuse Plan. This table does not include all policies and programs, but rather focuses on specific actions or improvements. Estimates of the funding requirements for expanding service to Fort Ord and other new development in the region, as well as non-Fort Ord vehicle costs, were provided by MST.

6.3 BICYCLE AND PEDESTRIAN SYSTEM

Non-motorized modes of travel are an important focus for the Fort Ord circulation system. The two most common non-motorized modes of travel are walking (pedestrian) and bicycling. Both pedestrian and bicycle travel are non-polluting, do not contribute to roadway congestion, and are healthy alternatives to vehicular travel. People often find walking and bicycling to be pleasant experiences when they have clearly defined facilities and feel safe using them.

There are a number of transportation and land use factors that influence the use of bicycles and walking as travel modes. These include: availability of facilities, mixture of land uses, supporting design environment, and supporting programs. The influence of these factors may vary depending on whether the entire trip is taken by bicycle/walking, or if the bicycle/pedestrian mode is the access mode to transit. The current Fort Ord Reuse planning activity incorporates many elements related to these factors.

Table 6-3
2015 FORT ORD REGIONAL TRANSPORTATION STUDY
TRANSIT IMPROVEMENT SUMMARY

Improvement Description		Estimated Cost
Capital		
Transit Vehicle Purchase and Replacement	Vehicles to serve new development	$10,000,000
	Vehicles to replace existing fleet	$5,000,000
Intermodal Centers	Construct center for bus and future rail	$1,800,000
	Construct park-n-ride lot 12th/Imjin	$900,000
	Construct park-n-ride lot 8th/Gigling	$1,100,000
Subtotal		**$18,800,000**
Operational		
Expand bus service in Fort Ord		$56,000,000
Expand regional bus service		$56,000,000
Subtotal		**$112,000,000**
Total Transit Costs		**$130,800,000**

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The design standards for roadways within Fort Ord include rights-of-way for both pedestrian and bicycle facilities. Design standards included as part of the draft Fort Ord Reuse Plan show that Class I bikeways should be incorporated into all arterial roadways. Figure E-4 illustrated the proposed Class I bikeway system for Fort Ord. On collector and local roads, Class II bike routes should be striped and marked where designated on an integrated bikeway master plan. Other two-lane local streets and all rural roadways should include shoulders adequate for bicycle use. Additional bicycle amenities that could be provided include racks or lockers at activity and transit centers, and racks on transit vehicles. Sidewalks are to be constructed along all urban roadways. To maximize the effectiveness of these facilities, connecting sidewalks and bikeways in adjacent areas should be pursued. One means of ensuring this is to apply the same design standards when arterials outside of Fort Ord are constructed or upgraded.

A critical factor in promoting pedestrian activity is to have land uses that permit trips that can be easily and safely walked. The primary example of pedestrian-friendly land uses are a mixture of uses located in proximity to one another. Like walking, bicycle trips are usually shorter in length and, thus, are also more likely in areas with a mixture of land uses that result in residences being in close proximity to employment, commercial and recreational opportunities.

The land use plan included in the draft Fort Ord Reuse Plan includes the creation of two mixed-use villages located north and south of the CSUMB campus, as well as a higher-density, mixed area to the west along Highway 1. Within these areas, residences will be able to access a range of goods, services and jobs within a short distance. The land use plan also incorporates several neighborhood shopping areas within or adjacent to the larger residential districts.

Site design characteristics that encourage pedestrian and bicycle activity include landscaping, minimal building setbacks in commercial areas, and shower facilities at the workplace. TDM programs at job sites, such as financial incentives for non-auto commuting, can also be developed to encourage commuting by bicycle and walking. Another way to support pedestrian and bicycle travel is to ensure that these modes are included in planning efforts. Each of these concepts are promoted within the draft Fort Ord Reuse Plan. The draft Fort Ord Reuse Plan recommends that TDM programs be promoted at work sites and other activity centers, and that all Fort Ord jurisdictions prepare Pedestrian and Bicycle System Plans. These plans are to be coordinated with adjacent land use jurisdictions, FORA, and appropriate school entities.

Table 6-4 provides a summary of the bicycle and pedestrian-related improvements or policies recommended as part of the Fort Ord reuse. Costs for these measures are assumed to be incorporated into the cost estimates for larger improvements (e.g. the cost for an arterial bike lane is incorporated into the cost for the roadway improvement), or are unavailable, or are not applicable.

6.4 TRANSPORTATION DEMAND MANAGEMENT

To some extent, the increases in travel demand created by Fort Ord and regional development will be managed by building or improving transportation facilities, but there also exists a variety of concepts and objectives that can be used to minimize the demand for vehicle trips as an alternative to increasing roadway capacity. TDM attempts to reduce the number of people who drive alone, and to increase the number of people who walk and who use carpools, vanpools, transit, and bicycles. The approach being taken as part of the Fort Ord Reuse transportation planning activity seeks to balance these two elements to achieve a transportation system that is both financially feasible and operationally acceptable.

Traditionally, TDM programs have focused on the work site. Some measures that can be pursued at the work site include: compressed work weeks, staggered/flexible work hours, telecommuting, on-site ridesharing, public transit subsidies, bicycle facilities, and parking pricing. Other strategies for

Table 6-4
2015 FORT ORD REGIONAL TRANSPORTATION PLAN
PEDESTRIAN AND BICYCLE IMPROVEMENTS/POLICIES

Construct sidewalks on all urban roadways
Constrauct Class I bikeways on all arterials
Construct Class II and III bikeways on designated collector, local and rural roads
Develop mixed-use, higher-densities areas
Promote pedestrian and bicycle-friencly site designs
Promote TDM programs
Prepare Pedestrian and Bicycle System Plans

implementation include promoting TDM programs at residential developments, retail centers, and other major activity centers, requiring new development to incorporate design features that will promote TDM programs, and enforcing CMP trip reduction programs.

There is no existing transportation demand management (TDM) program in place for Fort Ord, however the draft Reuse Plan states that TDM programs should be promoted at work sites and other activity centers. Further, TAMC has developed a trip reduction program as part of the CMP.

6.5 LAND USE PLAN

Local land use planning is another method of managing regional traffic growth as well as local traffic problems. The draft Fort Ord Reuse Plan includes land use polices aimed at providing Fort Ord with a cohesive community through:

- identifiable centers to add focus to the larger area;
- diversity and choice to enhance opportunity and interaction;
- alternative transportation that stresses access vs. speed and encourages a pedestrian-friendly environment;
- housing diversity in type, density, and location; and
- natural and preserved areas that link all sectors together in a seamless way.

The policies listed above can be found in the Land Use Element of the draft Reuse Plan, along with a specific description of the existing land use conditions.

The relationship between the transportation system and land use planning is an interactive one. As stated above, one of the policies of the land use element is to support alternative transportation use. The transportation system can support this goal by providing the infrastructure necessary to use alternative transportation modes, and by not oversupplying infrastructure oriented to the use of the automobile,

particularly single-occupant vehicles. Additionally, the land use element presented in the Reuse plan supports this goal by providing jobs/housing balance and mixed-use development.

Providing a jobs/housing balance is intended to encourage employers to locate in areas where there are significantly more residents than jobs and to add housing development near employment centers. In a mixed-use development, a variety of compatible land uses are located in proximity to one another. If a mixed-use development includes commercial uses that serve offices and/or residences, employees and residents can patronize the commercial uses without making a vehicle trip. Increasing the density of a mixed-use development results in a decrease in the distances between uses, further encouraging walking and reducing vehicle travel. In single-use developments, higher densities can mean greater opportunities for carpooling and transit service.

As noted in Section 3.3 of this report, other land use-related concepts that impact transportation include the design of the street network, transit-oriented design (TOD). A grid networks can reduce vehicle miles traveled (VMT) by reducing the distance that needs to be traveled between two points (as compared to networks where cul-de-sacs predominate). A grid network also provides more direct routes for pedestrians and bicyclists. TOD is a deliberate alteration of post-World War II suburban patterns. It assumes a sizeable parcel of developing/redeveloping land (at least one-third of a mile in radius) centered on a current or planned major transit station. Development in a TOD would include a range of housing densities and mix of land uses. Pedestrian facilities are provided to the transit station and between the land uses to make it convenient for residents and employees to walk and bicycle. Vehicle travel is reduced within the TOD as a result of the clustering of land uses. Regionally, transit use would be increased as a result of more residences and employment sites being located near a transit station.

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7. FINANCING STRATEGY

The proposed transportation system presented in the previous chapter includes approximately $920 million in capital and operational improvements to address existing deficiencies, and to serve future development in the former Fort Ord and the region. A primary constraint to the implementation of the proposed system is the ability to fund these improvements.

A number of existing and potential funding sources for transportation were discussed in Chapter4 of this report. While there are a number of existing funding programs or sources that may provide funds for the types of improvements identified within this study, funding for most, if not all, of these improvements is not yet secured. Furthermore, an assessment of these existing sources suggests a limited capacity for financing future improvements. Implementation of the improvements proposed in this study will, undoubtedly, require new funding sources.

The following sections represent the initial steps in addressing the issue of financing the improvements suggested as part of this study. The following section provides a breakdown of improvement costs by type (e.g. roadway versus transit, state versus local roadway, etc.). The second section summarizes the conclusions regarding currently dedicated or expected funding from existing sources as discussed in Chapter 4. The results from a preliminary nexus analysis are presented in the third section. This analysis includes a breakdown of the demand for individual improvements attributable to Fort Ord development, non-Fort Ord development, and to public/non-development sources. This is followed by a discussion of the differences between the cost and nexus information presented in this report versus that presented in the Fort Ord Reuse plan. The final section of this chapter provides a discussion of potential sources that may be pursued to cover unfunded portions of the proposed improvements.

7.1. COST ASSESSMENT

The transportation improvements presented in this report include a mixture of projects covering various transportation modes and types of facilities. A summary of individual project cost estimates is presented in the previous chapter. A breakdown of these project costs, according to type of improvement, is presented in Table 7-1. The purpose of this breakdown is to provide direction regarding the types of funding sources that may be applicable for financing the suggested improvements. Some sources, both existing and potential, are constrained with respect to the types of projects that may be funded from that source. For example, funds from sources may only be used for roadway capital projects, while those from other sources may only be used for transit operational expenditures. It must be recognized that this table does not include all potential transportation projects within the region through the year 2015. It includes only major improvements to the regional system and those within the former Fort Ord.

Roadway improvements contained in the proposed transportation plan include measures such as the widening or extension of existing roads, as well as the construction of new roads and bridges. Impacted roadways include a number of state highways within Monterey County, as well as arterials that are part of the CMP network or form the proposed arterial network on Fort Ord. Proposed transit capital improvements include both the purchase of new vehicles and the construction of intermodal facilities. The operational improvements reflect the costs to expand service to meet the needs created by the redevelopment of Fort Ord and projected growth throughout other areas of the region.

Table 7-1
BREAKDOWN OF ESTIMATED COSTS BY IMPROVEMENT TYPE

Improvement Type	Estimated Cost	Percent Share
Total Capital Costs	**$857 million**	**88%**
Highway Capital Improvements	$705 million	73%
Regional Arterial Capital Improvements	$59 million	6%
On-Fort Ord Arterial Improvements	$74 million	8%
Transit Capital Improvements	$19 million	2%
Transit Service Expansion (Operations and Maintenance)	**$112 million**	**12%**
Service Expansion for Fort Ord	$56 million	6%
Service Expansion for Other Growth Areas	$56 million	6%
Total Transportation Costs	**$ 969 million**	**100%**

As shown in Table 7-1, and illustrated in Figure 7-1, capital improvements account for nearly 88% of the total transportation costs associated with the proposed transportation system. Within the proposed capital improvements, costs for state highway improvements represent the most significant share at $705 million, or 73% of all transportation costs. Only 8% of the total costs are for roadway capital improvements within the boundaries of the former Fort Ord. Transit capital improvements account for only 2% of the total costs. Increased transit operational and maintenance costs, however, represent 12% of the total costs.

7.2. DEDICATED AND EXPECTED FUNDING

Within Chapter 4 of this report, existing and potential funding sources for transportation improvements were described. As part of this discussion, conclusions were made regarding the level of funding either currently dedicated or reasonably expected to be received in the future from existing sources. As noted, these sources are expected to provide only partial funding necessary for future improvements. A review of these sources suggests that available funding will be limited to that currently dedicated through the STIP and DCAG programs, as well as reasonably expected funds generated through the STIP County Minimum program, the LTF program and transit farebox recovery.

For roadway improvements, currently dedicated funds include state-allocated STIP funds for major highway projects, and federal DCAG grant funds for various improvements within the boundaries of the former Fort Ord. These funds include $143 million in the STIP for Highway 1 - Hatton Canyon and the Prunedale By-Pass, plus $10 million in DCAG funds. In addition to these dedicated funds, the county is expected to continue receiving its' STIP County Minimum allocation. As estimated by TAMC, this allocation is expected to be $4 million per year for a total of $80 million over the twenty year planning horizon for this study. However, revenues for the next 6 years are already committed, leaving only $56 million excess funds for allocation to the improvements identified in this study. It should be re-iterated that funds received through state gas tax revenues are expected to cover roadway maintenance costs, and will not provide a significant contribution to the financing of the proposed improvements.

With respect to transit operations and maintenance, expected funds for service improvements include those derived from the population-based LTF program, and from farebox revenues. Assumptions regarding the level of funds expected from these sources were developed in consultation with TAMC and MST. First, it was assumed that the per capita transit funding from LTF will remain constant at $22. As

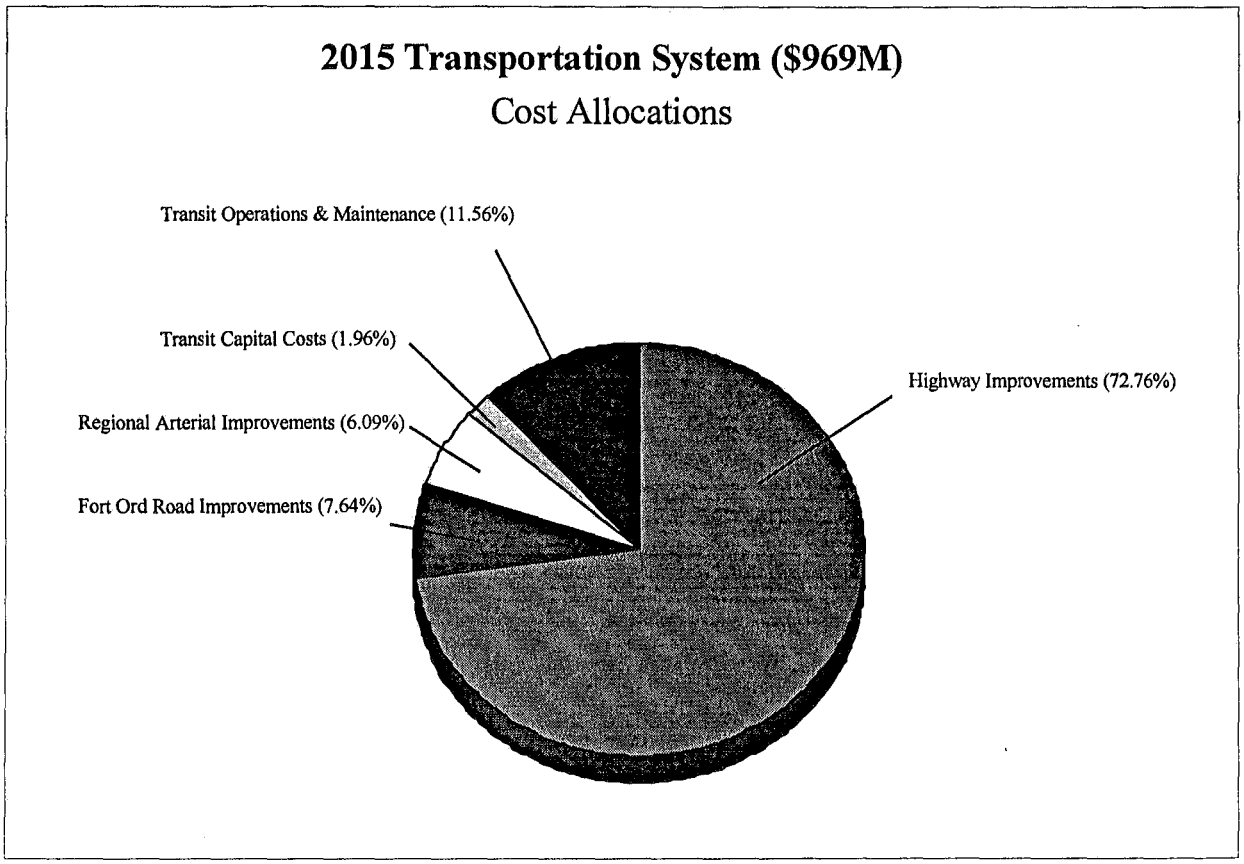

Figure 7-1
Total Cost Breakdown

such, the LTF funds generated by Fort Ord population growth to the year 2015 is forecast to be $703,736, while that generated by off-site growth is $1,793,540. Second, it was assumed that a farebox recovery of 30% would be achieved and used to reduce funding needs for transit operating costs. At this level, farebox revenues are expected to cover $33.6 million of the estimated $112 million in service improvement costs.

Table 7-2 highlights costs, expected funds, and anticipated shortfall by improvement type. This table illustrates the key conclusion that traditional sources are not expected to provide sufficient funding necessary for future improvements. This assessment also suggests that new funding sources will be needed to finance the proposed improvements.

Table 7-2
ESTIMATED COSTS, EXPECTED FUNDING AND SHORTFALLS

Improvement Type	Costs/ Expected Funding
ROADWAY CAPTIAL	
Total Estimated Costs	$838 million
Expected Sources:	
STIP	$143 million
DCAG	$10 million
STIP County Minimum	$56 million
Total	$209 million
Shortfall	$629 million
TRANSIT CAPTIAL	
Total Estimated Costs	$19 million
Expected Sources:	$0
Shortfall	$19 million
TRANSIT OPERATIONS	
Total Estimated Costs	$112 million
Expected Sources:	
LTF	$2.5 million
Farebox Revenue	$33.6 million
Total	$36.1 million
Shortfall	$75.9 million
ALL IMPROVEMENTS	
Total Estimated Costs	$969 million
Funding from Expected Sources	$245.1 million
Shortfall	$723.9 million

Beyond the dedicated or expected funding described above, the specific funding sources or programs needed to finance the proposed improvements have not been created. In response, this study has explored a number of options for generating funds using local programs. The options explored include development-related financing, tax increment financing, local-option taxes, and toll roads. To support this assessment of potential sources, a preliminary nexus analysis was conducted. The results of this analysis are presented in the following section.

7.3 PRELIMINARY NEXUS ANALYSIS

Two important conclusions may be derived from the discussion of funding sources in Chapter 4 and the previous section. First, current funding sources are expected to only partially fund a few of the proposed improvements by the year 2015. Second, a development-related financing mechanism represents a potential funding source that warrants further consideration.

It is important to note, however, the constraints related to development-related financing. First, the amount contributed must be proportional to the share of the improvement's need that is created by new development. The need for an improvement may be generated by the reuse of the former Fort Ord, by growth within the study area but outside the former Fort Ord, and by the desire to correct existing deficiencies. Second, development-related financing cannot be used when a large percentage of new trips start or end outside the assessment area and, therefore, would not be charged. Thus, improvements to major facilities serving a high percentage of inter-regional trips cannot be included in a development-related fee program. Third, development-related financing cannot be used for operations and maintenance. These constraints greatly impact the amount that can be generated through such programs, and how the funds may be used.

To support the possible implementation of a development-related financing mechanism, a preliminary nexus analysis of the proposed improvements was conducted. The purpose of this analysis was to identify the "fair share" of each proposed improvement that could be allocated to future development. As part of this process, dedicated or expected funding for each improvement was identified, and the remaining balance distributed between Fort Ord development, non-Fort Ord development and public shares. These shares were determined based upon the projected relative contribution to the demand for an improvement. The preliminary nature of this analysis is reflected in the use of only two "zones" for the nexus determination - inside the boundaries of Fort Ord versus outside. Prior to the implementation of a development-related financing mechanism, a more detailed nexus analysis involving multiple zones outside Fort Ord would likely be required. The use of multiple zones would allow for determination of the differential demand for improvements generated by development in different areas of the region.

For roadway improvements, this preliminary analysis involved the identification of the Fort Ord and non-Fort Ord contributions to the volume increase on the regional roadways examined in this study. The former Fort Ord's contribution to added trips is equal to the percent of growth (new trips) with one trip end in the former Fort Ord. For financing purposes, a trip with only one end in the former Fort Ord was split 50/50 with North County. Public shares were determined based on the need to correct existing deficiencies. Costs were also allocated to the public share where conditions, such as a significant portion of trips on a segment having ends outside the study area, suggested that a true nexus for development-related financing may not apply. For transit service improvements and intermodal facilities, where numerical forecasts of use or demand were not available, the allocation of costs was based primarily on the geographic location of the proposed improvement.

The results of the preliminary nexus analysis for individual projects are presented in Table 7-3. Within this table, where dedicated or expected funds may be attributed to a specific project, this has been done. Where expected funds are not allocated to a specific project, these funds are reflected through a reduction in the level of the unfunded public share for the appropriate category of improvement. A summary of the nexus results, differentiated between capital and operaitonal improvements, is provided in Table 7-4. Figure 7-2 illustrates the nexus results for each type of capital improvement, while Figure 7-3 illustrates capital cost distribution for each impact share.

A primary conclusion that may be derived from this preliminary nexus analysis is that even a region-wide development-related financing program cannot be expected to generate funds sufficient to finance all of the improvements identified in this study. This conclusion is illustrated by the unfunded public share of nearly $280 million.

Table 7-3
2015 FORT ORD REGIONAL TRANSPORTATION STUDY
PRELIMINARY NEXUS ANALYSIS RESULTS

FACILITY	ESTIMATED COST	DEDICATED/EXPECTED FUNDING (1)		UNFUNDED COST ALLOCATION(2)		
		Amount	Source	Fort Ord Development	Impact Study Area Development	PUBLIC(3)
Regional Highway Projects						
Highway 1 - Hatton Canyon	$36,000,000	$36,000,000	STIP	$0	$0	$0
Highway 1 - North of Castroville	$60,000,000	$0		$0	$0	$60,000,000
Highway 1 - Seaside/Sand City	$20,000,000	$0		$6,400,000	$13,600,000	$0
U.S. 101 - Prunedale By-Pass	$236,000,000	$107,000,000	STIP	$0	$0	$129,000,000
U.S. 101 Interchanges	$63,000,000	$0		$0	$0	$63,000,000
Highway 68 - Bypass Freeway	$177,000,000	$0		$18,054,000	$138,768,000	$20,178,000
Highway 156 Widening	$50,000,000	$0		$0	$0	$50,000,000
Highway 183 Widening	$59,000,000	$0		$0	$56,050,000	$2,950,000
Highway 218 - North-South to Hwy 68	$3,590,000	$0		$1,629,860	$1,960,140	$0
Expected STIP County Minimum Funds (4)	$0	$56,000,000	STIP	$0	$0	($56,000,000
SUBTOTAL	**$704,590,000**	**$199,000,000**		**$26,083,860**	**$210,378,140**	**$269,128,000**
Off-Site Arterial Improvements						
Davis Road - Widening n/o Blanco	$10,000,000	$0		$5,570,000	$3,720,000	$710,000
Davis Road - New bridge	$5,000,000	$0		$2,030,000	$2,970,000	$0
Blanco Road - Widening and bridge	$12,378,000	$0		$6,337,536	$5,520,588	$519,876
Reservation Road - Widening	$12,664,400	$0		$9,068,973	$3,431,417	$164,010
Del Monte - Seaside/Monterey	$10,000,000	$0		$3,420,000	$3,460,000	$3,120,000
Del Monte - Marina	$5,576,300	$0		$4,488,922	$1,087,379	$0
California	$2,460,000	$0		$697,500	$1,162,500	$600,000
Crescent	$720,000	$0		$720,000	$0	$0
SUBTOTAL	**$58,798,700**	**$0**		**$32,332,931**	**$21,351,884**	**$5,113,886**
On-Site Improvements						
Gateway and Misc Safety Improvements/Rehab	$20,300,364	$9,780,000	DCAG	$10,520,364	$0	$0
Abrams	$603,000	$0		$603,000	$0	$0
12th/Imjin	$9,065,000	$0		$4,532,500	$4,532,500	$0
Blanco/Imjin Connector	$4,080,000	$0		$4,080,000	$0	$0
8th Street	$3,821,900	$0		$3,248,615	$573,285	$0
Inter-Garrison	$4,480,000	$0		$3,808,000	$672,000	$0
Gigling	$4,537,800	$0		$3,221,838	$1,315,962	$0
2nd Avenue	$7,232,500	$0		$5,398,068	$1,834,432	$0
North-South Road	$6,160,600	$0		$3,326,724	$2,833,876	$0
California	$2,769,200	$0		$1,038,450	$1,730,750	$0
Salinas Ave.	$2,412,000	$0		$2,412,000	$0	$0
Eucalyptus Road	$2,880,000	$0		$2,880,000	$0	$0
Eastside Road	$6,020,000	$0		$4,358,480	$1,661,520	$0
SUBTOTAL	**$74,362,364**	**$9,780,000**		**$49,428,039**	**$15,154,325**	**$0**
Transit Capital Improvements						
Transit Vehicle Purchase & Replacement	$15,000,000	$0		$5,000,000	$5,000,000	$5,000,000
Intermodal Centers	$3,800,000	$0		$3,800,000	$0	$0
SUBTOTAL	**$18,800,000**	**$0**		**$8,800,000**	**$5,000,000**	**$5,000,000**
TOTAL CAPITAL COSTS/SHARES	**$856,551,064**	**$208,780,000**		**$116,644,830**	**$251,884,349**	**$279,241,886**

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(1) Includes $56 million in expected STIP funds not yet allocated. Does not include traffic impact fees already collected, that may be used for some of these projects.
(2) Allocation of costs based on a "Nexus" assessment of individual improvements. Fort Ord and Impact Study Area Development shares based on relative contribution to traffic volume growth on subject facility.
(3) "Public" includes share for existing congestion and portion of traffic growth attributable to trips outside the study area. (Note: in some instances, where the percentage of trips with one or both ends are external to Fort Ord and the study area is significant, the Nexus requirement cannot be met and the full cost must be covered by non-development sources).
(4) Assume that STIP County Minimum funds will be allocated to highway improvements. Specific projects not yet specified.

Table 7-4
SUMMARY OF PRELIMINARY NEXUS ANALYSIS
COST SHARE ALLOCATION BY IMPROVEMENT TYPE

Share	Roadway and Transit Capital Improvements	Transit Operation and Maintenance Improvements	Total
Dedicated or Expected Funding	$209	$36	$245
Fort Ord Development	$117	$38.5	$155.5
Non-Fort Ord Development	$252	$37.5	$289.5
Unfunded Public Share	$279	$0	$279
Total	$857	$112	$969

7.4 RELATIONSHIP TO DRAFT FORT ORD REUSE PLAN

This study is based largely on the same analysis used for the transportation element of the draft Fort Ord Reuse Plan prepared separately for FORA. However, the list of improvements, costs and funding shares vary between the two studies. These differences are due in part to the broader, regional focus of this study, and to input received subsequent to the preparation of the draft Reuse Plan (and, indeed, input received as comments on the draft Reuse Plan).

Reflective of this study's more regional emphasis, improvements and costs presented here, but not contained in the draft Reuse Plan or related PFIP include:

- regional improvements for which there is no Fort Ord contribution;
- transit operational costs; and
- off-site transit capital costs.

Additionally, the transportation system presented in this report contains two improvements not listed in the draft Fort Ord Reuse Plan PFIP: the widening of Davis Road north of Blanco, and the widening of Highway 1 from Fremont to Del Monte in Seaside/Sand City. Within the draft Reuse Plan, this segment of Highway 1 was identified as being deficient and the widening incorporated into the LOS results; however, no cost estimate was included. These two improvements have been added largely in response to comments received on the draft Reuse Plan and associated EIR. The potential exists to fully or partially mitigate the need for these improvements through aggressive transit service implementation.

Finally, the cost shares presented in the previous section reflect the direct results of the nexus analysis for all roadway improvements. Within the draft Fort Ord Reuse Plan, a portion of the costs for improvements to Highway 156 was allocated to the Fort Ord share. The share shown in the draft Reuse Plan was not based on the nexus analysis, but rather based on the importance of this highway in providing a link between future development on Fort Ord and the San Francisco Bay Area. From the strict nexus perspective, the significant percentage of trips on this link with one end outside the study area suggests that development-related financing may not normally be applied. For this reason, the results shown in this report reflect the full burden on non-development sources.

2015 Transportation Systems ($857M)
Capital Funding Allocation

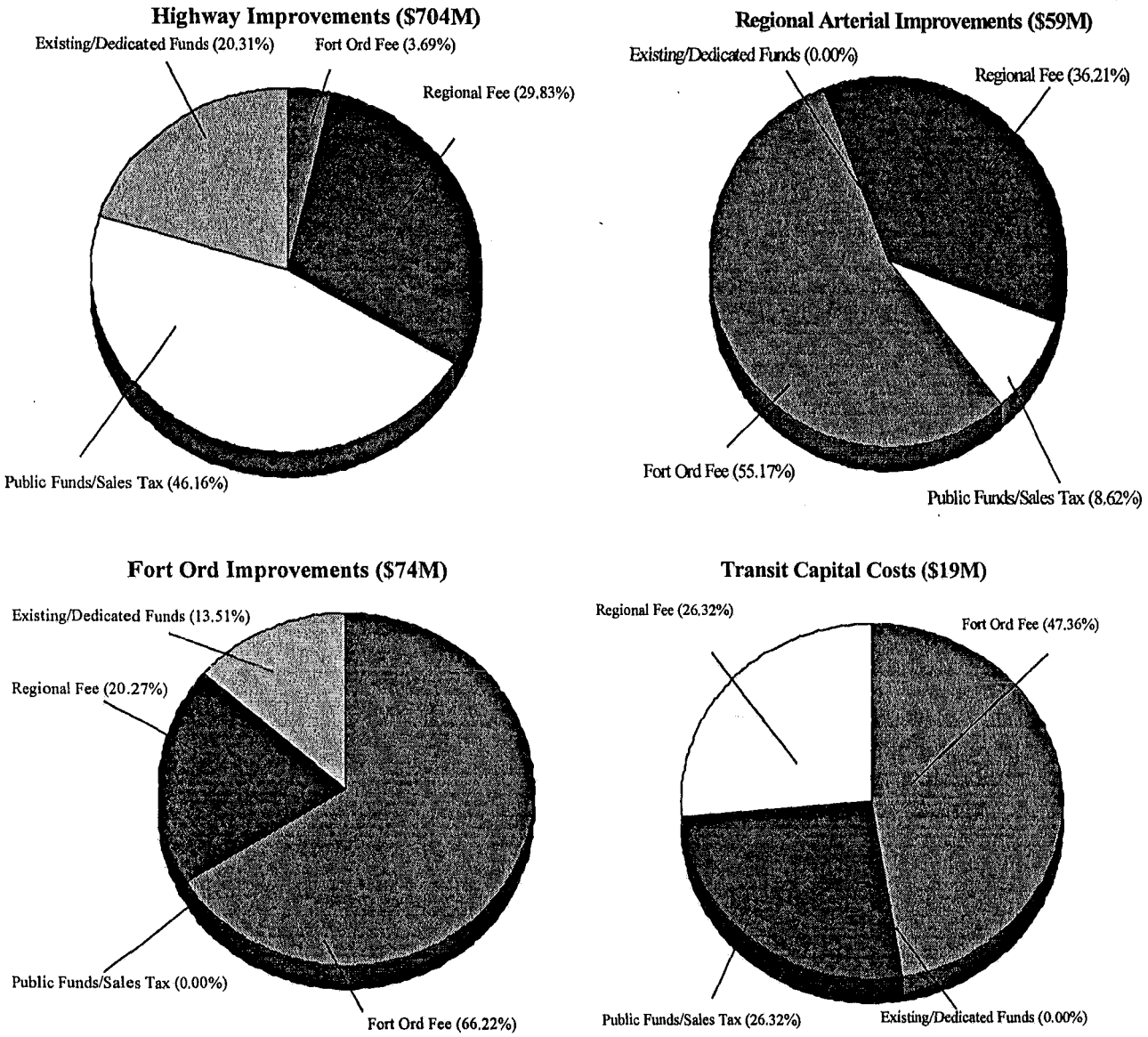

Figure 7-2
Capital Cost Impact Shares By Project Type

2015 Transportation System ($857M)
Capital Funding Allocation

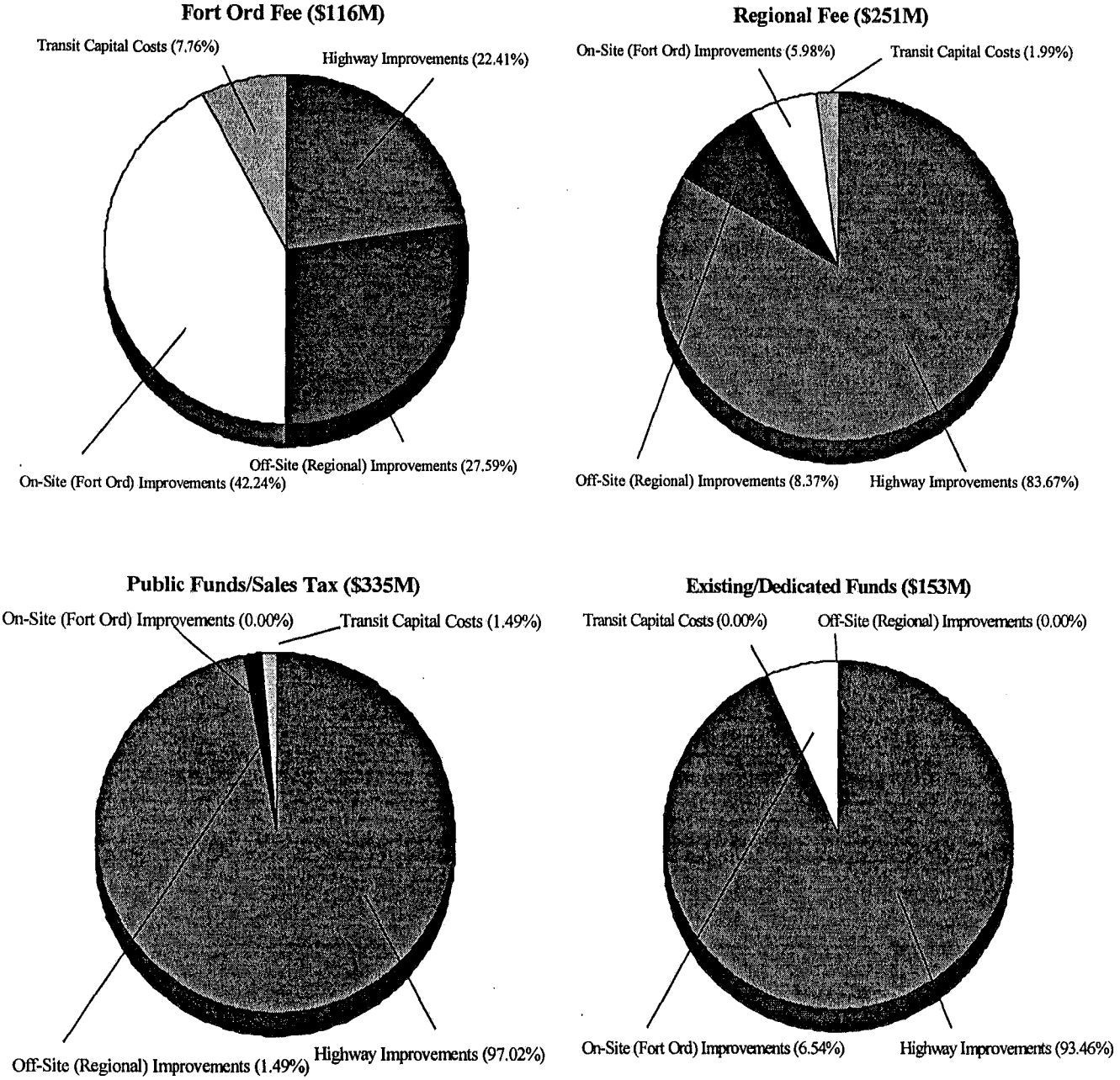

Figure 7-3
Capital Cost Distribution by Impact Share Category

7.5. POTENTIAL FINANCING SOURCES

As the cost and expected funding assessments indicate, there is a potential $724 million funding shortfall for the set of transportation system improvements identified in this study; a number that does not include minor improvements to the regional system nor local improvement projects. Options for filling this shortfall include securing additional funds from traditional federal and state programs, or establishing new revenue-generating mechanisms. Potential new funding programs include local-option taxes, development-related financing, and tax increment financing. Chapter 4 of this report contains a discussion of these existing and potential funding sources for transportation improvements.

In trying to match the identified funding sources with the suggested improvements, there are two facts that are important to consider. First, some sources, both existing and potential, are constrained with respect to the types of projects that may be funded from that source. For example, funds from sources may only be used for roadway capital projects, while those from other sources may only be used for transit operational expenditures. Second, development-related financing, identified as a likely potential source of funding, is limited in the amount or share of a project's cost that it may cover. Development-related financing typically may only be used to cover that portion or share of a project's costs consistent with the share of a project's need attributed to that development. Additionally, development-related financing is not legally defensible when a large percentage of new trips start or end outside the assessment area and, therefore, would not be charged. Thus, improvements to major facilities serving a high percentage of inter-regional trips should be included in a development-related fee program. These constraints greatly impact the amount that can be generated through such programs, and how the funds may be used.

Knowledge of these limitations or constraints, combined with the cost allocation and nexus analysis presented previously in this chapter, may be used to identify potential funding sources or strategies for the transportation system presented in this report. Consistent with these limitations, the following discussion of potential funding strategies is broken up according to three types of improvements: roadway capital, transit capital, and transit operational. A summary of the potential funding strategies is provided in Table 7-5 at the end of this chapter. In reviewing these strategies, it must be recognized that the intent of this study was to identify the funding needs and options. The implementation of any potential financing program is beyond the scope of this study.

7.5.1 Roadway Capital Funding

The future transportation system described in this report contains nearly $840 in roadway capital improvements. Many of the sources identified in Chapter 4 can be used for funding roadway capital improvements. Those traditionally used to finance major roadway projects include federal STP funds and state fuel tax revenues. These funds are typically programmed for specific projects through the STIP process. As noted earlier, $143 million in STIP funds are currently dedicated for projects in Monterey County. An additional $56 million is expected to be available through the STIP County Minimum program over the next 20 years. Expected funding for roadway projects identified in this study includes that provided through the federal DCAG grant program for improvements on Fort Ord. These dedicated or expected funds, however, are projected to leave a shortfall of $629 million for roadway capital improvements.

One option for overcoming this shortfall is to secure additional funds through current federal and state programs. Because the most significant cost element of the proposed transportation system is that for state highway improvements, efforts to obtain additional STIP funding is a logical course of action. Another current program is the federal demonstration program. Given Fort Ord's significance to the base

reuse program, the potential exists to secure such funding. Funds from these existing sources can be used to cover improvements needed to address both existing deficiencies and future demand, but would likely cover only highway and not arterial improvement costs.

If these sources prove insufficient, a potential new source is a local-option tax. Revenues from such a tax may be used for any roadway improvement, and may be used to cover both the public and "development" cost shares as defined in the preliminary nexus analysis. Development-related and tax increment financing mechanisms also represent potential sources, but may only be used to cover the "development" portion of the estimated costs as indicated in the nexus analysis. A fifth potential source is that of toll road financing. This source, itself, has three potential elements: federal or state demonstration funds, public bonds to be repaid by future toll revenue, and private investment. In the last instance, private investors would be given a license to operate the facility and collect toll revenues as a return on their investment.

As noted previously, an assumption has been made that the local subvention of the fuel tax revenue will be sufficient to cover future roadway maintenance costs.

7.5.2 Transit Capital Funding

Proposed transit capital expenditures include both the purchase of transit vehicles and the construction of intermodal facilities. Nearly $19 million in improvements of this nature are included in the proposed transportation system. Current funding sources for transit capital expenditures include federal Section 3 funds, and state TCI and TDA funds. The expectation is that these sources will continue to provide funding for the capital needs of the existing transit system. The assessment of these sources, however, suggests that at current levels, funding would not be available to cover the improvements identified in this study.

As with roadway capital projects, the first step to overcome the expected shortfall may be to pursue additional funding from the traditional federal and state sources. Local-option taxes, develop-related financing, and tax increment financing represent potential new sources for funding transit capital improvements. Because the transit capital expenditures highlighted in this study are directed toward future development needs, the opportunity exists to cover a majority of these costs through a development-related financing program. Indeed, the draft Fort Ord Reuse Plan contains a provision for the financing of the intermodal facilities and the Fort Ord share of transit vehicle costs through a Fort Ord development financing program.

7.5.3 Transit Operations and Maintenance Funding

Funds for transit operations and maintenance are derived through a combination of sources including federal Section 9 funds, state STA and TDA funds, and farebox revenues. Compared to roadway maintenance, however, the situation for the funding of transit operations and maintenance is quite different. First, operating costs, particularly for a bus system, represent a much higher portion of total costs in comparison to the roadway system. Second, it can not be assumed that existing sources will provide sufficient funding to cover future transit operating and maintenance costs. Many sources believe that funding levels will decrease creating shortfalls in the funding of existing service. If it is assumed, however, that funding from these sources will be sufficient to cover existing service levels, an additional $112 million would be required to finance the transit service expansion proposed to address growth in Fort Ord and

throughout the region. Existing sources expected to increase directly with this growth and expansion are LTF funds and farebox revenues. Regardless, a shortfall of nearly $76 million is still projected.

Remedies for this shortfall are limited, because many potential funding sources, including development-related and tax increment financing, are viewed as being limited to capital expenditures. Flexible programs, such as local options tax, do provide ability to generate funds for operations and maintenance. Increased federal and state funding from existing sources also represent an option for financing for covering projected shortfalls.

(j/tcd/proj/50068/finrep/ch7fin.doc)

Table 7-5
POTENTIAL FUNDING STRATEGIES

Improvement Type	Costs/ Expected Funding	Unfunded Share/Potential Funding Level		
		Public	Fort Ord Development	Other Development
ROADWAY CAPITAL IMPROVEMENTS				
Total Estimated Costs	$838 million			
Funds from Expected Sources	$209 million			
Shortfall	$629 million	$274 million	$108 million	$247 million
Potential Funding Sources/Strategies:				
Increased federal/state funding (Demonstration funds, STIP)		✓	✓	✓
Local-option Tax		✓	✓	✓
Development-related Financing Program			✓	✓
Tax Increment Financing			✓	✓
Toll Road Financing		✓	✓	✓
TRANSIT CAPITAL IMPROVEMENTS				
Total Estimated Costs	$19 million			
Funds from Expected Sources	$0			
Shortfall	$19 million	$5 million	$9 million	$5 million
Potential Funding Sources/Strategies				
Increased federal/state funding (Section 3, TCI, TDA)		✓	✓	✓
Local-option Tax		✓	✓	✓
Development-related Financing Program			✓	✓
Tax Increment Financing			✓	✓
TRANSIT OPERATIONAL IMPROVEMENTS				
Total Estimated Costs	$112 million			
Funds from Expected Sources	$36.1 million			
Shortfall	$75.9 million	$0	$38.5 million	$37.5 million
Potential Funding Sources/Strategies:				
Increased federal/state funding (FTA Section 9, LTF, TDA)		✓	✓	✓
Local-option Tax		✓	✓	✓

(j/tcd/proj/50068/finrep/tbl7-5.doc)

Table A-1
MONTEREY COUNTY SOCIO-ECONOMIC DATA
BY CENSUS TRACT

Tract	Area	1990						2015			
	(acres)	Population	Pdensity	Household	Hdensity	Employment	Edensity	Population	Pdensity	Employment	Edensity
1	3,792.1	9232	2.4	2810	0.7	152	0.0	24150	6.4	2715	0.7
2	398.4	5700	14.3	1791	4.5	912	2.3	7832	19.7	1084	2.7
3	305.4	4012	13.1	1516	5.0	559	1.8	6024	19.7	779	2.6
4	497.6	4907	9.9	2011	4.0	1687	3.4	6527	13.1	1966	4.0
5	931.1	9255	9.9	2342	2.5	990	1.1	11346	12.2	1201	1.3
6	264.8	5904	22.3	1425	5.4	318	1.2	6828	25.8	481	1.8
7	290.3	11272	38.8	2617	9.0	261	0.9	13053	45.0	397	1.4
8	250.7	4637	18.5	1229	4.9	266	1.1	6627	26.4	615	2.5
9	1,287.1	4663	3.6	1250	1.0	2296	1.8	13354	10.4	4362	3.4
10	3,064.8	512	0.2	150	0.0	13923	4.5	7330	2.4	23817	7.8
11	384.6	3245	8.4	1310	3.4	3241	8.4	5522	14.4	5241	13.6
12	306.9	3182	10.4	1299	4.2	515	1.7	4518	14.7	1924	6.3
13	223.7	2316	10.4	819	3.7	4780	21.4	3213	14.4	7541	33.7
14	308.3	2628	8.5	1114	3.6	2357	7.6	3615	11.7	3143	10.2
15	1,160.1	5751	5.0	2523	2.2	4055	3.5	9574	8.3	4745	4.1
16	209.8	2780	13.2	1017	4.8	205	1.0	3615	17.2	389	1.9
17	210.3	3523	16.8	1292	6.1	255	1.2	4719	22.4	445	2.1
18	1,054.6	7269	6.9	2479	2.4	2466	2.3	10037	9.5	3262	3.1
101.98	14,445.0	7397	0.5	1944	0.1	3919	0.3	8462	0.6	4948	0.3
102.01	7,530.6	3791	0.5	963	0.1	570	0.1	4560	0.6	1104	0.1
102.02	10,047.3	3747	0.4	1154	0.1	928	0.1	4270	0.4	1558	0.2
103.01	11,255.5	8451	0.8	2888	0.3	1211	0.1	9120	0.8	1617	0.1
103.02	19,304.8	1858	0.1	682	0.0	4174	0.2	2070	0.1	5600	0.3
104	646.5	5272	8.2	1320	2.0	1267	2.0	7480	11.6	2819	4.4
105.01	16,604.0	6252	0.4	2022	0.1	1636	0.1	13000	0.8	5028	0.3
105.02	7,983.6	12174	1.5	4527	0.6	2995	0.4	23011	2.9	3551	0.4
106.01	72,052.9	5273	0.1	1596	0.0	5055	0.1	20297	0.3	9769	0.1
106.02	591.2	6698	11.3	1291	2.2	1145	1.9	9338	15.8	1260	2.1
107	47,831.2	8101	0.2	2999	0.1	157	0.0	10720	0.2	402	0.0
108		4660						8500			
108.98	100,198.5	3221	0.0	2004	0.0	3763	0.0	4260	0.0	5675	0.1
109	888.0	6223	7.0	52	0.1	1266	1.4	8420	9.5	3266	3.7
110	121,326.0	5559	0.0	2496	0.0	1315	0.0	6240	0.1	1558	0.0
111	150,390.9	8649	0.1	2230	0.0	2259	0.0	16540	0.1	3323	0.0
112	61,813.7	9076	0.1	2387	0.0	3520	0.1	13645	0.2	5039	0.1
113	296,385.0	11616	0.0	3708	0.0	5161	0.0	16610	0.1	6332	0.0
114.02	261,072.5	454	0.0	109	0.0	35	0.0	1110	0.0	37	0.0
114.98	646,082.2	2740	0.0	1186	0.0	782	0.0	3000	0.0	868	0.0
115	161,988.4	1391	0.0	763	0.0	115	0.0	1600	0.0	157	0.0
116	35,783.6	6982	0.2	3480	0.1	3039	0.1	8720	0.2	4016	0.1
117	1,460.5	4667	3.2	2405	1.6	160	0.1	4800	3.3	186	0.1
118	610.3	3946	6.5	3162	5.2	5554	9.1	4550	7.5	5955	9.8
119	5,214.1	5069	1.0	2739	0.5	1481	0.3	6040	1.2	1836	0.4
120	272.4	3583	13.2	1480	5.4	630	2.3	3861	14.2	670	2.5
121	273.4	2286	8.4	1112	4.1	437	1.6	2390	8.7	438	1.6
122	217.8	2832	13.0	1259	5.8	396	1.8	3070	14.1	397	1.8
123	144.6	2104	14.6	1094	7.6	800	5.5	2490	17.2	873	6.0
123.01	342.7	942	2.7	338	1.0	4	0.0	980	2.9	4	0.0
124.01	195.2	1958	10.0	1204	6.2	1672	8.6	2380	12.2	1836	9.4
124.02	698.9	3354	4.8	1773	2.5	1405	2.0	3960	5.7	1404	2.0
125	398.6	5729	14.4	2670	6.7	4728	11.9	6300	15.8	7211	18.1
126	398.2	2867	7.2	99	0.2	4187	10.5	2900	7.3	4198	10.5
127	158.9	3015	19.0	1476	9.3	242	1.5	3300	20.8	325	2.0
128	1,058.6	5505	5.2	2472	2.3	2360	2.2	6665	6.3	3185	3.0
129	233.2	609	2.6	341	1.5	9362	40.1	830	3.6	10916	46.8
130	790.3	3122	4.0	2000	2.5	5405	6.8	3450	4.4	6121	7.7
131	323.3	3397	10.5	923	2.9	380	1.2	3450	10.7	565	1.7
132	10,030.6	3650	0.4	1397	0.1	2817	0.3	5439	0.5	6818	0.7
133	1,308.7	5857	4.5	2907	2.2	4483	3.4	6330	4.8	6063	4.6
134	312.5	1661	5.3	733	2.3	332	1.1	1721	5.5	400	1.3
135	333.5	5103	15.3	1783	5.3	192	0.6	6465	19.4	155	0.5
136	237.0	3874	16.3	1452	6.1	907	3.8	4957	20.9	855	3.6
137	177.7	4057	22.8	1388	7.8	1150	6.5	5172	29.1	983	5.5
138	301.9	5637	18.7	1693	5.6	162	0.5	7004	23.2	162	0.5
139	265.3	2697	10.2	1007	3.8	281	1.1	3664	13.8	282	1.1
140	707.1	2168	3.1	865	1.2	3932	5.6	3377	4.8	6048	8.6
141	27,664.8	28602	1.0	6471	0.2	20461	0.7	44268	1.6	15985	0.6
142	639.7	9865	15.4	3470	5.4	1172	1.8	10200	15.9	1453	2.3
143.01	2,716.9	3562	1.3	1320	0.5	238	0.1	5300	2.0	3732	1.4
143.02	3,467.6	3566	1.0	1396	0.4	962	0.3	5800	1.7	612	0.2
TOTAL		355657		121224		159842		519969		221702	

(J/TCD/50068/FILES/AMBAG/TRACT.XLS)

Table A-2
SALINAS AREA SOCIO-ECONOMIC DATA
SELECTED CENSUS TRACTS

Tract	Area	1990						2015			
	Acres	Population	Pdensity	Household	Hdensity	Employment	Edensity	Population	Pdensity	Employment	Edensity
2	398.4	5700	14.3	1791	4.5	912	2.3	7832	19.7	1084	2.7
3	305.4	4012	13.1	1516	5.0	559	1.8	6024	19.7	779	2.6
4	497.6	4907	9.9	2011	4.0	1687	3.4	6527	13.1	1966	4.0
5	931.1	9255	9.9	2342	2.5	990	1.1	11346	12.2	1201	1.3
6	264.8	5904	22.3	1425	5.4	318	1.2	6828	25.8	481	1.8
7	290.3	11272	38.8	2617	9.0	261	0.9	13053	45.0	397	1.4
8	250.7	4637	18.5	1229	4.9	266	1.1	6627	26.4	615	2.5
9	429.0	4663	10.9	1250	2.9	2296	5.4	13354	31.1	4362	10.2
11	384.6	3245	8.4	1310	3.4	3241	8.4	5522	14.4	5241	13.6
12	306.9	3182	10.4	1299	4.2	515	1.7	4518	14.7	1924	6.3
13	223.7	2316	10.4	819	3.7	4780	21.4	3213	14.4	7541	33.7
14	308.3	2628	8.5	1114	3.6	2357	7.6	3615	11.7	3143	10.2
15	1,160.1	5751	5.0	2523	2.2	4055	3.5	9574	8.3	4745	4.1
16	209.8	2780	13.2	1017	4.8	205	1.0	3615	17.2	389	1.9
17	210.3	3523	16.8	1292	6.1	255	1.2	4719	22.4	445	2.1
18	1,054.6	7269	6.9	2479	2.4	2466	2.3	10037	9.5	3262	3.1
106.02	591.2	6698	11.3	1291	2.2	1145	1.9	9338	15.8	1260	2.1
TOTAL	7,816.7	87742	11.2	27325	3.5	26308	3.4	125742	16.1	38835	5.0

Average person per household: 3.21

Table A-3
Peninsula Area Socio-Economic Data
Selected Census Tracts

Tract	Area	1990						2015			
	(acres)	Population	Pdensity	Household	Hdensity	Employment	Edensity	Population	Pdensity	Employment	Edensity
Pacific Grove											
120	272.4	3583	13.2	1480	5.4	630	2.3	3861	14.2	670	2.5
121	273.4	2286	8.4	1112	4.1	437	1.6	2390	8.7	438	1.6
122	217.8	2832	13.0	1259	5.8	396	1.8	3070	14.1	397	1.8
123	144.6	2104	14.6	1094	7.6	800	5.5	2490	17.2	873	6.0
124.01	195.2	1958	10.0	1204	6.2	1672	8.6	2380	12.2	1836	9.4
124.02	698.9	3354	4.8	1773	2.5	1405	2.0	3960	5.7	1404	2.0
Subtotal	**1,802.4**	**16117**	8.9	**7922**	**4.4**	**5340**	**3.0**	**18151**	**10.1**	**5618**	**3.1**
Average Persons per Household:		2.03									
Monterey											
125	398.6	5729	14.4	2670	6.7	4728	11.9	6300	15.8	7211	18.1
126	398.2	2867	7.2	99	0.2	4187	10.5	2900	7.3	4198	10.5
127	158.9	3015	19.0	1476	9.3	242	1.5	3300	20.8	325	2.0
128	1,058.6	5505	5.2	2472	2.3	2360	2.2	6665	6.3	3185	3.0
129	233.2	609	2.6	341	1.5	9362	40.2	830	3.6	10916	46.8
130	790.3	3122	4.0	2000	2.5	5405	6.8	3450	4.4	6121	7.7
131	323.3	3397	10.5	923	2.9	380	1.2	3450	10.7	565	1.7
133	436.2	5857	13.4	2907	6.7	4483	10.3	6330	14.5	6063	13.9
Subtotal	**3,797.3**	**30101**	**7.9**	**12888**	**3.4**	**31147**	**8.2**	**33225**	**8.7**	**38584**	**10.2**
Average Persons per Household:		2.34									
DRO, Seaside, Sand City											
134	312.5	1661	5.3	733	2.3	332	1.1	1721	5.5	400	1.3
135	333.5	5103	15.3	1783	5.3	192	0.6	6465	19.4	155	0.5
136	237.0	3874	16.3	1452	6.1	907	3.8	4957	20.9	855	3.6
137	177.7	4057	22.8	1388	7.8	1150	6.5	5172	29.1	983	5.5
138	301.9	5637	18.7	1693	5.6	162	0.5	7004	23.2	162	0.5
139	265.3	2697	10.2	1007	3.8	281	1.1	3664	13.8	282	1.1
140	707.1	2168	3.1	865	1.2	3932	5.6	3377	4.8	6048	8.6
Subtotal	**2,335.0**	**25197**	**10.8**	**8921**	**3.8**	**6956**	**3.0**	**32359**	**13.9**	**8885**	**3.8**
Average Persons per Household:		2.82									
Marina											
142	639.7	9865	15.4	3470	5.4	1172	1.8	10200	15.9	1453	2.3
143.01	1,811.3	3562	2.0	1320	0.7	238	0.1	5300	2.9	3732	2.1
Subtotal	**2,450.9**	**13427**	**5.5**	**4790**	**2.0**	**1410**	**0.6**	**15500**	**6.3**	**5185**	**2.1**
Average Persons per Household:		2.80									
TOTAL	10,385.6	84842	8.2	34521	3.3	44853	4.3	99235	9.6	58272	5.6
Average Persons per Household:		2.46									

(j/TCD/50068/FILES/AMBAG/TRACT.XLS)

Appendix B
ISSUES FOR FURTHER DISCUSSION

This report is intended to provide an overview of the primary transportation needs in the region for the year 2015, with a focus on the roadway needs created by the reuse of the former Fort Ord. Beyond this overview, there are a number of items that warrant further discussion. This additional discussion is intended to help emphasize a key topic or issue, to provide supplemental information, or to identify the limits of a specific problem area or concern as it relates to the Fort Ord reuse. It must be recognized that it was not within the resources of this study to address and resolve all existing and future transportation issues for the region.

State Highway 1/Fremont Interchange

Issues have arisen related to the design and operation of key interchanges in the former Fort Ord area. The most notable of these is the Fremont Boulevard. There are several factors contributing to operational concerns at this location:

- the convergence of Del Monte Boulevard, Fremont Boulevard, Military Avenue, and Ord Avenue in close proximity to the interchange;
- the increased demand on the interchange due to new developments in the immediate vicinity, including the approved additional shopping center development in Sand City along Del Monte Boulevard; and
- the railroad tracks on the east side of the interchange.

A preliminary analysis of this location has indicated that the reuse of Fort Ord is not expected to contribute significantly to the use of this interchange. For Fort Ord, the connection of Coe Avenue to State Highway 1 (via Ord Avenue) through this interchange is important but is not emphasized as a primary access route. Furthermore, deficiencies at this location already exist. Caltrans is currently working with the cities of Seaside and Sand City on the issues related to access to State Highway 1 at this interchange and proposals for new development in the immediate vicinity of the interchange. For these reasons, the redesign of this interchange was not addressed as part of this study.

Westside Bypass

The Westside Bypass is a proposed four- to six-lane facility extending from the Espinosa/Russell interchange of U.S. 101 to Blanco Road. TAMC completed the *Westside Salinas Bypass and Fort Ord Multimodal Corridor Transportation Study* in July 1993. The study reviewed alternative Westside Bypass locations to relieve congestion in Salinas, but no conclusive recommendations were made

because of insufficient information on future traffic demands associated with reuse of the former Fort Ord. Analysis conducted for this study and the Fort Ord Reuse plan has indicated that the Westside Bypass does not significantly benefit Fort Ord. Furthermore, it does not relieve forecasted congestion on Davis Road in Salinas, primarily because Davis Road serves a local circulation function that would not be met by the proposed bypass.

Although remaining a possibility for the long-term, the Westside Bypass is not considered a critical need for the year 2015. The TAMC Board has adopted the policy that consideration of improvements in this area be limited to options that include new roadway alignments for only the portion north of Highway 183. As stated in the Monterey County RTP, alternatives for the Westside Bypass will be finalized by TAMC, Monterey County, the City of Salinas, and the agricultural community as part of a separate study.

Multimodal Corridor

The phrase "Multimodal Corridor" is used in this study to refer to a high-capacity transit corridor between the former Fort Ord and Salinas. The implementation of a rail link along this corridor is viewed as a potentially viable project beyond the year 2015. For this reason, details of such service, including the type of facility (rail, light rail, bus, or exclusive HOV) and level of service (operating hours, frequency), are not addressed as part of this study. However, this study and the Fort Ord Reuse Plan have addressed issues regarding the alignment and conveyance of right-of-way for this corridor on the former Fort Ord. A preferred alignment and the reservation of right-of-way within the former Fort Ord are elements of both plans.

In the short-term, TAMC has begun exploring options for providing limited service to Fort Ord from Monterey using existing track. This proposal includes the possibility a limited track extension within Fort Ord to better serve CSUMB and the adjacent area.

The Role of Alternative Modes and Demand Management in the Reuse Area

The analyses conducted for this study is based on the assumption that the mode split and vehicle occupancy rates for trips to, from and within the reuse area would be consistent with historical values in the region. At present, it is estimated that transit captures approximately 2% of all trips made in the MST service area. One objective of the Fort Ord Reuse planning effort was to identify and incorporate

elements that would facilitate a higher level of non-SOV travel. For example, the land use plan is designed to promote travel by transit, pedestrian and bicycle modes through the development of a number of higher density, mixed-use areas. Furthermore, the proposed infrastructure program for the former Fort Ord includes the construction of sidewalks, bicycle facilities, an intermodal center, and two park-and-ride facilities. The reuse plan also includes recommendations supporting a variety of TDM measures and include guidance on how site design for the proposed uses might further facilitate the use of transit and non-motorized modes. The fourth working paper for this study specifically addresses the issue of transit service to the former Fort Ord. That paper examines the key markets that may be served, identifies primary service options, and estimates potential mode split levels. Extensive discussion of demand management, transit-oriented design, and pedestrian-oriented design was included in the first working paper.

It is recognized within this study and the Fort Ord Reuse Plan that alternative mode and demand management strategies may reduce or delay the need for roadway capacity enhancements. This is tempered, however, by the reality that even under the most optimistic scenario the auto, and particularly the SOV auto, will remain the predominant travel choice. Unless travel behavior is significantly altered prior to 2015, the steps taken within Fort Ord to promote alternative modes and demand management are expected to delay but not eliminate the need for the roadway improvements proposed in this plan.

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Appendix C

DESCRIPTIONS OF LAND USE AND TRANSPORTATION STRATEGIES

Source: TransCore (formerly JHK & Associates), *Land Use/Transportation Strategies to Minimize Motor Vehicle Emissions,* Draft, Chapter 3, prepared for the California Air Resources Board, March 22, 1995.

In this appendix, definitions and descriptions of each of ten major land use and transportation strategies are provided. Also provided are the results of a literature search of reported expected effectiveness for each strategy. These strategies were examined in a project that JHK completed for the California Air Resources Board (ARB) entitled *Land Use/Transportation Strategies to Minimize Motor Vehicle Emissions: An Indirect Source Research Study.* Many of the definitions are derived directly from a recently-completed ARB report *The Linkage Between Land Use and Air Quality* (1994), authored by Terry Parker, an Associate Air Pollution Specialist with ARB. The definitions specified for this research project draw out important elements of the strategies and illustrate how the strategies differ from and relate to one another.

It should be noted that the research methods employed in many land use studies do not always fully support definitive conclusions. One reason research methods in the study of land use often cannot derive conclusive findings is that it is difficult to develop, test, and control separate land use strategies to the degree required by rigorous experimental design methodologies. For example, it is difficult to find perfectly comparable employers, parking, transit service and employees for a mixed-use site and a comparison site for purposes of studying the unique effects of mixed use. Multivariate statistical analysis has been used in most studies. Without comparable controls, however, there is no certainty if the land use strategy or some other variables are bringing the observed travel results. Other important variables include traveler characteristics (gender, age, income, etc.) and destination characteristics (parking supply, price, congestion, safety, etc.).

There are other reasons to view land use studies in the literature with some caution. In many cases strategy effectiveness is projected by a model rather than assessed from experience. While models give us some confidence in projected results, they are not completely reliable. Furthermore, sometimes the literature features results of a particular effective case. Whether the case results would be replicated if carried out in other cases, sites or situations is not clear. Finally, there sometimes is a considerable range of results reported for a particular strategy. Reasons for the variation are not clear, but likely relate to the setting in which the strategy was implemented, the exact means of implementation or the presence/absence of important supporting variables such as quality of transit service or parking availability and price. For all these reasons, it is best to be cautious in interpreting the results of the literature, especially in projecting likely effects of individual strategies in particular communities. At best, the literature suggests potential ranges of effects and identifies variables important to determining outcomes.

Strategy #1: Transit-Oriented Design (TOD)

Definition

Transit-Oriented Design (TOD) is a deliberate alteration of post-World War II suburban patterns. It assumes a sizable parcel of developing/redeveloping land (at least one-third of a mile in radius) centered on a current or planned major transit station. Parker defines TOD as a concept that incorporates an intentional orientation to transit and pedestrian travel, clusters services and other uses in a 'town center.' Like the POD (see below), TODs provide a range of housing densities and mix of land uses." (Parker 1994) A TOD has been described as:

> A mixed-use community within an average of one-quarter mile walking distance of a transit [station] and core commercial area. The design, configuration, and mix of uses emphasize a pedestrian-oriented environment and reinforce the use of office, open space, and public uses within comfortable walking distance, making it convenient for residents and employees to travel by transit, bicycle or foot, as well as by car. (Parker 1994)

Although autos are accommodated within TOD, a high level of auto facilities is incompatible with TOD. Also, while TOD is often considered a strategy for newly developing areas at the metropolitan periphery, it may be even more effectively implemented as redevelopment within an urban or suburban area.

As noted in the *Linkage* report, "[t]ransit-oriented development is receiving serious attention in California. Plans for a new development south of Sacramento, 'Laguna West,' attempt to cluster higher-density housing surrounding a neighborhood commercial and service center that is more convenient for walking, biking and transit. Similar projects have also been proposed in San Diego, the San Francisco Bay Area, and other parts of California" (Parker 1994). Similar projects are also underway in the Washington D.C. area, Florida and New Jersey. However, no new project including all of the elements of TOD has been fully built and occupied.

Expected Effectiveness

The literature indicates that providing convenient access to transit at residential and commercial developments will result in greater transit use to and from that development. For example, in the San Francisco Bay Area, an analysis was conducted of two neighborhoods located near BART (heavy rail) stations to compare their travel modes for commute and shopping trips (Bacon, 1994). The neighborhoods

had similar per capita incomes and about twenty percent of commuters used BART in both neighborhoods. However, the neighborhood with a transit-oriented design (TOD), that had higher densities and a mixture of uses within walking distance of the transit station, had a twenty percent lower drive-alone mode share for commute trips. In addition, less than fifteen percent of BART passengers drove to the BART station.

In regional evaluations, TODs have been found to result in lower VT and VMT. In the LUTRAQ (*Making the Land Use Transportation Air Quality Connection*) study, a model-based forecast was developed for the Portland Metropolitan Region to estimate the impacts of regional and subregional TODs (Cambridge Systematics 1992). Regionally, the analysis indicated that TODs could produce a reduction of VT by 7.7 percent and VMT by 13.6 percent, compared to a standard suburb in the region. Within the TODs, the model predicted twenty percent fewer home-based vehicle trips and ten percent greater transit usage in comparison to the standard suburb in the region. In Central New Jersey, a study of a hypothetical "transit construct" (mixed use centered on a major rail or bus stop) implemented throughout a region indicated that per person vehicle use would decrease by almost thirty percent in the peak periods and twenty-five percent in the off-peak periods compared to the standard suburb (Middlesex-Somerset-Mercer Regional Council 1992).

Compared to modern developments, many areas developed before World War II were more oriented towards the transit system. Studies indicate that there is more transit use and less auto use in these developments. For example, an evaluation of neighborhoods in the San Francisco Bay Area indicates that households in pre-war neighborhoods average twenty percent fewer trips and twenty-five percent fewer auto-driver trips than households in neighborhoods that developed in the post-war era. (Friedman 1992). Although this study did not control for household size, auto ownership, or income (which is twenty-three percent less in the older neighborhoods), it does suggest the possible impact of orienting development patterns to the transit system. A matched-pair analysis of work trips in pre- and post-war neighborhoods in the San Francisco and Los Angeles regions controlled for income, density and transit service, to differentiate the unique effects of land use and street patterns. The study found that transit-oriented neighborhoods have a higher transit mode share in Los Angeles (1.3 percent) and in San Francisco (5.1 percent) than do conventional neighborhoods. Walking and bicycling shares were also higher in Los Angeles (3.3 percent) and San Francisco (6.6 percent) (Cervero 1993).

Overall, it appears TODs reduce solo driving mode shares or vehicle trips within the TOD area by twenty percent to fifty percent at the neighborhood level compared to conventional development patterns. Of course, stronger or weaker effects may actually occur, depending on implementation particulars and site characteristics.

References

Bacon, Vinton, Carolyn Radisch, Tom Wieczorek, Trip Reduction Potential of "Transit Village" Development Pattern, prepared for Professor Robert Cervero and Dan Solomon, University of California at Berkeley, City Planning 218 / Architecture 201, December 6, 1993.

> Development patterns in the study areas do not result in higher levels of BART ridership for work trips, although the drive alone share of work trips was 20% lower in the more pedestrian oriented environment.
>
> Mode of access to transit stations is significantly influenced by the built environment immediately surrounding a transit station, the driving modes (park and ride, kiss and ride) were found to occupy a 20% lower share within the pedestrian oriented environment.
>
> Shopping trips appear to be significantly influenced by mixed use and pedestrian oriented development patterns. Reductions of more than 30% in automobile trips were found in a mixed use setting with high levels of transit service.

Cervero, Robert, Robert Fraizier, Roger Gorham, Lisa Madigan, and Edward Stewart, *Transit-Supportive Development in the United States: Experiences and Prospects,* Prepared for Federal Transit Administration, U.S. Department of Transportation, October 1993.

> This report examines recent experiences in the U.S. with transit-supportive developments - projects which, by design, give attention to the particular needs of transit users and pedestrians. The study focuses mainly experiences in the suburbs and exurbs of large U.S. metropolises, which in most cases are served only by bus transit. Assessments are carried out at three levels - individual sites, neighborhoods, and communities. Since in the course of the research we found fewer U.S. examples of transit-supportive developments in bus-only suburban-exurban environs than popular accounts might have us believe, the study gives particular emphasis to implementation issues - how recent market and regulatory factors have influenced the transit-supportive design movement.
>
> This paper presents empirical evaluation of the potential effects of "Neo-Traditional Neighborhood Design" (NTND) community design on household trip rates relative to what one could expect when compared to travel characteristics of standard suburban planned unit developments. The analysis uses data from a 1981 regional travel survey of the San Francisco Bay Area households, and compares household travel characteristics of older "Traditional-design" communities to those in the newer suburban tract communities exhibiting dramatically higher drive alone rate, whereas households in traditional communities exhibited significantly higher use of alternative travel modes.

Friedman, Bruce, Stephen P. Gordon, John B. Peers, *The Effects of Neo-Traditional Neighborhood Design on Travel Characteristics*, Fehr & Peers Associates Inc., Lafayette, California, July 10, 1992.

When considering the results of this paper for NTND designs, these findings must be modified somewhat, as not all mode choice factors that exist in older Traditional-design communities would be duplicated in a modern NTND. Actual travel patterns will depend on community location, demographic mix, specific design, and available travel alternatives. Thus the differences identified here should be interpreted as the maximum level of shift in the travel mode choice one could expect. Depending on the project location and specific design features, study findings indicate that on average, the daily trip generation for neo-traditional households would be 20% less than for households in Standard Suburban areas, and daily auto trip generation rates would be 24% less. The availability of these estimates could be valuable to planners, engineers, and public officials in determining the role of these projects in meeting regional public goals.

Note: Effects of income, household size, and vehicle ownership not explicitly considered.

Cambridge Systematics Inc., Calthorpe Associates with Parson Brinkerhoff Quade Douglas Inc., *The LUTRAQ Alternative Interim Report*, 1000 Friends of Oregon, October 1992.

The LUTRAQ alternative is a comprehensive solution, integrating land use and transportation policies, for managing projected growth in Washington County, Oregon. The Metro (Metropolitan Service District) transportation modeling system was used to conduct simulations of the LUTRAQ alternatives and a No Build alternative. The results of this analysis show that the LUTRAQ alternatives, as compared to the Bypass alternatives for the year 2010 would:

- Increase the share of trips from home to work made by transit by 45%
- Increase the proportion of all trips made either on foot or be bicycle by 22%
- Reduce the number of households who will own 2-3 automobiles by 5.6%
- Reduce the number of vehicle trips per household by 7.7% and
- Reduce peak hour vehicle miles traveled by 13.6%.

The analysis also shows that residents living in TODs would enjoy the following advantages in the year 2010:

- over 35% would choose to own only one car, and over 9% would choose not to own a car at all;
- the average TOD household would make 22% fewer home-based car trips per day than the average household in the area under the Bypass alternative;
- over 20% of the workers living in TODs would choose to take transit to work, over twice as much as under the Bypass alternative; and
- the children living in TODs would be more than twice as likely to walk or bike to school from their homes than would children elsewhere in the study area, under any alternatives.

These statistics represent the results forecast developed for an early version of the LUTRAQ alternative. Since the completion of that version, reviews by national and local technical committees have led to modification of the alternative.

This latter version of the LUTRAQ alternative will be modeled using the same forecasting system applied to the early version of the alternative. In addition, the LUTRAQ study will be modeling the transportation impacts of the alternative not only to the year 2010, but through the year 2040, using an interactive land use model installed at Metro as part of the LUTRAQ project. Impacts on vehicle emission, energy consumption, system and user costs, and quality of life measures will be assessed.

Middlesex-Somerset-Mercer Regional Council (MSM), *The Impact of Various Land Use Strategies on Suburban Mobility*, FTA-NJ-08-7001-93-1, December 1992.

This is a report on a projective study of the interaction between suburban land use trends and regional traffic conditions. Three different models of high density, mixed use centers designed to fit in the Middlesex-Somerset-Mercer Region of New Jersey where developed. The three models examined-transit construct, short drive construct, and walking construct-placed residents' home closer to their working and shopping destinations. The models incorporated residential and employment growth expected in the region by 2010, but reshaped the growth into different land use configurations. The project growth was located in the cities and in a small number of newly crated suburban centers instead of in a low density developments spread throughout the region. Based on the study it is concluded that concentrating new suburban development into higher density, mixed-use centers will slow the growth of regional vehicular use, by up to 18% in terms of vehicle trips and 12% in terms of VMT.

Strategy #2: Increase Density Near Transit Stations

This strategy consists of efforts to intensify land uses around high-capacity rapid transit stations. Typically, it is characterized by infill and partial redevelopment rather than full implementation of a comprehensive, idealized TOD. Unlike TOD, mixed use is not a necessary element. This strategy consists of a more incremental program for making the best use of both the transit system and the limited land supply near major stations. Such a program has the following goals:

- promoting land uses that generate the most transit and pedestrian trips near stations;
- locating these uses in close proximity to transit station entrances; and
- providing higher density land development around stations (Parker, 1994).

As noted in the *Linkage* report: "[l]and use decisions for the areas around transit corridors are critical due to the fixed nature of rail transit," the large capital cost represented by rail, and the limited amount of land within easy walking distance (one-third to one-quarter mile) of rail stations. In such a setting, land use "decisions need to be made with a long-term view, as they will last for many years to come." The wrong land uses or site designs can "impede the development of subsequent, more transit-supportive projects in the future. Land use measures to support alternative travel modes and reduce

automobile use are available on both the community (or metropolitan) and local (neighborhood) levels" (Parker 1994). Adequate pedestrian facilities are an important component of this strategy.

Expected Effectiveness

One element of a TOD is an increased amount and density of development near existing and planned transit stations. (A transit station refers to a rail transit stop or a transit center that is served by numerous bus lines. A bus stop for single routes is not considered a transit station.) A number of studies have found that a factor that leads to greater transit use is the proximity of both the residence and employment site to rail stations (JHK & Associates 1989, JHK & Associates 1987, Cervero 1993, Stringham 1982). Within walking distance of a rail station, transit use is significantly higher than for the surrounding region or for areas within driving distance of the rail station. Transit share declines as the distance from rail station increases over 1,000 feet (JHK & Associates 1987, JHK & Associates 1989). Density is important to transit use. For example, in two urban areas of Canada, it was found that residents of high-density areas are thirty percent more likely to use transit than other residents located the same distance from the transit station (Stringham 1982). A survey of housing preferences of high-tech workers in Silicon Valley found that sixty-five percent of the respondents said that they would use rail transit if it was located within one-half mile of both their home and employment site (Santa Clara County Manufacturing Group 1993).

The studies are quite uniform in their findings and conclusions. Cervero, JHK & Associates, and Stringham found higher transit use in both residential and employment centers closer to transit (Cervero 1993, JHK & Associates 1989, Stringham 1982). More transit use is also associated with higher density developments when distance from transit is controlled for. While the studies do not control for type of development, traveler characteristics or parking situation at the transit destination, the findings seem to apply across a great variety of developments, which lends some confidence to the results.

The literature suggests a range of increases in transit use can be expected from the strategy. Cervero finds up to about thirty percent of trips among residents near BART are non-auto. Further from BART, the proportion of non-auto trips ranges from a few percent to perhaps fifteen percent depending on the residential area (Cervero 1993). JHK found residential use of transit declines by 0.65 percent by every 100 feet in distance from transit, and office use declined by 0.75 percent for every 100 feet of distance (JHK & Associates 1989). Stringham finds that high density residents are thirty percent more likely to use transit

at the same distance from rail stations as low density residents; however, the study did not control for characteristics of the residents (Stringham 1982).

References

Cervero, Robert, *Ridership Impacts of Transit-Focused Development in California*, National Transit Access Center (NTrac), University of California at Berkeley, October 1993.

An in-depth report on the current realities and potentialities of concentrating more housing and workplaces around rail stations. Existing large-scale developments near stations of five California rail transit operations (BART, the Peninsula CalTrain, Sacramento Regional Transit, and San Diego Transit) are described. Ridership patterns are identified, stratified for housing office/workplace and retail developments. The study is based to a large extent on a survey of the "main trips" by 900 station area residents, 1,430 station area workers and 900 station area shopping center patrons. The research includes a literature review of similar studies in the Toronto and Washington, D.C. metropolitan areas.

For this study, surveys were conducted of developments near California rail stations that met these criteria: (1) Maximum distance: sites had to lie within two-thirds of a mile from stations, and ideally within the more walkable distance of one-third mile; and (2) minimum size: the following thresholds had to be met - residential (75 dwellings units); office (10,000 square feet or 100 employees); and retail (400,000 square feet). Candidate sites were screened for the following five California rail systems: BART; CalTrain ; and Santa Clara County Transit (SCCTA);Sacramento Transit (ST); and San Diego Transit (SDT). These systems represent a mix of rail technologies: BART-heavy rail; CalTrain-commuter rail; and SCCTA, ST, and SDT-light rail. In all, 27 residential projects located near 20 different rail stations were surveyed. Surveys were mailed to all households at these sites, eliciting data on "main" weekday trips made by persons 16 years and above. The response rate was 18.4 percent, providing data on over 2,500 trips among nearly 900 individuals.

For transit-focused offices, surveys were conducted at the workplace with the approval of office management. In all, data were compiled from 1,430 workers at 18 transit-focused offices in California, representing a 22.7 percent response rate. Lastly, pedestrians intercept surveys were carried out to gather travel data for shoppers and others at retail centers near BART stations, producing around 900 survey responses.

The following results were found for the 27 survey residential sites.

- The average rail modal split for all trips was 15 percent, with significant variation. Rail shares as high as 79 percent and as low as 2.0 percent were found among residential projects. Housing around BART averaged the highest rail splits (26.8 percent), while housing around SCCTA averaged the lowest (6.7 percent). Overall, those residing near California rail stations are fairly auto-dependent - over 75 percent relied on a car, either as a driver or a passenger, for their primary trips.

- Rail captured 19 percent of work trips made by stations-area residents, and in the case of BART, 33 percent. This is much higher that the three BART-served

counties' rail modal split of 5 percent for work trips in 1990. It is also considerably higher than the 1990 average of 17.8 percent for all Bay Area residents living within one-half mile of BART station. For each Bay Area city served by BART, residents living near rail stations were around five times as likely to commute by rail transit as the average resident-worker in the same city.

- The strongest predictors of whether station-area residents commuted by rail was whether their destination was near a rail station and whether they could park free at their destination. Other significant predictors were vehicle ownership levels and the availability of employer-paid transit allowances. If station-area residents work in San Francisco for an employer who charges for parking and they receive a transit voucher, there is over a 95 percent chance they will commute by BART. If the same conditions hold and they work in Oakland, the probability falls to 64 percent; and for most other BART-served destinations, the odds are in the 10 to 15 percent range. And if they work at a destination beyond normal walking distance from BART and receive free parking, there is only around a 2 percent chance they will commute by rail. Clearly, if transit-based housing is to produce meaningful mobility and environmental benefits, there must also be a transit-focused employment centers.

Key findings: Although station area residents are several times more likely to use rail transit than non-station area residents, the rail system will attract a substantial proportion of work trips only if both home and work sites are within walking distance of rail transit, and parking charges exist at the work site.

JHK & Associates, and Kevin G. Hooper, *Travel Characteristics at Large-Scale Suburban Activity Centers*, National Cooperative Highway Research Program Report 323, Transportation Research Board, Washington, DC, October 1989.

This study is based on a large-scale survey of six large-scale suburban activity centers (SACs), containing office, retail, hotel, and residential activity. Three centers (Bellevue; Southcoast Metro; Southdale) were "small", with relatively equal amounts of office and retail. Three centers (Parkway; Perimeter; Tysons Corner) were "large" with 2.5 to 6.5 times as much office as retail. Surveys included: person and vehicle counts; workplace travel surveys (to 38,000 employees); intercept surveys at retail and hotel sites; daily trip diaries from residents. The study was explicitly exploratory, aimed at establishing basic information about travel behavior at SACs. It does not include any statistical testing of the differences between SACs or of the relationship between the physical characteristics of the SACs and their travel characteristics.

Key findings:

- Trip generation rates tended to be lower than ITE estimates for all uses. For office, rates per square foot were lower than ITE rates, but rates per employee were higher, suggesting that employee densities are lower in SACs.

- Auto modes represent the vast majority, even for internal trips. Bellevue, with good transit service and design for pedestrians, had significantly

higher shares of transit (7% versus 1%) and midday walk trips (25% versus 16%) than the other SACs.

- A significant portion of travel in the SACs was not between home and work.

JHK and Associates, *Development-Related Ridership Survey, Final Report*, prepared for the Washington Metropolitan Area Transit Authority, March 1987.

This ridership survey was conducted to study the travel behavior of persons traveling to and from residential and commercial developments around Metrorail stations. Relationships between travel characteristics and the nature of development at each site were established. The study consisted of survey of persons traveling to and from office buildings, multi-family residential buildings, retail sites and hotels near Metrorail stations. A sample of 34 building sites were survey. The results of the study document a number of significant implications of land use and transportation planning in the Washington metropolitan area.

Santa Clara County Manufacturing Group, "High Tech Workers Housing Survey, Findings and Analysis", August 1993.

A survey of workers in high-tech industries in Santa Clara County, CA suggested that a sizable proportion would be willing to accept attached homes and/or homes with smaller lots if housing prices were lower or their commutes were significantly shorter.

Stringham, M., "Travel Behavior Associated with Land Uses Adjacent to Rapid Transit Station," *ITE Journal*, April 1982.

A study based on surveys of 2,000 persons living and working near rail transit stations in Toronto and Edmonton, Canada. The study found that within 3,000 feet of stations 30 to 60 percent of major trips were by transit. High density (apartment) dwellers were 30 percent more likely to use transit compared to single-family dwellers at the same distance from a station.

Strategy #3: Density Near Transit Corridors

Definition

This strategy consists of efforts to intensify land uses within walking distance of a transit corridor. A transit corridor is envisioned as a surface transit route (bus or perhaps streetcar) rather than a major multi-modal center as is typically found at a major rail station. As defined here, transit accessibility is less than at a rapid transit station or within an idealized TOD. In most other respects, this strategy is similar to the preceding strategy. Typically this strategy is characterized by infill and partial redevelopment rather than full implementation of a comprehensive, idealized TOD.

Expected Effectiveness

There is less quantitative data on how increasing densities near transit corridors affects travel behavior. (A transit corridor is an arterial or higher level roadway with a series of transit nodes that are no more than 1/2 mile apart and that are served by multiple bus routes and/or light rail lines.) Most prior research efforts have focused on corridor and areawide density associated with high use of rail transit or bus service (Barton-Aschman 1990). An empirical study of the relationship between urban form and transit use found that transit usage triples for each doubling in density (Pushkarev and Zupan 1977). However, these studies did not control for other possible influences on transit use and therefore are more suggestive than conclusive. Overall, the literature simply is insufficient to allow confident conclusions about the specific magnitude of effect.

References

Barton-Aschman Associates, Inc. with Hammer, Siley George Associates, *Research Triangle Regional Transit/Land-Use Study*, prepared for North Carolina Department of Transportation, 1990.

> Examined land use requirement for a successful rail system in the Research Triangle area. Analysis of the proposed rail system was based in part on Pushkarev and Zupan. Land use requirements were expressed in terms of dwelling units per acre and proximity to the rail stations.

Pushkarev, B. and J. Zupan, *Public Transportation and Land Use Policy*, Bloomington, Indiana University Press, 1977.

> This study attempts to identify and quantify the key determinants of transit ridership in urban areas. To this end it explores the role of land use density (especially residential), presence of rail transit, amount of downtown nonresidential space (a surrogate for employment), residential density, land use patterns, and other variables. Residential density influences transit share.
>
> Increased densities are related to transit mode share by regression and correlation; patterns of work trips per worker and trip lengths are provided for various land use types and various downtown sizes. This based on data from New York and 23 downtowns. Other sources of data included 1960 and 1970 Census Journey-to-work data for U.S. metropolitan areas.
>
> Key findings:
>
> > - Transit share increases as residential density increases, across different cities and within cities. But only 56.8% of the variation between cities is explained by density. Total downtown office floor space (CBD strength) and rapid transit service are also predictors of transit share, explaining an additional 22% of the variation.

- Transit trip-end density (population density times the number of trips per person) increases more rapidly than residential density increases, due to a compounding effect.

- Auto ownership increases as income increases and residential or destination density decreases.

- If rapid transit service is provided, auto ownership decreases at each income or density level; the impact of rapid transit service is equivalent to a ten-fold increase in residential density.

- Trip attenuation rate for different non-residential cluster groups in the New York City area is a function of total non-residential floorspace, distance to the cluster, distance to Manhattan (farther from Manhattan means more trips). Thus, the public transit pay-off of an increase in residential density is greatest if in the immediate vicinity of a non-residential cluster.

Strategy #4: Mixed-Use Development

Definition

Mixed-use development fosters integration of "compatible land uses, such as shops, offices, and housing," and encourages them "to locate closer together and thus decreases travel distances between them. Mixed-use development, if properly designed and implemented, can reduce VMT and VT and can help increase transit ridership, especially during the off-peak (non-commute) periods. For example, a mixed-use area containing restaurants, a museum, a theater and retail stores has a greater potential to generate transit ridership than an area with retail stores alone" (Parker 1994). Regardless of how persons arrive at such a center, they will be able to make many trips by walking once they arrive at such a mixed-use center; such trip linkage would not be possible in a single-purpose area. The addition of residential uses can further increase pedestrian tripmaking.

"Mid-day trips from work for lunch or to run errands can also be influenced by mixed-use strategies" (Parker 1994). Employees already on-site can supplement the buying power of nearby residents, reducing the minimum market area required for a given type of establishment to be profitable. As defined here this strategy is a cumulative set of project- and site-level measures that can be applied to both new development and redevelopment.

Expected Effectiveness

Most studies of mixed-use developments do not control for employee characteristics, parking and other important determinants of travel behavior, so results can not be attributed solely to mixed use. Nevertheless, the studies are quite consistent in suggesting less vehicle trip making associated with mixed use. The Institute of Transportation Engineers finds eight percent trip reduction (Colorado/Wyoming Section Technical Committee 1987). Ewing finds that mixed-use communities generate between 2.3 and 2.8 vehicle hours of travel compared to 3.4 for auto oriented suburban communities (Ewing 1994). JHK found a major mixed-use suburban activity center had higher transit use and midday walk trips than other suburban centers: seven percent transit versus one percent and midday walk of twenty-five percent versus sixteen percent (JHK & Associates 1989).

The study by ULI does not directly address vehicle trip rates, but does indicate a high proportion of trips generated at mixed-use developments are amenable to non-auto use. In suburban settings, twenty-eight percent of trips from mixed-use developments were to nearby services and shopping, as compared to nineteen percent for non-mixed-use developments. In mixed-use developments in CBDs, sixty-one percent of trips were to nearby uses (compared to twenty-nine percent in non-mixed-use developments) (Urban Land Institute 1983). These findings suggest mixed use generates many more trips amenable to walking and cycling than non-mixed uses. Overall, it appears that a reduction on the order of eight percent might be possible.

References

Colorado/Wyoming Section Technical Committee, "Trip Generation for Mixed-Use Developments," *ITE Journal*, February 1987, pp. 27-32.

Trip generation analysis of a cross-section of mixed-use centers. Twenty-four hour drive-way traffic counts at mixed-use developments in three Colorado cities in 1986 were taken, in addition to interviews to check for multi-purpose trips. Machine counts were then compared to estimates based on ITE trip generation rates, and the statistical significance of the difference was tested.

Findings:

- Based on interviews with tripmakers, a 25% reduction in trip generation for individual uses might be predicted, since 16% of trips were found to involve two uses and 7% three or more uses. But only an 8% difference between total actual trips and the predicted number of trips based on ITE rates was found - not a statistically significant difference. Thus it seems that secondary trips would not occur or would occur at a much lower rate when land uses were not mixed.

Ewing, Reid, Padma Haliyur, and G. William Page, *Getting Around a Traditional City, A Suburban PUD, and Everything In-between,* Transportation Research Board, 73rd Annual Meeting, January 9-13, 1994, Washington, D.C.

Beyond some studies relating density to mode choice, VMT, or gasoline consumption, precious little is known about the relationship of location and land use to household travel patterns. Against this backdrop, a 16,000-record travel survey for Palm Beach County, Florida, was analyzed. Six communities were culled from the larger data base, and household travel data were then tested for statistically significant differences in trip frequency, mode choice, trip chaining, trip length, and overall vehicular travel.

Households in a sprawling suburb generate almost two-thirds more vehicle hours of travel per person than comparable households in a traditional city. While travel differences are significant, they are smaller than one might expect given the more than ten-fold difference in accessibility among the communities. Sprawl dwellers compensate for poor accessibility by linking trips of household members in multipurpose tours.

Implications for land planning are more complex than simply pedestrianizing the suburbs. Communities should internalize as many facilities and services as possible. This is true even where the automobile reigns supreme. Land uses should be arranged to facilitate efficient auto trips and tours. The more sprawling the area, the more important this becomes. By concentrating activities in centers and corridors, linked accessibility to activities can be maintained even as direct accessibility falls off.

JHK & Associates, and Kevin G. Hooper, *Travel Characteristics at Large-Scale Suburban Activity Centers*, National Cooperative Highway Research Program Report 323, Transportation Research Board, Washington, DC, October 1989.

This study is based on a large-scale survey of six large-scale suburban activity centers (SACs), containing office, retail, hotel, and residential activity. Three centers (Bellevue; Southcoast Metro; Southdale) were "small", with relatively equal amounts of office and retail. Three centers (Parkway; Perimeter; Tysons Corner) were "large" with 2.5 to 6.5 times as much office as retail. Surveys included: person and vehicle counts; workplace travel surveys (to 38,000 employees); intercept surveys at retail and hotel sites; daily trip diaries from residents. The study was explicitly exploratory, aimed at establishing basic information about travel behavior at SACs. It does not include any statistical testing of the differences between SACs or of the relationship between the physical characteristics of the SACs and their travel characteristics.

Key findings:

- Trip generation rates tended to be lower than ITE estimates for all uses. For office, rates per square foot were lower than ITE rates, but rates per employee were higher, suggesting that employee densities are lower in SACs.

- Auto modes represent the vast majority, even for internal trips. Bellevue, with good transit service and design for pedestrians, had significantly higher shares of

> transit (7% versus 1%) and midday walk trips (25% versus 16%) than the other SACs.
>
> - A significant portion of travel in the SACs was not between home and work.

Urban Land Institute, *Shared Parking*, 1983.

> A nationwide study, primarily of parking behavior associated with various land uses. The study also examines the effect of mixed use on parking and trip linkage at CBD and non-CBD mixed-use sites.

U.S. Department of Transportation, *1990 National Personal Transportation Survey, Summary of Travel Trends*, Washington, D.C., 1992.

> The fourth national survey of travel behavior conducted by the U.S. DOT (prior surveys were conducted in 1969, 1977, and 1983).

Strategy #5: Infill and Densification

The *Linkage* report succinctly characterizes the potential of this strategy:

> The infill, redevelopment and reuse of vacant or underutilized parcels within existing urban areas can help to decrease vehicle traffic, reduce walking distances and support better transit systems. This strategy also has other benefits: lower infrastructure costs, more efficient delivery of services, increased economic viability of cities, and reduced conversion of agricultural land and open spaces to urban or suburban development...
>
> Infill and redevelopment that is located within walking distance of transit service has greater potential to shift travel away from personal vehicles. The design, quality, mixture and compatibility of residential and other types of infill projects are factors that must be carefully considered to enhance their acceptability to neighboring residents and businesses, especially in the case of higher-density infill and redevelopment projects (Parker 1994).

Expected Effectiveness

Prior research suggests that an increase in density can have an impact on travel behavior even if the increase in density is not within TODs or transit corridors. Several sources indicate that increasing residential density or increasing employment density will result in less auto travel (Dunphy 1994, Frank 1994, Holtzclaw 1990, Middleton 1990). In a study of San Francisco Bay Area communities, a doubling in residential density was associated with twenty to thirty percent less VMT (Holtzclaw 1990). A study of households in five neighborhoods in the San Francisco Bay Area found that higher densities were positively

correlated with the percent of trips made by non-motorized modes of travel (Kitamura 1994). Similar results were found in an analysis of the 1990 National Personal Transportation Survey, but indicated that density increases at the lowest levels (e.g., from 1,300 to 2,700 persons/square mile) had no effect (Dunphy 1994). Much less use of single-occupant vehicles was found at employment densities greater than seventy-five employees/acre and at residential densities greater than fifteen persons/acre (Frank 1994). Overall, we may be reasonably confident that this strategy reduces vehicle trip making. Density can be a surrogate for urban characteristics such as mixture of uses, availability of transit services, and average income, to name a few.

References

Middleton, William D., "LRT helps reshape a city," *Railway Age*, February 1990.

> Analysis of the role Portland's light rail system (MAX) has played in reinforcing the city's effort to increase the vitality of downtown while reducing auto dependence for downtown access and circulation. While focused mainly upon describing development projects along the LRT line, the article does report that Portland has witnessed an increase in downtown employment of 30,000 without an increase in the number of autos entering the downtown.

Dunphy, Robert T., and Kimberly M. Fisher, *Transportation, Congestion, and Density: New Insights,* Transportation Research Board, 73rd Annual Meeting, January 9-13, 1994, Washington, D.C.

> Part of the case for higher density development is based on the belief that compact urban forms are more efficient compared to low density development, derisively known as suburban sprawl. This paper examines some broad relationships between driving, transit use, urban form and congestion using urban area data as well as special analysis of the 1990 National Personal Transportation Survey. While some of the relationships found by other authors are confirmed, the regional data shows that there are other factors involved in explaining such differences, and the national household data presents a less robust relationship. The national data shows that there are significant differences in the household characteristics of persons living at different density levels - characteristics that are themselves important determinants of travel. Issues relating to these findings in the context of public policies on development and transportation are explored.

Frank, Lawrence D. Ph.D., *The Impacts of Mixed Use and Density on The Utilization of Three Modes of Travel: The Single Occupant Vehicle, Transit, and Walking,* Transportation Research Board, 73rd Annual Meeting, January 9-13, 1994, Washington, D.C.

> Presented in this paper are findings from an empirical analysis to test the impacts of land-use mix, population density, and employment density on the use of the single occupant vehicle (SOV), transit, and walking for both work trips and shopping trips. The hypothetical relationships tested focused on whether there is a relationship between urban form factors. Whether this relationship exists when controlling for non-urban form and modal choice and urban form when they are measured at both trips ends as opposed to

either the origin or destination. A review of literature and experiences suggested that a fair amount of information is known about the impacts of density on mode choice. However, considerable debate exists over whether density itself is actually the causal stimulus or a surrogate for other factors. To address this issue, a database was developed with a comprehensive set of variables for which density may be a proxy, e.g., demographics and level of service. This analysis employed a correlational research design in which modal choice was compared among census tracts with differing levels of density and mix. Findings from this research indicate that density and mix are both related with mode choice, even when controlling for non-urban form factors for both work trips and shopping trips. Furthermore the relationship between population and employment density and mode choice for SOV, transit, and walking is non-linear for both work and shopping trips. Transit usage and walking increase as density and land-use mix increase, while SOV usage declines. Findings from this research suggests that measuring urban form at both trip ends provides a greater ability to predict travel choices than looking at trip ends separately. Findings also suggest that increasing the level of land-use mix at the trip origins and destinations is also related with a reduction in SOV travel and an increase in transit walking.

Holtzclaw, John, *Explaining Urban Density and Transit Impacts on Auto Use*, Presented by the National Resources Defense Council and the Sierra Club to the State of California Energy Resources Conservation and Development Commission, April 19, 1990.

An empirical study of a cross section of Bay Area communities explores the extent to which higher residential density plus neighborhood businesses plus improved transit services result in higher convenience and mobility which result in a reduction in driving, which results in savings in fuel, pollutant emissions, and auto ownership costs.

A survey of selected neighborhoods of the Bay Area was undertaken for 1988 (NE San Francisco, San Francisco as a whole, Rockridge in Oakland, Walnut Creek, and Danville-San Ramon). Data sources included U.S. Census, ABAG, MTC, and various state agencies; VMT data was derived from the California Bureau of Automotive Repair.

Key finding: a doubling of the population or residential density reduces annual auto mileage per household and per capita by 25-30%. Thus, if the population of an area is doubled by infill, VMT will increase by only 40-50%, rather than 100% at existing densities or 167-186% for half the density.

This analysis does not attempt to separate the effect of density from the effect of neighborhood services and transit services in its conclusions. A community that is twice as dense as another and has these other characteristics that the other does not will have less automobile travel; without these characteristics, the effect on auto travel would likely be diminished. Also income, household size, and auto ownership are not controlled for, though comparative values for these variables is presented.

Middlesex-Somerset-Mercer Regional Council (MSM), *The Impact of Various Land Use Strategies on Suburban Mobility,* FTA-NJ-08-7001-93-1, December 1992.

This is a report on a projective study of the interaction between suburban land use trends and regional traffic conditions. Three different models of high density, mixed use centers

designed to fit in the Middlesex-Somerset-Mercer Region of New Jersey where developed. The three models examined-transit construct, short drive construct, and walking construct-placed residents' home closer to their working and shopping destinations. The models incorporated residential and employment growth expected in the region by 2010, but reshaped the growth into different land use configurations. The project growth was located in the cities and in a small number of newly crated suburban centers instead of in a low density developments spread throughout the region. Based on the study it is concluded that concentrating new suburban development into higher density, mixed-use centers will slow the growth of regional vehicular use, by up to 18% in terms of vehicle trips and 12% in terms of VMT.

Kitamura, Ryuichi, Patricia Mokhtarian and Laura Laidet, *A Micro-Analysis of Land Use and Travel in Five Neighborhoods in the San Francisco Bay Area,* November 1994.

Analysis was performed to determine the effect of specific land-use and attitudinal characteristics on travel behavior in five diverse San Francisco Bay Area neighborhoods. The land-use factors found to be significantly correlated with trip generation and mode share were residential density, public transit accessibility, mixed land use, and the presence of sidewalks. The attitudinal variables were assessed with a survey and analyzed in eight factors (environment, transit, automobile mobility, etc.). These factors were found to have a more significant association, which the authors suggest means that "land use policies promoting higher densities and mixtures may not alter travel demand materially unless residents' attitudes are also changed."

Strategy #6: Concentrated Activity Centers and Strong Downtowns

Definition

This strategy seeks to combine higher-density development appropriately into concentrated nodes to take advantage of transit and opportunities for pedestrian and nonmotorized travel.

The locations of these nodes may be urban or suburban. If a variety of activities (such as shops and services, offices, other employment sites and residences) are clustered, they can become lively 'activity centers.' A network of such centers, or "nodes," can more easily be linked by a transit network to other similar centers and to the central business district.
Activity centers served by transit located in suburban areas can also provide accessibility to transit service for surrounding residential areas. Activity centers or nodes are also referred to as 'Urban Villages' or 'Suburban Business Districts' (Parker 1994).

Downtowns, also referred to as central business districts, are a special kind of *Concentrated Activity Center.*

> Strong central business districts that include substantial amounts of both employment and housing have historically had the best quality transit service and the highest rates of transit use. Transit use tends to be higher in downtown sites for many reasons, including: there are a concentrated number of land uses located within walking distance of transit stations (such as jobs, shops, public facilities and retail services), higher parking costs, greater traffic congestion, limited parking availability, and better access to transit at both trip ends.
>
> Central business districts of many major cities in the U.S. tend to have a number of high-rise buildings, with some restaurants, shops and other services, but little activity after business hours or on weekends. (Parker 1994)
>
> Higher density housing in the downtown and nearby areas can contribute to safer and more lively central cities, and reduce the commute for those residents who live and work downtown (Parker 1994).

Residents of downtown also tend to use transit more often and for more purposes than other metropolitan residents because downtowns are generally focal points of the regional transit system.

Expected Effectiveness

Because of the many similarities between these two strategies, much of the literature on activity centers applies to both concentrated activity centers and downtowns. Studies have shown that developing activity centers and strong downtowns with a mixture of uses can result in significant reduction in vehicle use for internal trips. One study of six large-scale, multi-use suburban activity centers found that the larger the center, the greater the percentage of internal trips (JHK & Associates 1993). However, the compactness of the development and pedestrian design features impact the mode of travel for internal trips. The clustering of land uses was found to significantly reduce trip generation by up to sixty-five percent for non-residential uses and forty-five percent for residential uses (Markovitz in Gilbert 1974). In a study of employee travel, mixing of uses increased the use of nearby facilities by nine percent in suburban areas and over thirty percent in the downtown (Urban Land Institute 1983). Overall, developing activity centers can increase the percentage of trips that are internal to the center, but, to reduce vehicle travel, the center must be compact with clustered, mixed uses that are pedestrian accessible.

References

Colorado/Wyoming Section Technical Committee, "Trip Generation for Mixed-Use Developments," *ITE Journal*, February 1987, pp. 27-32.

Trip generation analysis of a cross-section of mixed-use centers. Twenty-four hour driveway traffic counts at mixed-use developments in three Colorado cities in 1986 were taken, in addition to interviews to check for multi-purpose trips. Machine counts were then compared to estimates based on ITE trip generation rates, and the statistical significance of the difference was tested.

Findings:

- Based on interviews with tripmakers, a 25% reduction in trip generation for individual uses might be predicted, since 16% of trips were found to involve two uses and 7% three or more uses. But only an 8% difference between total actual trips and the predicted number of trips based on ITE rates was found - not a statistically significant difference. Thus it seems that secondary trips would not occur or would occur at a much lower rate when land uses were not mixed.

JHK & Associates, and Kevin G. Hooper, *Travel Characteristics at Large-Scale Suburban Activity Centers*, National Cooperative Highway Research Program Report 323, Transportation Research Board, Washington, DC, October 1989.

This study is based on a large-scale survey of six large-scale suburban activity centers (SACs), containing office, retail, hotel, and residential activity. Three centers (Bellevue; Southcoast Metro; Southdale) were "small", with relatively equal amounts of office and retail. Three centers (Parkway; Perimeter; Tysons Corner) were "large" with 2.5 to 6.5 times as much office as retail. Surveys included: person and vehicle counts; workplace travel surveys (to 38,000 employees); intercept surveys at retail and hotel sites; daily trip diaries from residents. The study was explicitly exploratory, aimed at establishing basic information about travel behavior at SACs. It does not include any statistical testing of the differences between SACs or of the relationship between the physical characteristics of the SACs and their travel characteristics.

Key findings:

- Trip generation rates tended to be lower than ITE estimates for all uses. For office, rates per square foot were lower than ITE rates, but rates per employee were higher, suggesting that employee densities are lower in SACs.

- Auto modes represent the vast majority, even for internal trips. Bellevue, with good transit service and design for pedestrians, had significantly higher shares of transit (7% versus 1%) and midday walk trips (25% versus 16%) than the other SACs.

- A significant portion of travel in the SACs was not between home and work.

Gilbert, Gorman and Javiv S. Dajani, "Energy, Urban Form & Transportation Policy", *Transportation Research*, Vol. 8, pp. 267-276, 1974.

This review of other works examines the following experimental and empirical analyses which consider land use patterns as a variable and estimate resulting travel demands give some indication of which spatial patterns would reduce travel demands. Major findings of studies reviewed include:

Theoretical (Modeling) Studies:

- Putman: Develops models that integrate land use and transportation analysis but are not intended to minimize travel requirements.

- Hemmens: Heavy concentrations in the center of jobs and residences results in higher aggregate travel times. Transportation planning and land use planning may not be interdependent.

- Jamieson, MacKay, & Latchford: Linear forms lead to lower capital costs and average travel times. Aggregate demand was not reported.

- Vorhees: Puget Sound Regional Transportation Study: Farbey & Murchland: There is little difference in transportation demand patterns for alternative land use patterns.

- Schneider & Beck: A computer procedure was developed to search for better land use forms, using a gravity model for evaluation. The best form had a maximum balance of jobs and housing at the least central node, a minimum of activity elsewhere, and the rest of the activity in the second least central node.

Studies Based on Actual Travel Behavior

- Watt & Ayers: The effect on gas consumption of price, commuter transportation efficiency, density, area, interspersion, and urban freeway availability were tested. For a sample of 37 U.S. cities, work trips by transit explains 61% of the variation in gas consumption per capita; freeway availability is the only other significant variable.

- Markovitz: Trip generation rates for clustered and non-clustered non-residential and residential land uses were determined for the New York region. For residential, clustering reduced the number of trips by 45%; for non-residential, clustering reduced the number of trips by 65%.

- Lansing, et al: Travel demand (trips/family/day) are not appreciably altered by planning; there was more variation within than between the communities investigated.

- Weiss, Burby, & Zehner: Annual household vehicle miles increased less in new towns (Columbia, Reston) than in control communities - 17% versus 37%.

Overall, the studies produce an unclear and somewhat contradictory picture of the urban form impact on travel demands, because they use different assumptions and methodologies, and because the many dimensions to "urban form" are not used consistently.

- Nevertheless, these studies suggest that:
  a. clustering results in fewer trips
  b. clusters should not be in central locations
  c. a linear form - or some other pattern that differs from concentric - may be most efficient in terms of minimizing travel
  d. city size affects demand
  e. a sprawling pattern is not the most efficient

Middlesex-Somerset-Mercer Regional Council (MSM), *The Impact of Various Land Use Strategies on Suburban Mobility,* FTA-NJ-08-7001-93-1, December 1992.

> This is a report on a projective study of the interaction between suburban land use trends and regional traffic conditions. Three different models of high density, mixed use centers designed to fit in the Middlesex-Somerset-Mercer Region of New Jersey where developed. The three models examined-transit construct, short drive construct, and walking construct-placed residents' home closer to their working and shopping destinations. The models incorporated residential and employment growth expected in the region by 2010, but reshaped the growth into different land use configurations. The project growth was located in the cities and in a small number of newly crated suburban centers instead of in a low density developments spread throughout the region. Based on the study it is concluded that concentrating new suburban development into higher density, mixed-use centers will slow the growth of regional vehicular use, by up to 18% in terms of vehicle trips and 12% in terms of VMT.

Urban Land Institute, *Shared Parking*, 1983.

> A nationwide study, primarily of parking behavior associated with various land uses. The study also examines the effect of mixed use on parking and trip linkage at CBD and non-CBD mixed-use sites.

Strategy #7: Jobs/Housing Balance

Definition

This strategy is intended to encourage employers to locate in areas where there are significantly more residents than jobs and add housing development near employment centers. It is not possible to draw any definitive conclusions about the ability to increase emission reductions as a result of government policy interventions designed to affect the ratio of jobs per household within an given geographic area. Quantitative studies on this topic are limited, and the literature is contradictory in its conclusions. For example, a study by Cervero concludes that a "balance" in the jobs-to-household ratio is associated with a three- to five-percent increase in travel by walking, cycling, and transit (Cervero 1988). However, research conducted by The Planning Institute concludes that such intervention does not produce any enforceable quantifiable travel-related benefits (The Planning Institute 1990). Thus, it should be recognized that

jobs/housing ratio intervention is a strategy that is dependent upon factors that are often beyond the direct control of individual counties, regional planning agencies, and air districts. One such factor is that jobs must be compatible with the skill-levels and income expectations of nearby residents.

Expected Effectiveness

There are limited and somewhat contradictory quantitative studies in the literature on this topic making it difficult to draw any definitive conclusions. For example, one study of fifty-seven areas concludes that a balance in jobs/housing is associated with three of five percent greater share of travel by walking, cycling and transit (Cervero 1993). However, other research concludes that the strategy does not bring any significant travel-related benefits (The Planning Institute 1990). Jobs/housing balance is inherently a regional or subregional issue that encompasses factors that are often beyond the direct control of cities and counties in their individual jurisdictions.

References

Cervero, Robert, *Ridership Impacts of Transit-Focused Development in California*, National Transit Access Center (NTrac), University of California at Berkeley, October 1993.

An in-depth report on the current realities and potentialities of concentrating more housing and workplaces around rail stations. Existing large-scale developments near stations of five California rail transit operations (BART, the Peninsula CalTrain, Sacramento Regional Transit, and San Diego Transit) are described. Ridership patterns are identified, stratified for housing office/workplace and retail developments. The study is based to a large extent on a survey of the "main trips" by 900 station area residents, 1,430 station area workers and 900 station area shopping center patrons. The research includes a literature review of similar studies in the Toronto and Washington, D.C. metropolitan areas.

For this study, surveys were conducted of developments near California rail stations that met these criteria: (1) Maximum distance: sites had to lie within two-thirds of a mile from stations, and ideally within the more walkable distance of one-third mile; and (2) minimum size: the following thresholds had to be met - residential (75 dwellings units); office (10,000 square feet or 100 employees); and retail (400,000 square feet). Candidate sites were screened for the following five California rail systems: BART; CalTrain ; and Santa Clara County Transit (SCCTA);Sacramento Transit (ST); and San Diego Transit (SDT). These systems represent a mix of rail technologies: BART-heavy rail; CalTrain-commuter rail; and SCCTA, ST, and SDT-light rail. In all, 27 residential projects located near 20 different rail stations were surveyed. Surveys were mailed to all households at these sites, eliciting data on "main" weekday trips made by persons 16 years and above. The response rate was 18.4 percent, providing data on over 2,500 trips among nearly 900 individuals.

For transit-focused offices, surveys were conducted at the workplace with the approval of office management. In all, data were compiled from 1,430 workers at 18 transit-focused

offices in California, representing a 22.7 percent response rate. Lastly, pedestrians intercept surveys were carried out to gather travel data for shoppers and others at retail centers near BART stations, producing around 900 survey responses.

The following results were found for the 27 survey residential sites.

- The average rail modal split for all trips was 15 percent, with significant variation. Rail shares as high as 79 percent and as low as 2.0 percent were found among residential projects. Housing around BART averaged the highest rail splits (26.8 percent), while housing around SCCTA averaged the lowest (6.7 percent). Overall, those residing near California rail stations are fairly auto-dependent - over 75 percent relied on a car, either as a driver or a passenger, for their primary trips.

- Rail captured 19 percent of work trips made by stations-area residents, and in the case of BART, 33 percent. This is much higher that the three BART-served counties' rail modal split of 5 percent for work trips in 1990. It is also considerably higher than the 1990 average of 17.8 percent for all Bay Area residents living within one-half mile of BART station. For each Bay Area city served by BART, residents living near rail stations were around five times as likely to commute by rail transit as the average resident-worker in the same city.

- The strongest predictors of whether station-area residents commuted by rail was whether their destination was near a rail station and whether they could park free at their destination. Other significant predictors were vehicle ownership levels and the availability of employer-paid transit allowances. If station-area residents work in San Francisco for an employer who charges for parking and they receive a transit voucher, there is over a 95 percent chance they will commute by BART. If the same conditions hold and they work in Oakland, the probability falls to 64 percent; and for most other BART-served destinations, the odds are in the 10 to 15 percent range. And if they work at a destination beyond normal walking distance from BART and receive free parking, there is only around a 2 percent chance they will commute by rail. Clearly, if transit-based housing is to produce meaningful mobility and environmental benefits, there must also be a transit-focused employment centers.

Key findings: Although station area residents are several times more likely to use rail transit than non-station area residents, the rail system will attract a substantial proportion of work trips only if both home and work sites are within walking distance of rail transit, and parking charges exist at the work site.

Cervero, Robert, *America's Suburban Centers, A Study of the Land Use - Transportation Link*, University of California, Berkeley, Prepared for Urban Mass Transportation Administration, January 1988.

Very comprehensive study of suburban employment centers as to employment, density, land use, mixed use, job housing measures, commuting and traffic conditions. Fifty-seven large suburban centers are surveyed. ("Centers" all had at least 1 million square feet of office floor space, 2000 or more workers, and at least 5 miles from the CBD, as of 1987). The relationship between solo commuting and land use variables is explored and quantified by regression.

Among the findings: high density centers show higher use of alternative modes and relatively lower levels of parking supply, but they also the slowest commute times and worst traffic levels of service on nearby arterial streets; single-use office is associated with more solo commuting; accessible retail near such offices seems to enhance ridesharing; centers with a more "even" jobs housing balance have higher walk and bike shares, but lower ridesharing. Influences on speeds and travel times also are examined.

The study is empirical, i.e., based on real travel data collected from a national cross-section of suburban centers. It investigates the extent to which suburban congestion problems and declining mobility are linked to the emerging land use environment of suburban employment areas, which induce most employees to drive alone. In addition to the land use environment (low density, single use, non-integrated), jobs/housing imbalances and certain policies (free parking, inadequate roads, meager transit service) contribute to the problem.

The study concludes that high density, large size, and high degree of mixed use development are necessary, but not sufficient prerequisites for significant levels of ridesharing, walking, and transit. Another conclusion is that single-use office settings (higher percent of total floorspace in office) induce drive alone commuting, while varied work environments (higher percent retail plus lower on-site jobs/housing ratio) encourage ridesharing. For individual workers, the shared-ride percent increases if they work at larger, single-tenant sites, and as distance from the job site increases.

Other conclusions: the benefit of balancing jobs and housing is in shorter work trips, not in mode shift, since transit and ridesharing are reduced. (With a higher ratio of jobs to housing in the area there is less balance); average speed on nearby freeways decreases as the jobs/housing ratio increases and as employees per acre increases.

Cervero's overall recommendation for suburban areas is the creation of workplaces with high density and "rich mixtures" of land uses, i.e. "small downtowns", with nearby affordable housing. (Summary based in part on SLH)

The Planning Institute, *Jobs Housing Balance and Regional Mobility Research Report,* University of Southern California, April 1990.

The conclusion from this report is that "jobs housing balance policy is not likely to be an effective means for reducing traffic congestion, and it therefore is not justified." This conclusion is supported with assertions that policy intervention is not necessary or desirable for achieving jobs housing balance, and that there is little evidence to support the assumption that there is a relationship between jobs housing balance and traffic congestion.

Strategy #8: Pedestrian Facilities

Definition

The provision of pedestrian facilities and the similar concept of Traditional Neighborhood Design (TND) represent a development strategy "that emphasizes pedestrian accessibility and the orientation of

houses towards narrower, tree-lined, grid-pattern or [otherwise] integrated streets." It combines, on a relatively small, neighborhood scale, "mixed uses and integrated street patterns to create a land use pattern that makes it easier for residents to walk between their houses, jobs, and commercial services" (Parker 1994).

An area that focuses on the provision of pedestrian facilities, as defined for this project, or TND:

> incorporates a small downtown, or 'town center,' within walking distance of homes, and generally has a higher overall density than in typical suburban neighborhoods. 'A majority of housing units are located within a five- to ten-minute walk of the town center, where commercial services and offices are concentrated.' A larger number of townhouse and other multi-family units are provided to meet this objective of locating residences within one-quarter mile (walking distance) of the town center.
>
> Single-family houses are placed somewhat further out from the town center, on somewhat smaller (compared to standard suburban) lots, with front porches closer to the sidewalk and garages typically placed behind the houses, often along alleys. 'Granny flats,' or second units, are sometimes built above the garages (Parker 1994).

Table 1 compares the characteristics of pedestrian-oriented developments to conventional suburban development. It should be noted that these design features apply also to TODs (Strategy #1); a TOD town center, however, is dominated by a major transit station and intermodal transfer facility. Because of the relatively smaller scale and lack of high-capacity transit, the density of uses, especially employment uses, tends to be lower than in a TOD project.

Table 1
FEATURES OF TRADITIONAL NEIGHBORHOOD VS. CONVENTIONAL SUBURBAN DEVELOPMENT

TRADITIONAL NEIGHBORHOOD DESIGN	STANDARD SUBURBAN DEVELOPMENT
• Integrated Streets	• Hierarchical Streets
• Narrower Streets	• Wide Streets
• On-Street Parking & Parking Structures	• Off Street Surface Parking Lots
• Shallower Setbacks	• Deeper Setbacks
• Shopping on Main St.	• Strips/Malls
• Mixture of Uses	• Single Uses
• Traffic Calming	• Auto Traffic Flow Optimized

Source: Parker 1994

Expected Effectiveness

The literature indicates that locating services and/or residences within walking distance of each other and providing adequate pedestrian facilities is associated with a greater walk mode share (Bacon 1993, Middlesex-Somerset-Mercer Regional Council 1992). A study of neighborhoods with similar per capita incomes near BART stations in the San Francisco Bay Area found that twelve percent walked to supermarkets, there was fifteen percent less auto use for accessing BART, and twenty percent fewer drive alone trips in pedestrian-oriented neighborhoods (PODs) (Bacon 1993). The "walking construct" model developed by the Middlesex-Somerset-Mercer Regional Council projected eighteen percent fewer daily vehicle trips in PODs (Middlesex-Somerset-Mercer Regional Council 1992). An empirical study of American walking behavior found that a pleasant/interesting environment can perhaps double the distance people are willing to walk (Untermann 1984). A study of "pedestrian environment factors" in the Portland metropolitan region found that the pedestrian environment is a significant factor in explaining auto use (Parsons Brinckerhoff Quade and Douglas 1993). Overall, the strategy might bring as much as twenty percent less use of autos for accessing transit systems, though confidence in the finding must be tempered by the paucity of controlled studies.

References

Bacon, Vinton, Carolyn Radisch, Tom Wieczorek, *Trip Reduction Potential of "Transit Village" Development Pattern,* Prepared for Professor Robert Cervero and Dan Solomon, University of California at Berkeley, City Planning 218 / Architecture 201, December 6, 1993.

> Development patterns in the study areas do not result in higher levels of BART ridership for work trips, although the drive alone share of work trips was 20% lower in the more pedestrian oriented environment.
>
> Mode of access to transit stations is significantly influenced by the built environment immediately surrounding a transit station, the driving modes (park and ride, kiss and ride) were found to occupy a 20% lower share within the pedestrian oriented environment.
>
> Shopping trips appear to be significantly influenced by mixed use and pedestrian oriented development patterns. Reductions of more than 30% in automobile trips were found in a mixed use setting with high levels of transit service.

Ewing, Reid, Padma Haliyur, and G. William Page, *Getting Around a Traditional City, A Suburban PUD, and Everything In-between,* Transportation Research Board, 73rd Annual Meeting, January 9-13, 1994, Washington, D.C.

> Beyond some studies relating density to mode choice, VMT, or gasoline consumption, precious little is known about the relationship of location and land use to household travel patterns. Against this backdrop, a 16,000-record travel survey for Palm Beach County,

Florida, was analyzed. Six communities were culled from the larger data base, and household travel data were then tested for statistically significant differences in trip frequency, mode choice, trip chaining, trip length, and overall vehicular travel.

Households in a sprawling suburb generate almost two-thirds more vehicle hours of travel per person than comparable households in a traditional city. While travel differences are significant, they are smaller than one might expect given the more than ten-fold difference in accessibility among the communities. Sprawl dwellers compensate for poor accessibility by linking trips of household members in multipurpose tours.

Implications for land planning are more complex than simply pedestrianizing the suburbs. Communities should internalize as many facilities and services as possible. This is true even where the automobile reigns supreme. Land uses should be arranged to facilitate efficient auto trips and tours. The more sprawling the area, the more important this becomes. By concentrating activities in centers and corridors, linked accessibility to activities can be maintained even as direct accessibility falls off.

Middlesex-Somerset-Mercer Regional Council (MSM), *The Impact of Various Land Use Strategies on Suburban Mobility,* FTA-NJ-08-7001-93-1, December 1992.

This is a report on a projective study of the interaction between suburban land use trends and regional traffic conditions. Three different models of high density, mixed use centers designed to fit in the Middlesex-Somerset-Mercer Region of New Jersey where developed. The three models examined-transit construct, short drive construct, and walking construct-placed residents' home closer to their working and shopping destinations. The models incorporated residential and employment growth expected in the region by 2010, but reshaped the growth into different land use configurations. The project growth was located in the cities and in a small number of newly crated suburban centers instead of in a low density developments spread throughout the region. Based on the study it is concluded that concentrating new suburban development into higher density, mixed-use centers will slow the growth of regional vehicular use, by up to 18% in terms of vehicle trips and 12% in terms of VMT.

Parsons Brinckerhoff Quade and Douglas, Inc., *The Pedestrian Environment,* 1000 Friends of Oregon, Making the Land Use, Transportation, Air Quality Connection, December 1993.

This report describes a methodology for quantifying zones in the Portland (OR) regional travel demand forecasting model network according to four pedestrian factors: ease of street crossings, sidewalk continuity, local street characteristics, and topography. These parameters were combined into a "Pedestrian Environmental Factor" (PEF) that was found to be a statistically significant predictor of auto ownership, mode choice, and destination choice.

Untermann, Richard, with Lynn Lewicki, *Accommodating the Pedestrian: Adapting Neighborhoods for Walking and Bicycling,* New York, 1984.

Extensive analysis of pedestrian behavior. Untermann suggests that most Americans will walk 500 feet. At one-half mile (2,640 feet) only about ten percent walk willingly. While Americans have historically been less willing to walk than other nationalities, acceptable

walking distance can be increased significantly by catering to pedestrians with pleasant routes and pedestrian-oriented activities along routes.

Strategy #9: Interconnected Street Networks

Definition

Regarding this strategy, the ARB *Linkage* report notes:

> During the past 20 years, the typical street circulation pattern in developing suburban areas has consisted of a hierarchy of local streets leading to collector streets, and then to major arterials that interconnect sections of a community to each other and to freeways.
>
> Collector and arterial streets, which often provide the only connections between different sections of suburban communities, tend to be quite wide to allow vehicles to travel faster. The typical suburban circulation pattern decreases the number of available routes between trip origin and destination points, and places many vehicles on major streets and at signaled intersections during peak hours....
>
> In contrast to the typical suburban street hierarchy, an integrated street pattern provides multiple routes to destinations, reducing the distances between two points. Overall vehicle travel times in integrated street patterns are comparable to the faster-moving arterials due to the shorter distances between various origin and destination points....
>
> Typically found in many older neighborhoods and small towns, integrated street networks have several advantages over typical suburban-style street patterns. They provide a number of route choices, more direct routes for pedestrians and bicyclists as well as cars, and they help to slow vehicle speeds. Slower vehicle speeds create a much safer and more interesting environment for pedestrians and bicyclists to share, and reduce noise impacts from vehicles (Parker 1994).

Traffic calming measures--street narrowing, vehicle diverters, pavement treatment to slow traffic--may be an important complement to interconnected streets to ensure that vehicle speeds are not high.

Expected Effectiveness

Studies of this strategy are limited. The available research includes only modeling exercises or empirical studies without controls; however, the literature does suggest that providing an interconnected street network, such as a gridded street pattern, rather than cul-de-sacs and dead-end streets, can result in lower VMT due to access to more direct routes of travel. Friedman finds twenty-five percent fewer auto

driver trips per household comparing pre-World War II and post-World War II neighborhoods, but fails to control for household or traveler variables (Friedman 1992). Kulash predicts a forty-three percent reduction in VMT at the community scale, but the results are drawn from a model study that compares grids with cul-de-sacs (Kulash 1974). Until more controlled studies are conducted for this strategy, it will be difficult to reach conclusions with confidence about the magnitude of effectiveness. Current work indicates the range of effect might be up to forty-three percent reduction in VMT in the immediately affected area.

References

Friedman, Bruce, Stephen P. Gordon, John B. Peers, *The Effects of Neo-Traditional Neighborhood Design on Travel Characteristics*, Fehr & Peers Associates Inc., Lafayette, California, July 10, 1992.

> This paper presents empirical evaluation of the potential effects of "Neo-Traditional Neighborhood Design" (NTND) community design on household trip rates relative to what one could expect when compared to travel characteristics of standard suburban planned unit developments. The analysis uses data from a 1981 regional travel survey of the San Francisco Bay Area households, and compares household travel characteristics of older "Traditional-design" communities to those in the newer suburban tract communities exhibiting dramatically higher drive alone rate, whereas households in traditional communities exhibited significantly higher use of alternative travel modes.
>
> When considering the results of this paper for NTND designs, these findings must be modified somewhat, as not all mode choice factors that exist in older Traditional-design communities would be duplicated in a modern NTND. Actual travel patterns will depend on community location, demographic mix, specific design, and available travel alternatives. Thus the differences identified here should be interpreted as the maximum level of shift in the travel mode choice one could expect. Depending on the project location and specific design features, study findings indicate that on average, the daily trip generation for neo-traditional households would be 20% less than for households in Standard Suburban areas, and daily auto trip generation rates would be 24% less. The availability of these estimates could be valuable to planners, engineers, and public officials in determining the role of these projects in meeting regional public goals.
>
> Note: Effects of income, household size, and vehicle ownership not explicitly considered.

Kulash, Damian, *Parking Taxes as Roadway Prices: A Case Study of the San Francisco Experience*, Urban Institute, Paper 1212-9, March 1974.

> In October 1970, San Francisco imposed a 25 percent parking tax, the largest jump in parking taxes and prices experienced to that time in the United States. It stayed in effect for 21 months before being lowered to 10 percent. This study examined the effect of the tax on parking demand and industry revenues.

Strategy #10: Strategic Parking Facilities

Definition

This strategy actually consists of two measures which may be developed independently or in conjunction with one another.

Parking Supply

This measure entails limiting the amount of parking available to motorists. The purpose of this strategy is to both encourage the use of non-auto modes and to reduce the actual and perceived difficulty of walking between nearby land uses. Restriction of parking needs to be implemented concurrent with alternative transportation options. It is generally recognized that most suburban areas oversupply parking, because they require each use to provide parking at close to its maximum need, and assume little use of non-auto modes. Combined with the fact that each development in suburban areas is generally required to provide its own parking on-site, total parking supply in suburban areas can be nearly twice as great as the peak number of spaces actually utilized (Willson 1992). With the shorter walking distances and greater feasibility of transit and other modes that parking supply restrictions would help bring about, the need for parking would be further reduced.

Preferential Parking

This measure consists of reserving parking close to buildings for carpool and vanpool vehicles. Typically it is implemented at major employers where the cost, scarcity and distance of parking are factors that affect employees' commute choice. The visibility of the preferential parking for high-occupancy modes also serves as a marketing tool for such modes. Where a charge for parking exists, carpools and vanpools can be provided with a reduction or elimination of the parking charge. Requirements for the provision of carpool and vanpool spaces should be based on realistic expectations for their use to avoid overallocation and wasting space.

Expected Effectiveness

A number of studies have found that parking supply impacts mode shares and the amount of vehicle travel (Aarts 1984, Dowling 1991, Gentvoort 1984, Gross 1978, Transport Canada 1978, Zarka 1987). One study found that when a parking lot was closed in an urban area in the Netherlands, there was a shift from single-occupant vehicles to transit and carpooling. In the short run, however, there was also an increase in emissions and VMT as a result of vehicles searching for parking (Gentvoort 1984). Another

study found that when alternate modes were available and relatively easy to access, vehicle use was reduced and therefore less parking is needed (JHK & Associates 1993). In a study of parking supply and parking pricing at hospitals in San Francisco, the amount of parking supplied was about one-third as strong of a predictor of mode share as the cost for parking (Dowling 1991). When parking supply was decreased and parking fees were increased at a school campus in Massachusetts, it was found that most of the impact on parking demand came from the reduction of parking spaces (Golob 1988).

There is extensive literature on the impact of increasing parking pricing on the demand for parking and on vehicle travel. When alternative modes (transit, van/carpools) are available, increasing the cost of parking can reduce solo driving (Dowling 1991, Golob 1988, Kulash 1974, Miller 1982, Miller 1983, Willson 1992, Zarka 1987). If high occupancy vehicles are offered free or subsidized parking when single-occupant vehicles are charged for parking, then an increase in ridesharing is likely to occur (Merhranian 1986, Miller 1983). The increase in ridesharing is dependent upon the difference in parking cost to solo drivers and the price and location of any preferential parking spaces.

References

Willson, Richard, *Suburban Parking Economics and Policy: Case Studies of Office Work Sites in Southern California*, for the Federal Transit Administration, October 1992.

> Parking demand and supply at ten case study sites in Riverside, Los Angeles, Orange and San Bernardino counties. Findings suggest oversupply of parking and quantifies the excess supply.

Aarts, Jan Alexandra and Jeffrey Hamm,"Effects of Ridesharing Programs on Suburban Employment Center Parking Demands", *Transportation Research Record 1980,* Transportation Research Board, 1984.

> Testing whether ridesharing decreases the demand for parking. Study comparing sites with and without ridesharing programs found sites with ridesharing programs and limited parking supply (28 percent less than comparison sites) had 20 percent less parking demand. Concludes, "Limited parking may be acting as the agent motivating the employees to rideshare."

Dowling, Richard, *Factors Affecting TDM Programs Effectiveness at Six San Francisco Medical Institutions*, Paper before the TRB 70th Annual Meeting, January 1991.

Case study suggests and quantifies effect of parking pricing and supply restraint on mode share at San Francisco hospitals. On-site parking supply is not related to ride share, but off-site parking is more important. Regression with parking charge above is enough to explain ride share variation; elasticity suggests $8/month increase will get 1% ride share reduced.

Gentvoort, J.Th., "Effects Upon Mode Choice of a Parking Restraint Measure", *Traffic Engineering and Control*, #25, 1984.

Study of before and after effects of closing a parking lot in the Hauge (The Netherlands). A sample of lot users was tracked before and after closing.

Golob, J., *Parking Permits and Price Changes (unpublished study/personal communication)*, University of California, Irvine, 1988.

Study examines the effects of increase in the cost of parking permits at the University of California, Irvine. There was a 78 percent increase in the price of a parking permit between the 1984/85 academic year and the 1986/87 academic year.

Gross, W.P., P.W. Giglio, et. al., *Amherst, Massachusetts Fare Free Bus and Demonstration Project: Final Evaluation Plan*, For the U.S. Department of Transportation, UMTA, 1978.

Parking fees were increased from $5.00 to $55.00 per year in the campus core, to $21 near the center and not increased for peripheral lots. Assigned spaces in the core and edge lots were decreased and the number of peripheral spaces increased. Campus shuttle was expanded. 79% of survey respondents still choose lots based on convenience rather than price, though students were more price sensitive.

Higgins, Thomas, J., *Flexible Parking Requirements*, An Urban Consortium Information Bulletin, Public Technology, Inc., Washington DC, 1982.

Dated but informative review of policy to reduce minimum parking requirements in return for developer contributions to in-lieu funds or demand management actions. Suggests policy has had mixed effect and presents many implementation difficulties. Case reviews include Calgary, Sacramento, Davis, Culver City, Escondito, Montgomery County, Phoenix, Palo Alto, Bellevue, Portland, and Seattle.

Kulash, Damian, *Parking Taxes as Roadway Prices: A Case Study of the San Francisco Experience*, Urban Institute, Paper 1212-9, March 1974.

In October 1970, San Francisco imposed a 25 percent parking tax, the largest jump in parking taxes and prices experienced to that time in the United States. It stayed in effect for 21 months before being lowered to 10 percent. This study examined the effect of the tax on parking demand and industry revenues.

Mehranian, Maria, Martin Wachs, Donald Shoup, Richard Platkin, *Parking Cost and Mode Choices Among Downtown Workers: A Case Study,* University of California at Los Angeles, DP8613, August 1986.

The study examined parking management of two downtown LA companies. Company A provides only subsidy for parking while Company B has incentive and rideshare programs.

Miller, Gerald K., Thomas J. Higgins, *Implementing Parking Pricing Strategies*, Urban Institute Paper, August 1983.

Indicates the effectiveness of various parking pricing strategies including revenue tax, space tax, surcharges, permits, rate changes at municipal garages, and discusses in general terms effects of reduced parking supply. Case studies highlighted for San Francisco, Washington D.C. federal workers, Ottawa, ENI Company, Seattle carpool discount program, Santa Cruz on street program.

Miller, Gerald, Carol Everett, "Raising Commuter Parking Prices - An Empirical Study," *Transportation II* 1982.

A "before and after" study of federal and private employees who were charged additional parking fees for commute trips.

Pickrell, D.H., D.C. Shoup, "Employer Subsidized Parking and Work-Trip Mode Choice", *Transportation Research Record 786*, 1980.

Study of 500 students at UCLA who were denied parking permits. 40% of students denied permits indicated that they commuted in modes other than SOVs. But when they were later offered permits, they discontinued use of alternative modes.

Transport Canada, *The Effects of the Imposition of Parking Charges on Urban Travel in Ottawa*, Summary Report TP 291, Montreal.

Increase in parking charges on federal employees in Ottawa. Prices rose from free to about 70 percent of commercial rates. Major bus improvements were included. Seven percent of federal workers changed mode, auto driver declined from about 35 percent to 28 percent. Bus transit share increase from 42 percent to 49 percent.

Zarker, Gary and Jesse Krail, Seattle Engineering Department, *The 1987 Evaluation of Transportation Management Programs*, Final Report, 1987.

Survey of 12 downtown buildings suggests parking supply availability may be a significant cause of mode shift. Report also demonstrates the ineffective nature of carpool discount stalls.

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