Tahoe Metropolitan Planning Organization

P.O. Box 5310
128 Market Street
Stateline, Nevada 89449
(775) 588-4547 ◆ Fax (775) 588-4527

May 12, 2010

Documentation of Categorical Exclusion for the Tahoe Metropolitan Planning Organization Lake Tahoe Region Bicycle and Pedestrian Plan under the National Environmental Policy Act

The Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) Regulations give federal agencies the authority and discretion to determine which of their own activities should be categorically excluded from NEPA depending on circumstances and valid justification. Furthermore, if a proposed activity falls under this section of the CFR, no further NEPA approvals are required by the Federal Highway Administration.

Under 23 Code of Federal Regulations (CFR) Section 771.117(c) "the following actions meet the criteria for Categorical Exclusions (CE's) in the Council on Environmental Quality (CEQ) regulation (section 1508.4) and 771.117 (a) of this regulation and normally do not require any further NEPA approvals by the Administration:

(1) Activities which do not involve or lead directly to construction, such as planning and technical studies.

The Tahoe Metropolitan Planning Organization (TMPO) Bicycle and Pedestrian Plan identifies numerous goals and policies as they relate to the creation of a region-wide bicycle and pedestrian system. Within the plan are identified projects such as: shared use paths, bicycle lanes, sidewalks and support facilities. While these projects and objectives are included in the plan, it is the understanding of the TMPO that each individual project will undergo environmental review and documentation as the project proceeds from the planning phase to the design and construction phases. For this reason, the Tahoe Metropolitan Planning Organization has declared the Lake Tahoe Region Bicycle and Pedestrian Plan as categorically excluded from the National Environmental Policy Act.

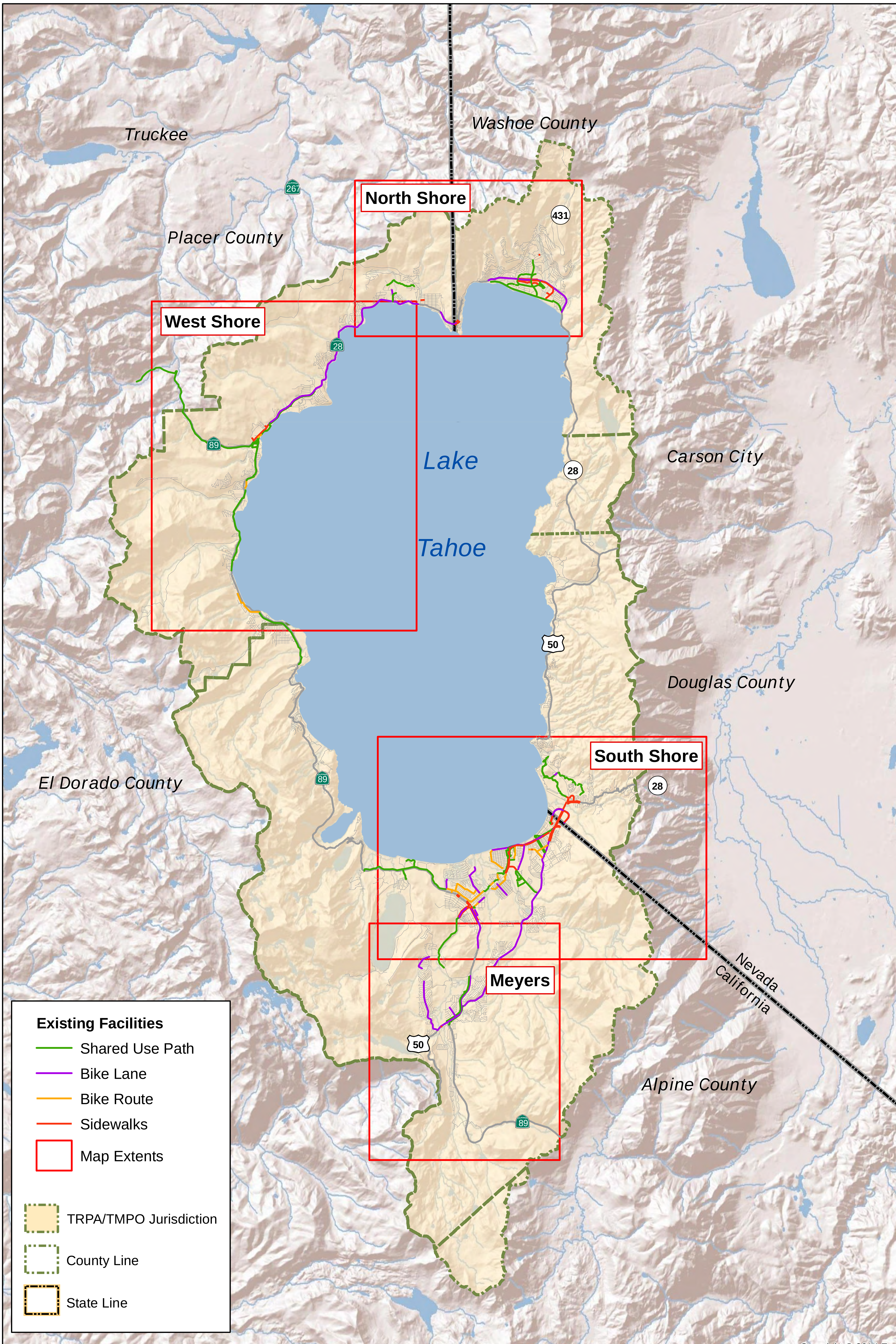
Nick Haven
Principal Transportation Planner

Karen Fink
Senior Transportation Planner

APPENDICES H-L
AVAILABLE ONLINE AT
http://www.tahoempo.org

APPENDIX B
MAPS AND PROJECT LISTS

Technical Amendment– December 2014



TRPA Existing Bicycle and Pedestrian Network

Tahoe Regional Planning Agency
TRPA Bicycle and Pedestrian Plan

0 2.5 5 Miles

Source: Data obtained from TRPA
Date: 12/12/14 TTC Approved
All Proposed facilities are conceptual only. For specific information, please contact implementing agency.

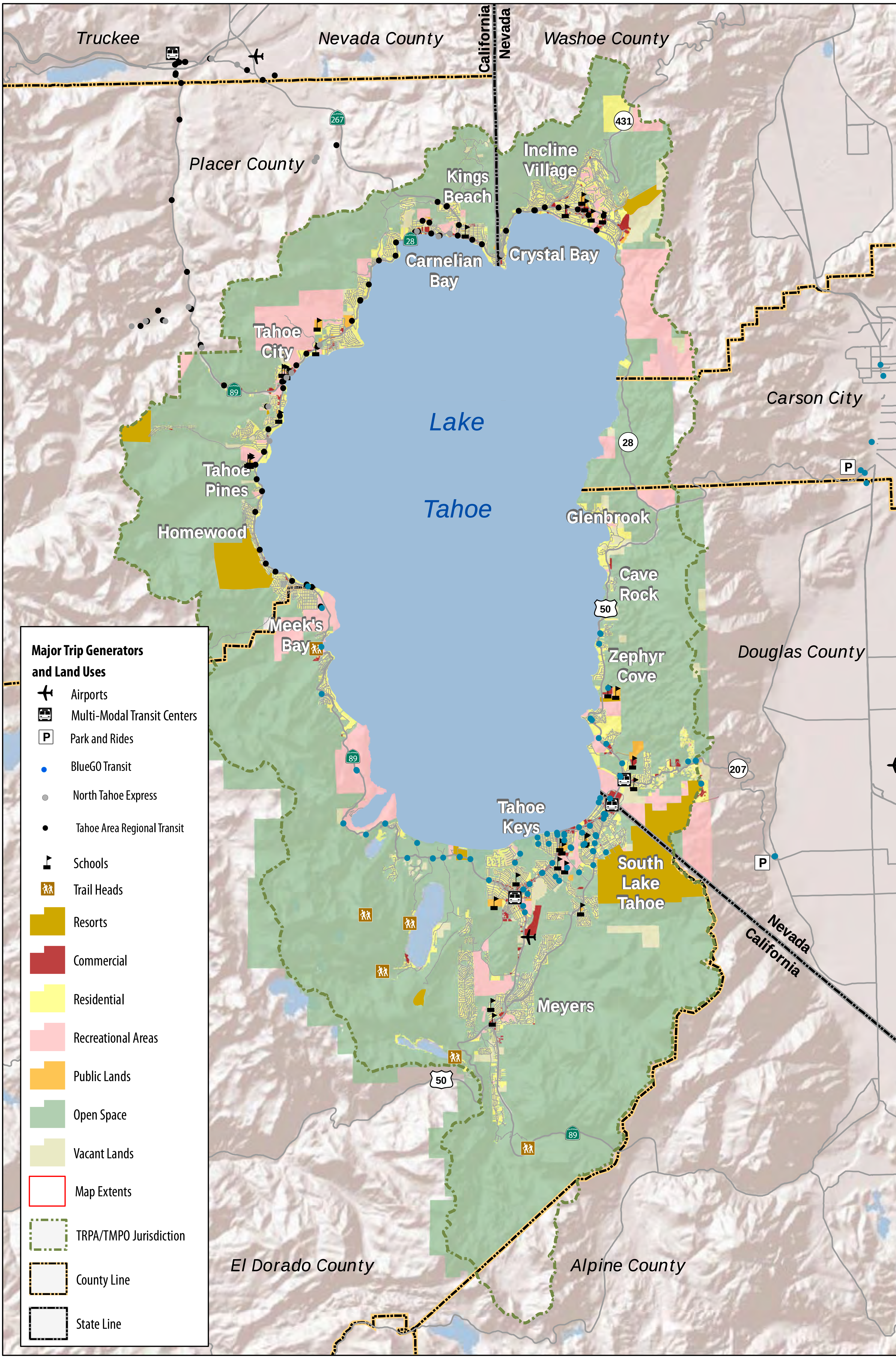


Figure 9: Major Trip Generators and Land Uses

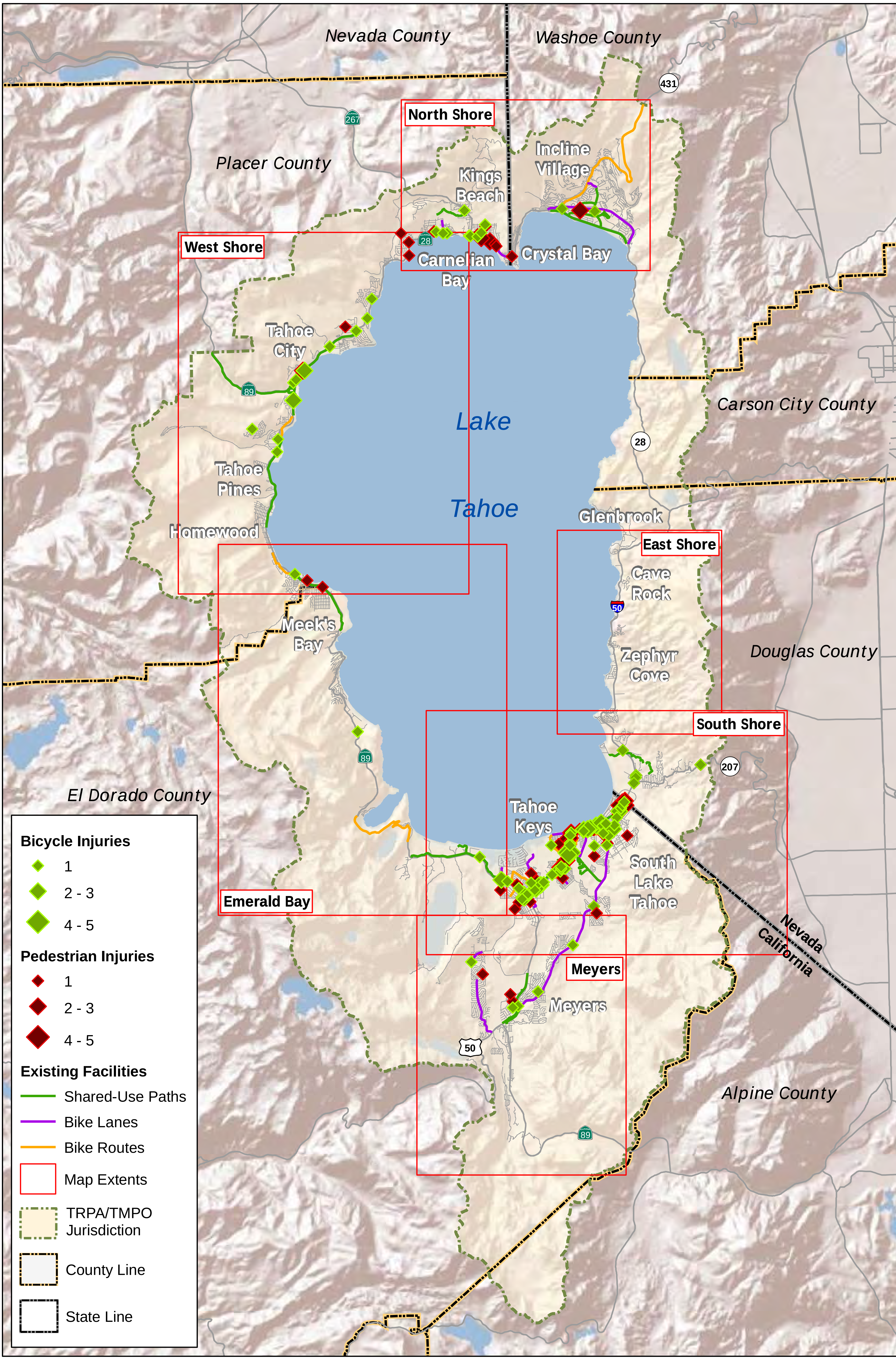


Figure 10: Bicycle and Pedestrian Collisions, 2004-2008

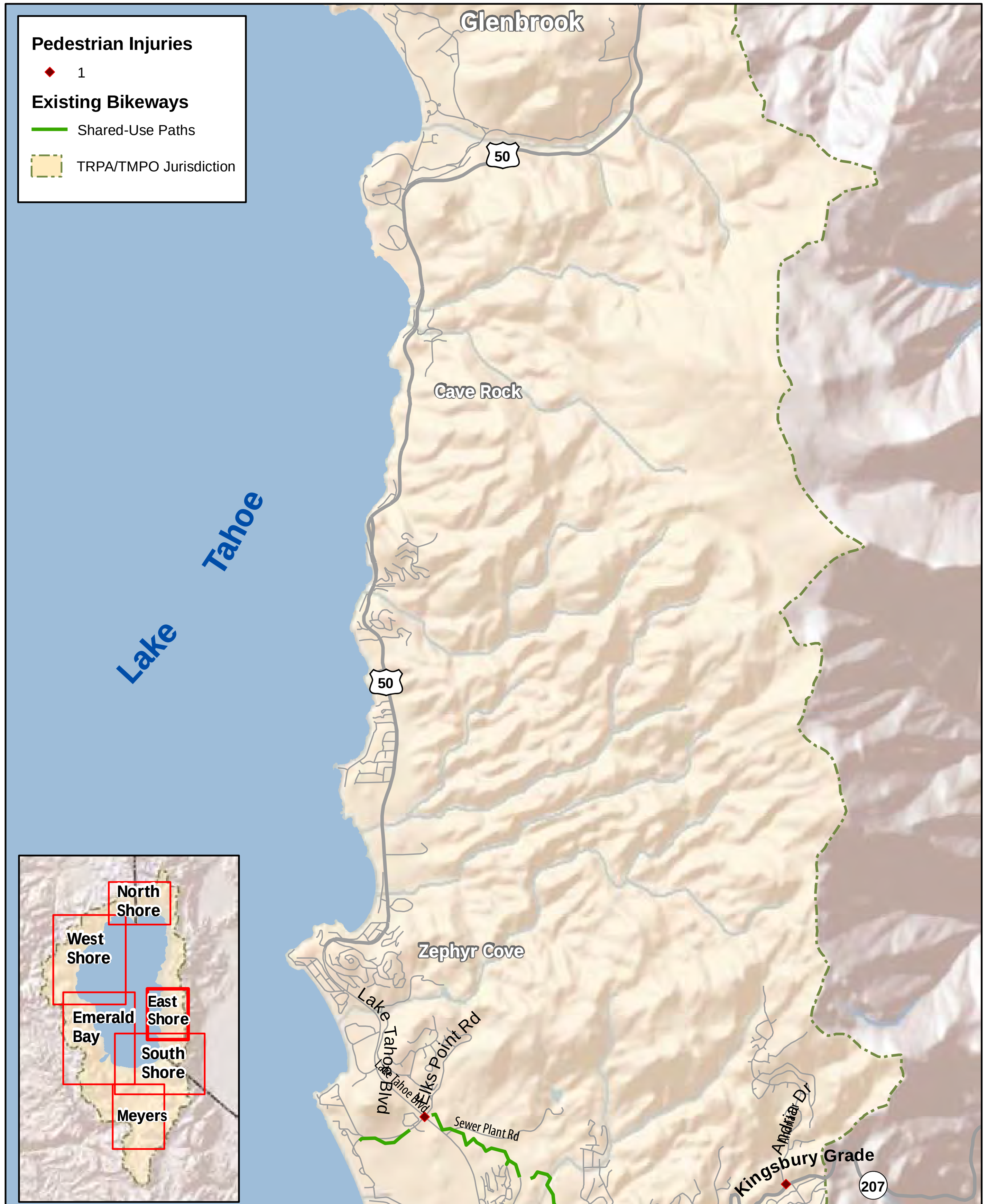


Figure 10: Bicycle and Pedestrian Collisions, 2004-2008, East Shore

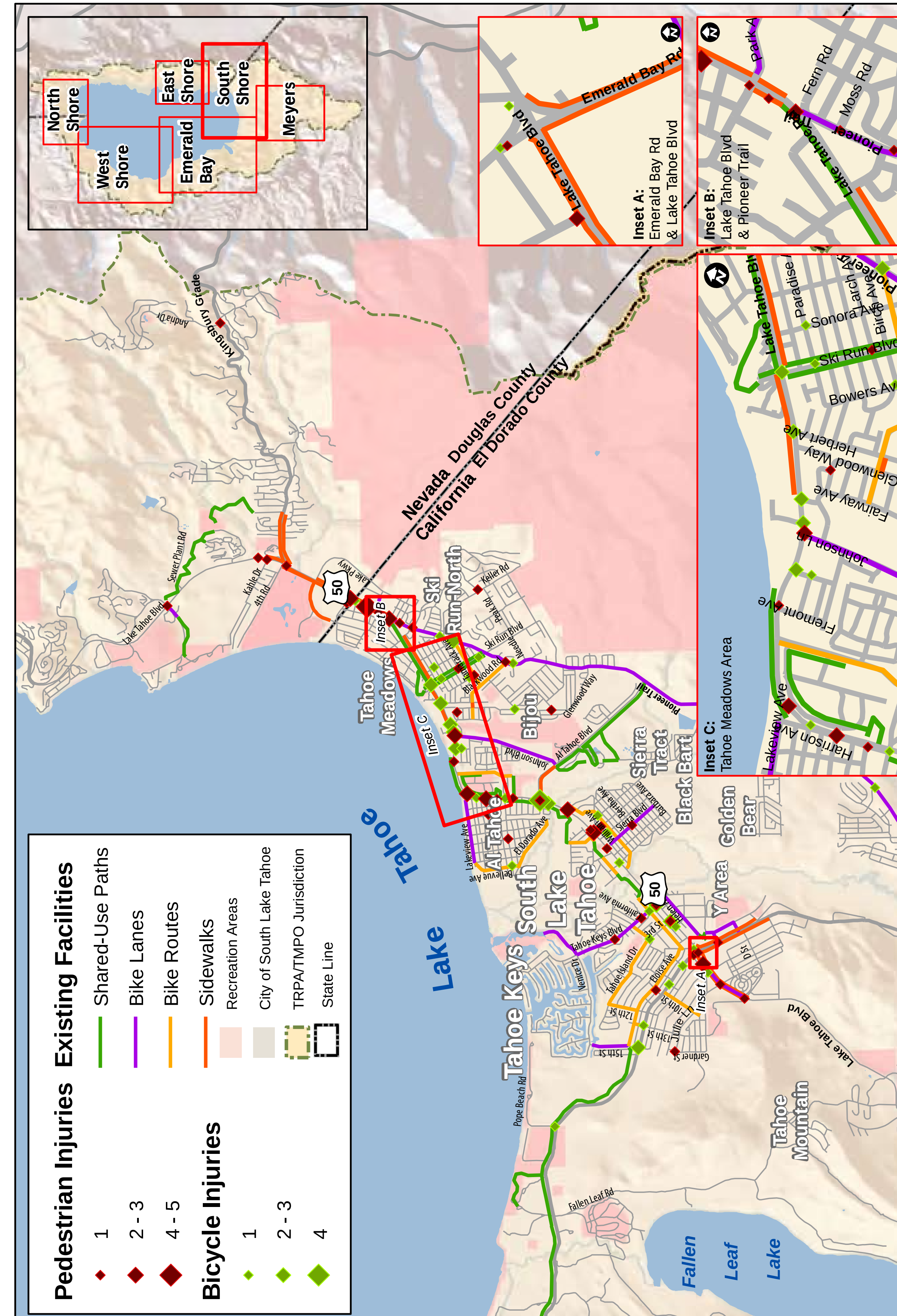


Figure 10: Bicycle and Pedestrian Collisions, 2004-2008, South Shore

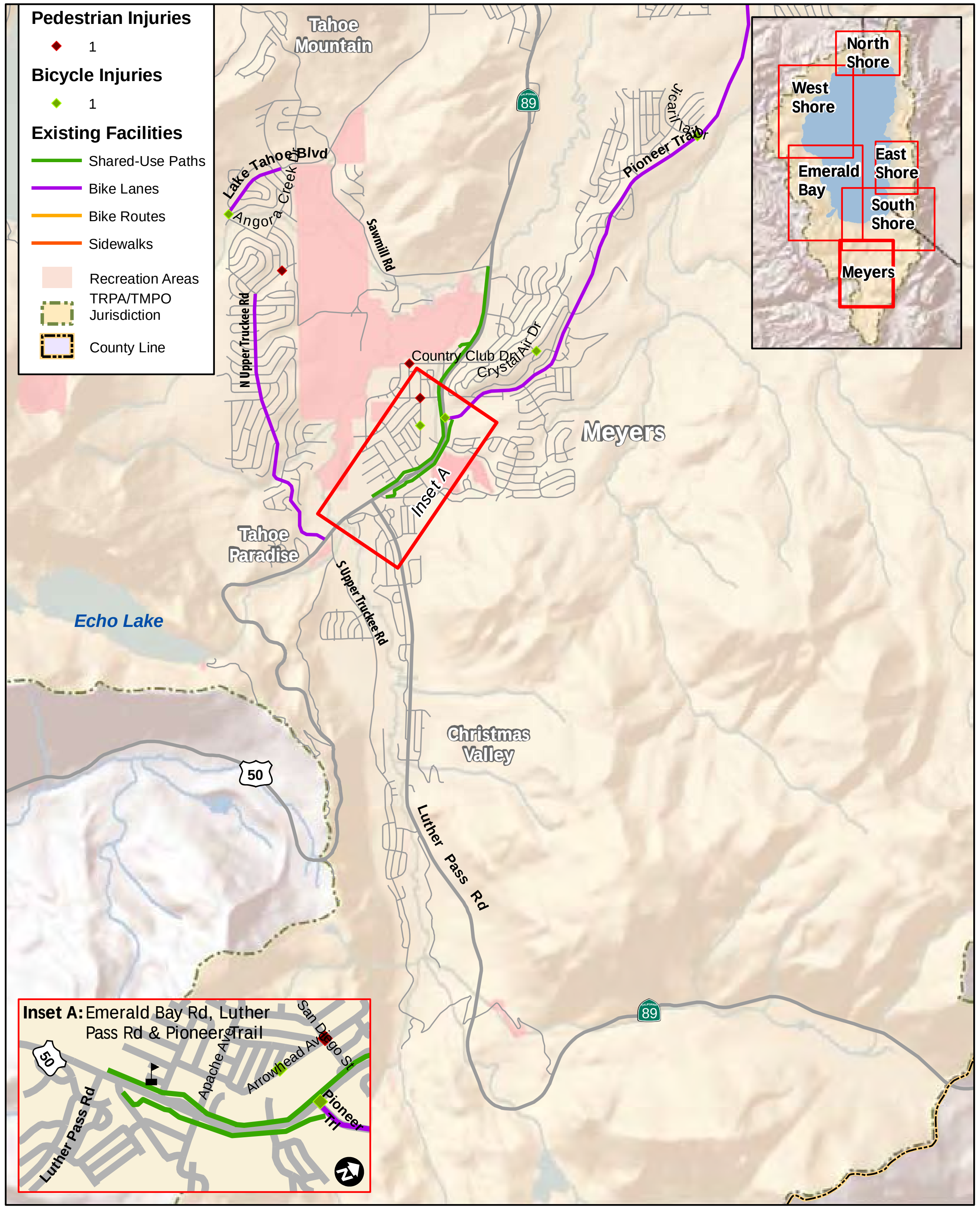


Figure 10: Bicycle and Pedestrian Collisions, 2004-2008, Meyers

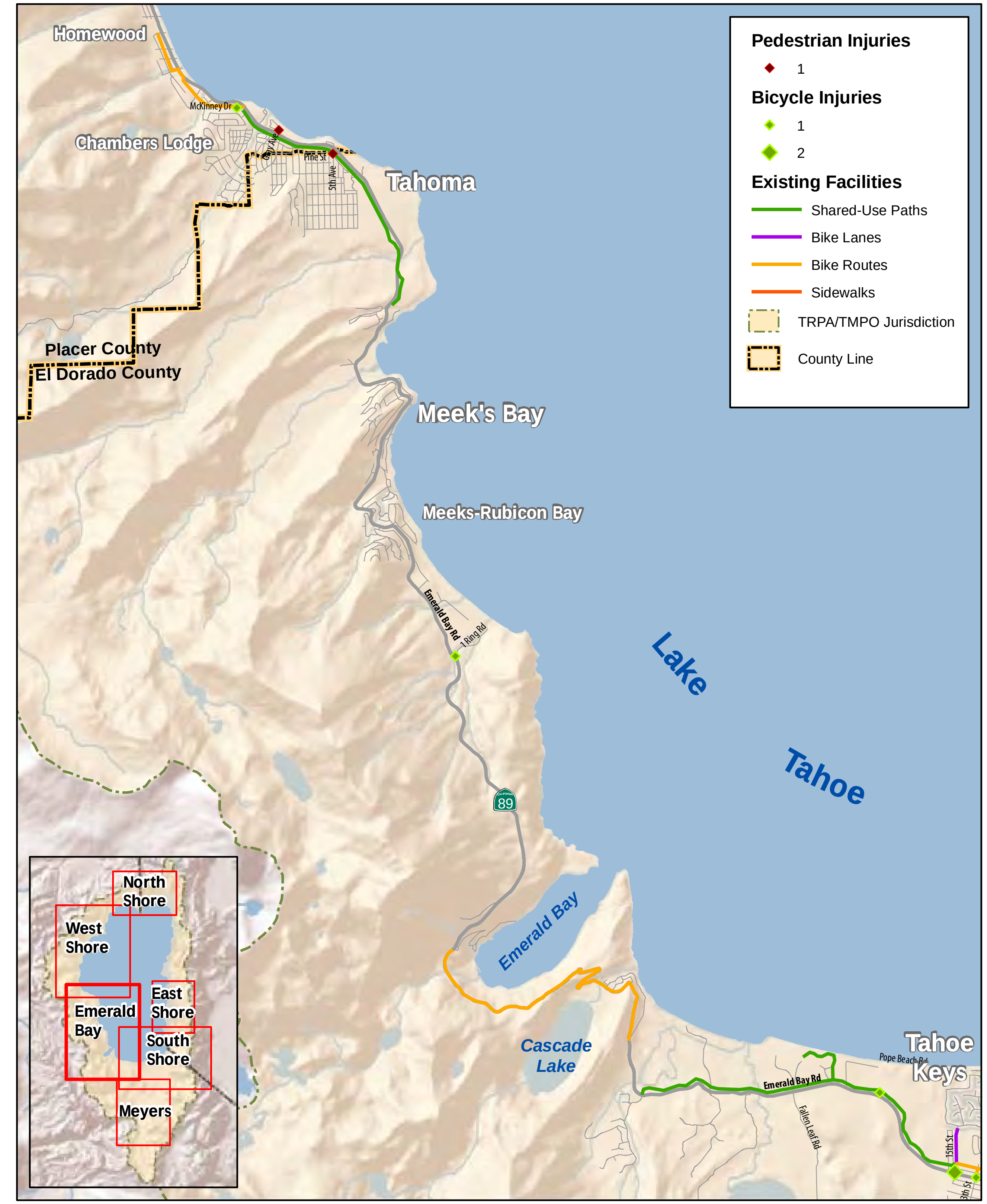


Figure 10: Bicycle and Pedestrian Collisions, 2004-2008, Emerald Bay

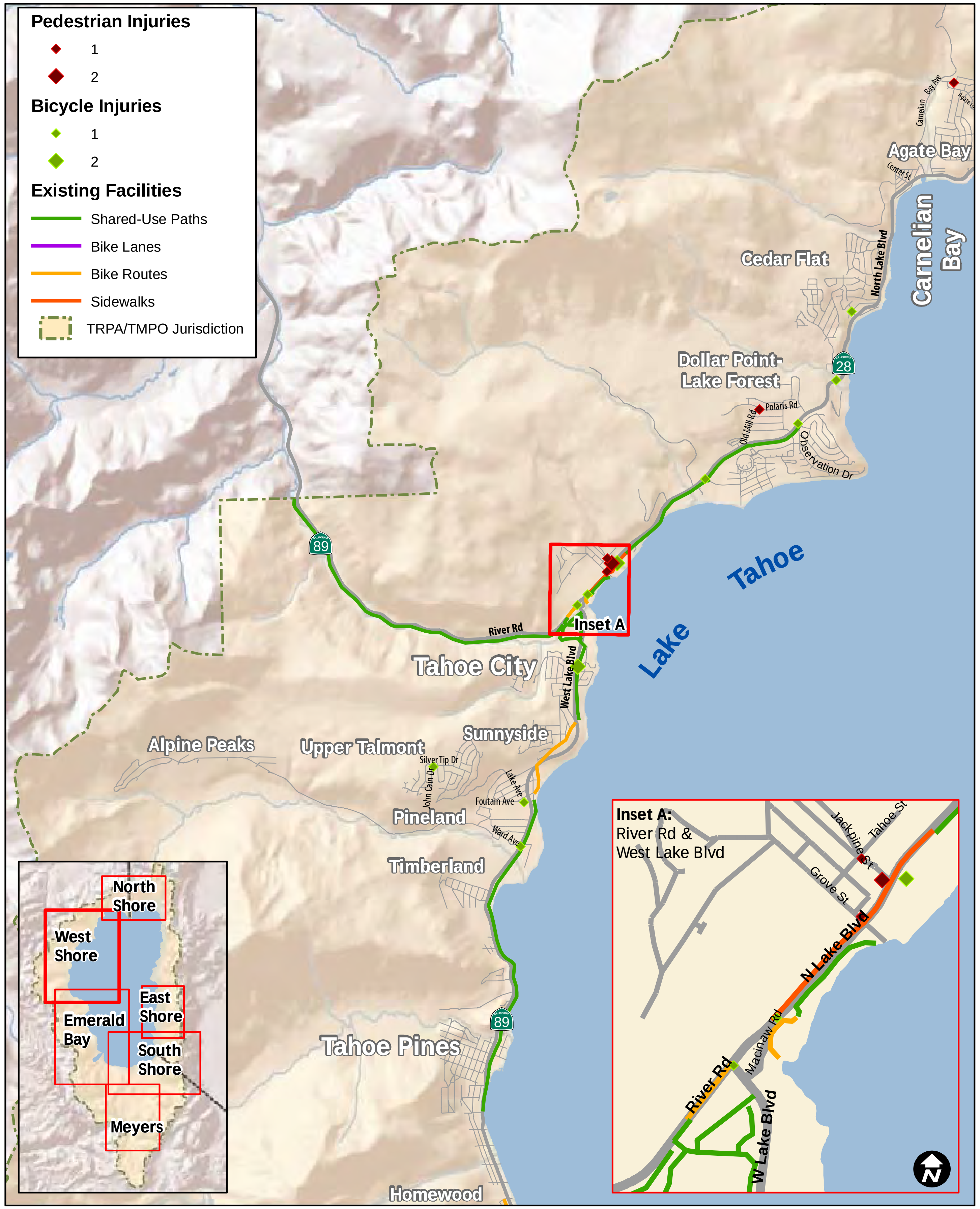


Figure 10: Bicycle and Pedestrian Collisions, 2004-2008, West Shore

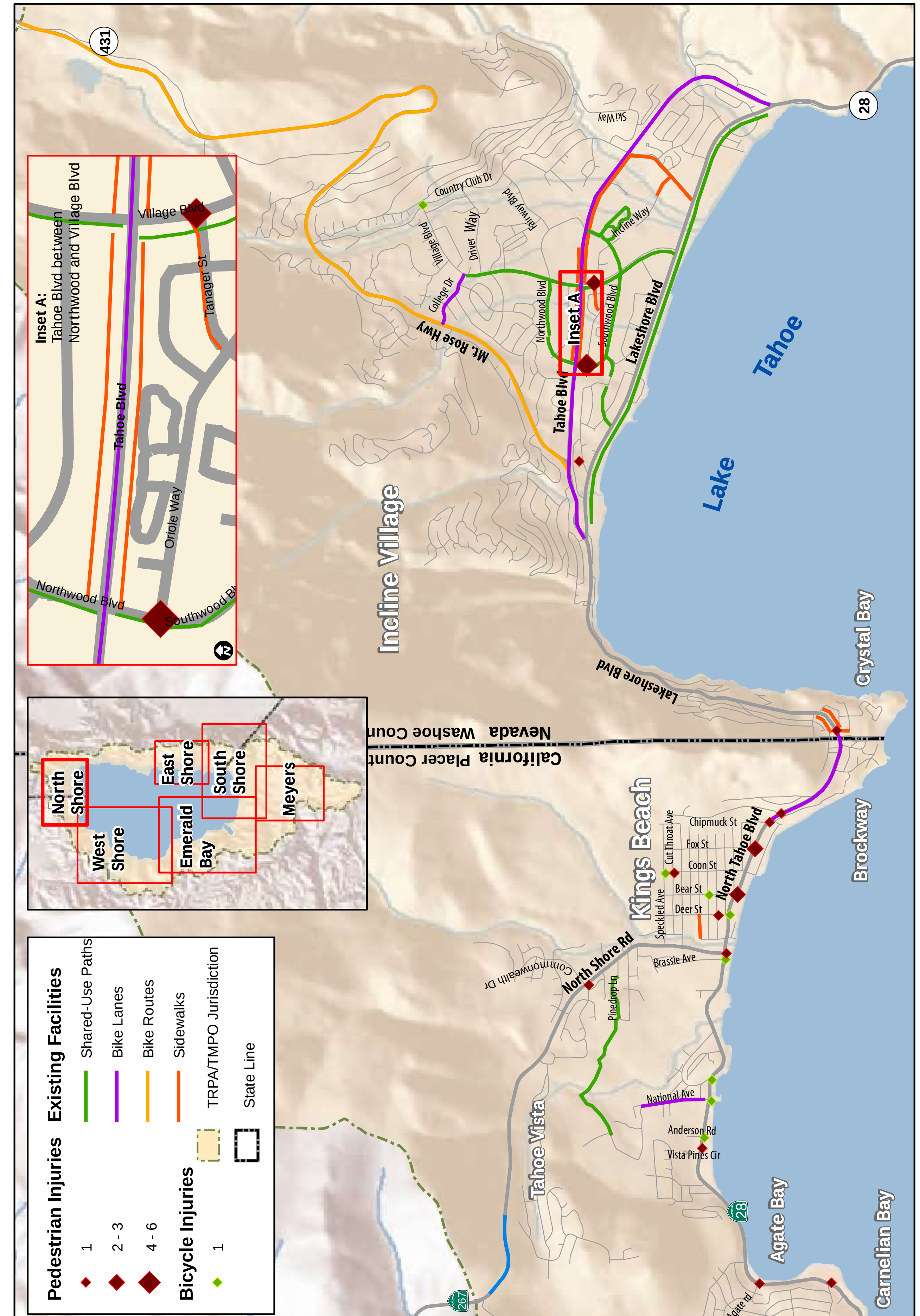
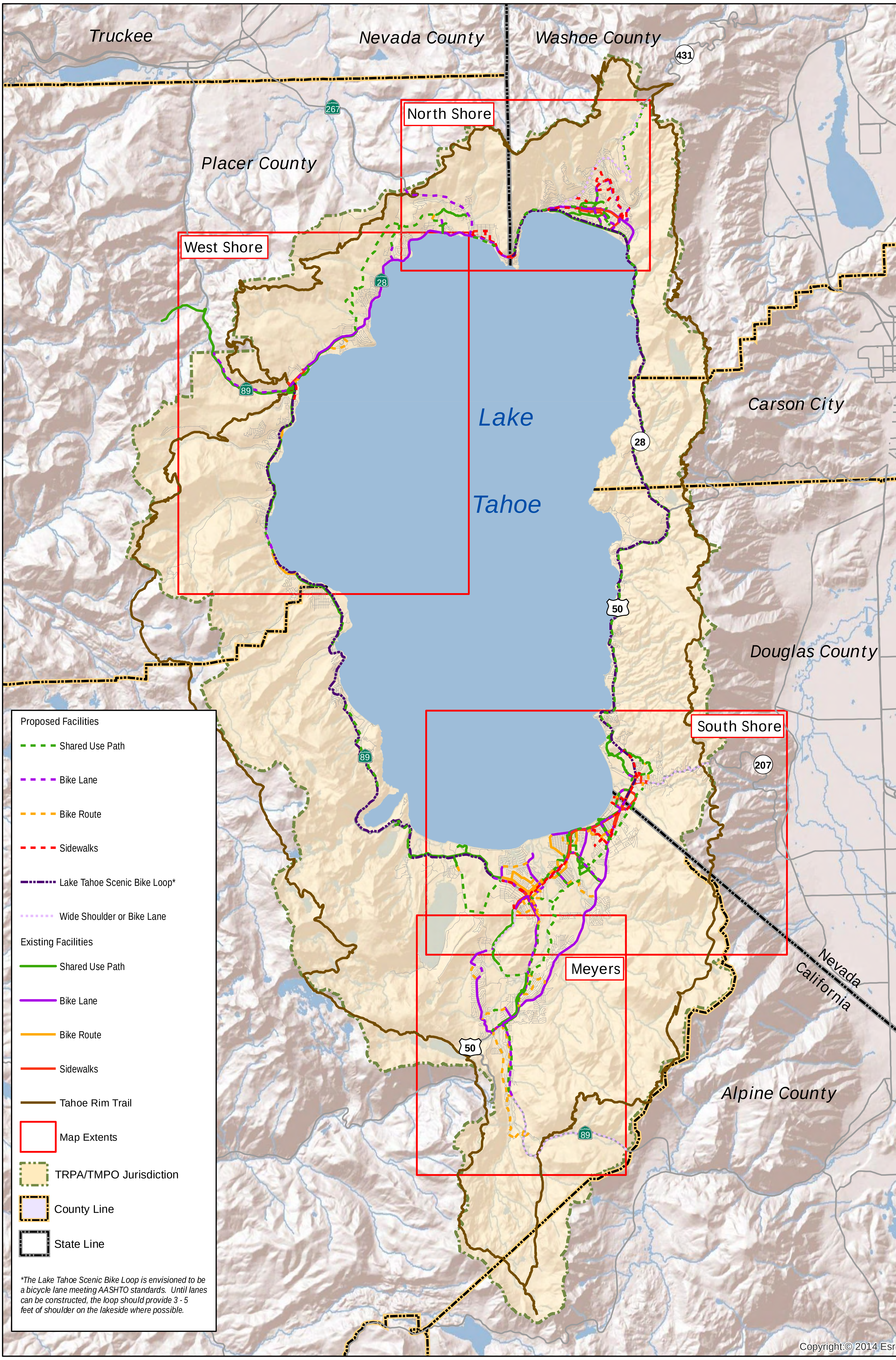


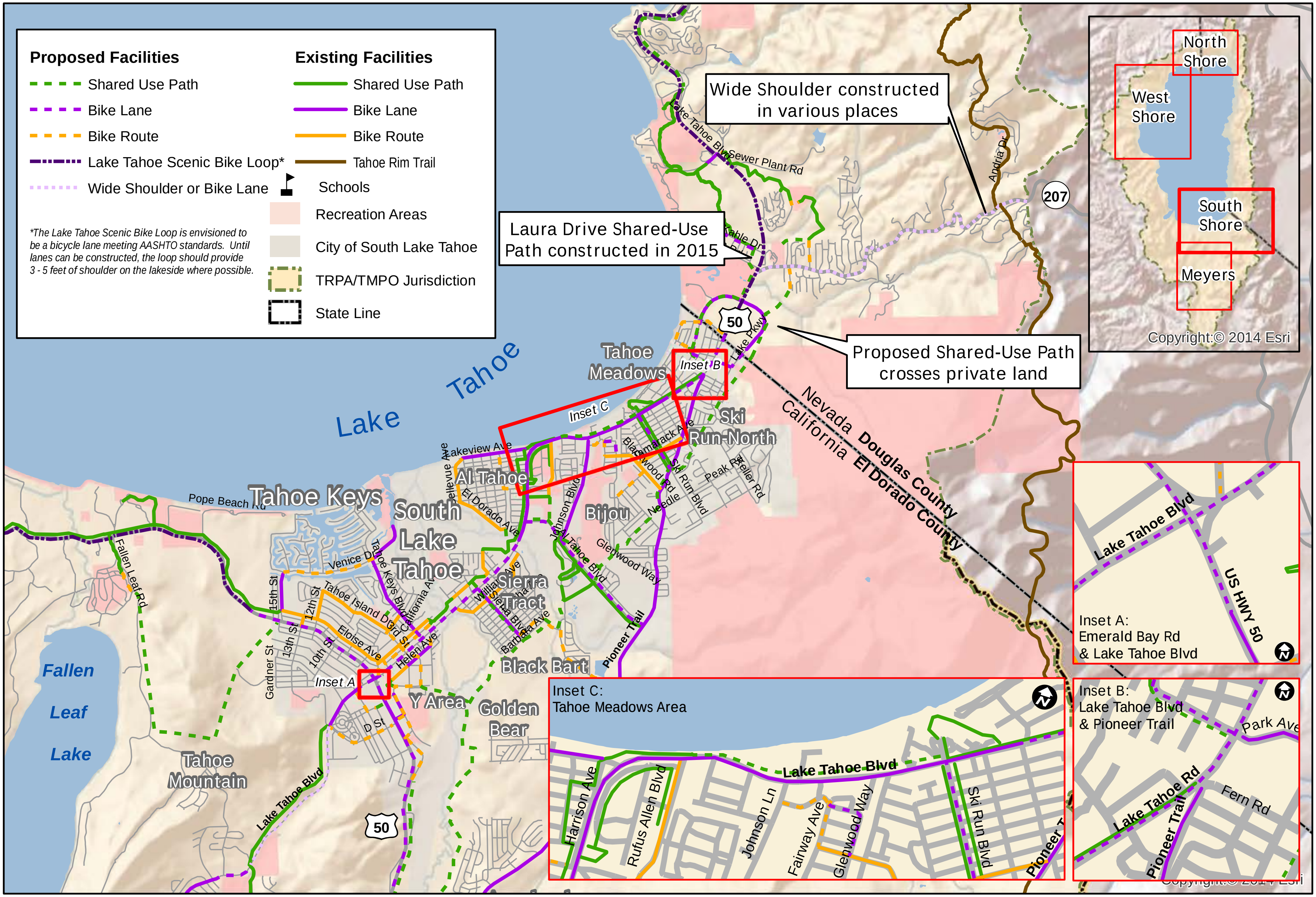
Figure 10: Bicycle and Pedestrian Collisions, 2004-2008, North Shore



TRPA Existing and Proposed Bicycle and Pedestrian Network

Tahoe Regional Planning Agency
TRPA Bicycle and Pedestrian Plan

Source: Data obtained from TRPA
Date: 12/12/14 TTC Approved
All Proposed facilities are conceptual only. For specific information, please contact implementing agency.



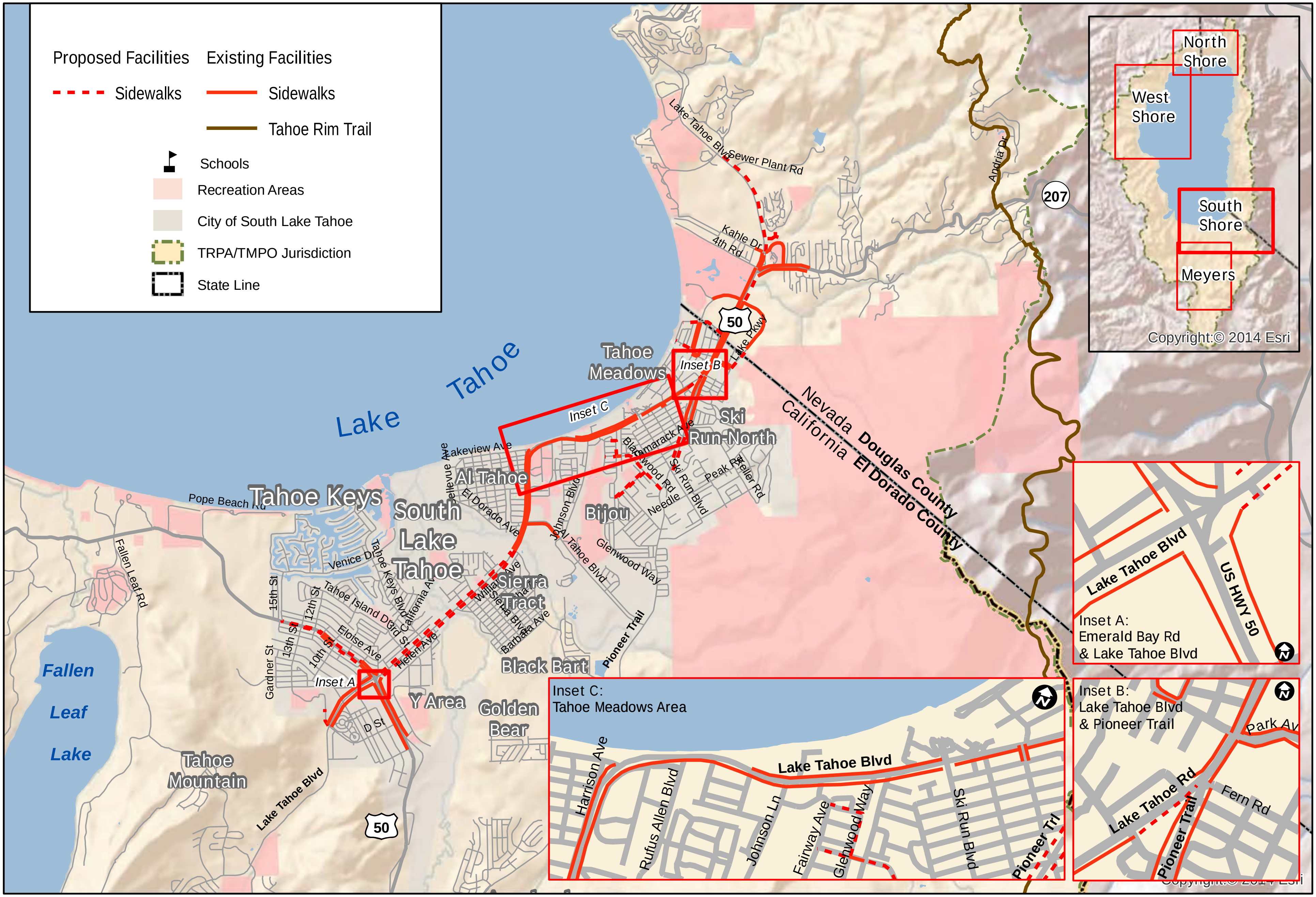
South Shore: Existing and Proposed Bikeways

Tahoe Regional Planning Agency
TRPA Bicycle and Pedestrian Plan

0 0.5 1 Miles

alta PLANNING + DESIGN

Source: Data obtained from TRPA
Date: 12/12/14 TTC Approved
All Proposed facilities are conceptual only. For specific information, please contact implementing agency.

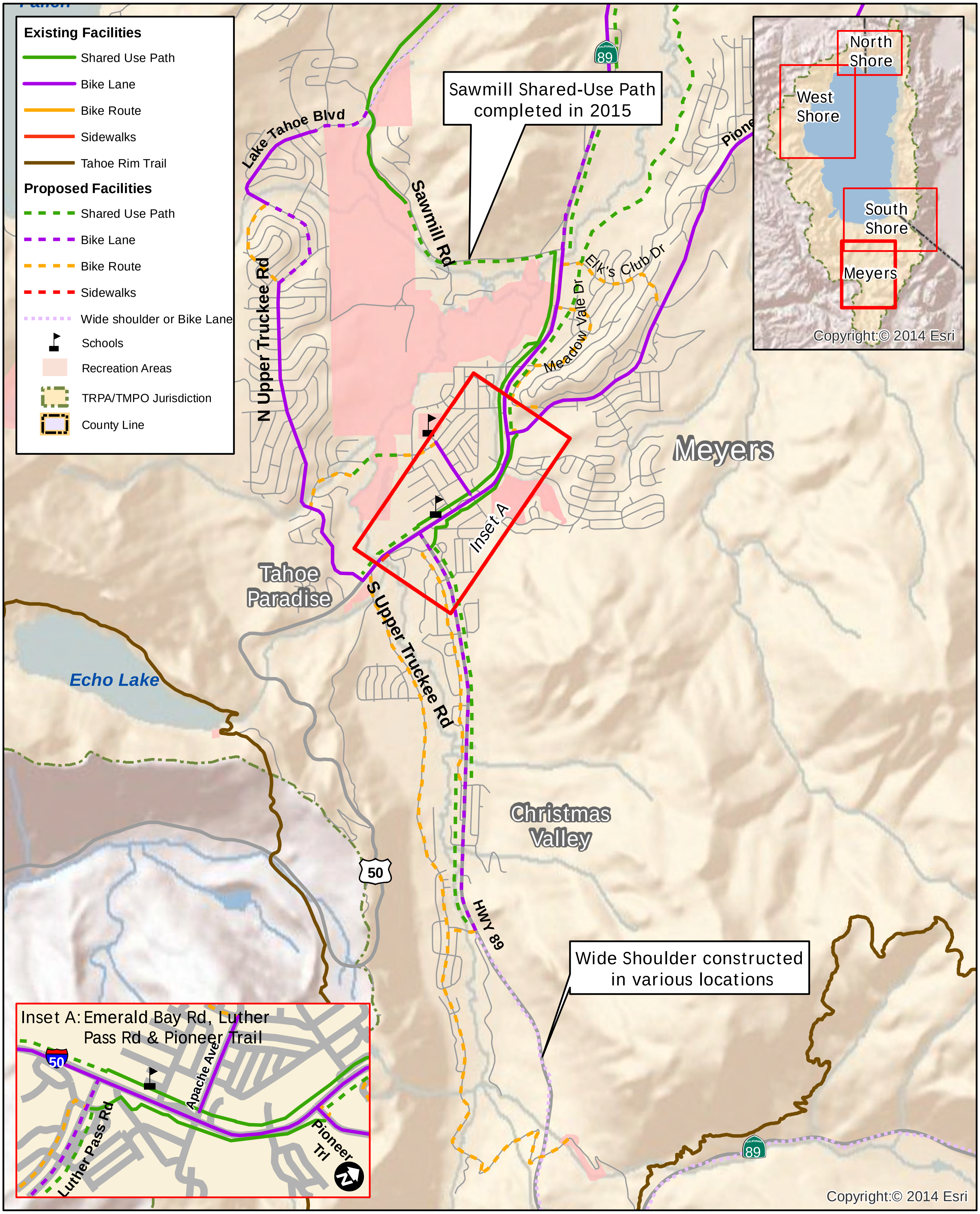


South Shore: Existing and Proposed Sidewalks

Tahoe Regional Planning Agency
TRPA Bicycle and Pedestrian Plan

0 0.5 1 Miles

Source: Data obtained from TRPA
Date: 12/12/14 TTC Approved
All Proposed facilities are conceptual only. For specific information, please contact implementing agency.

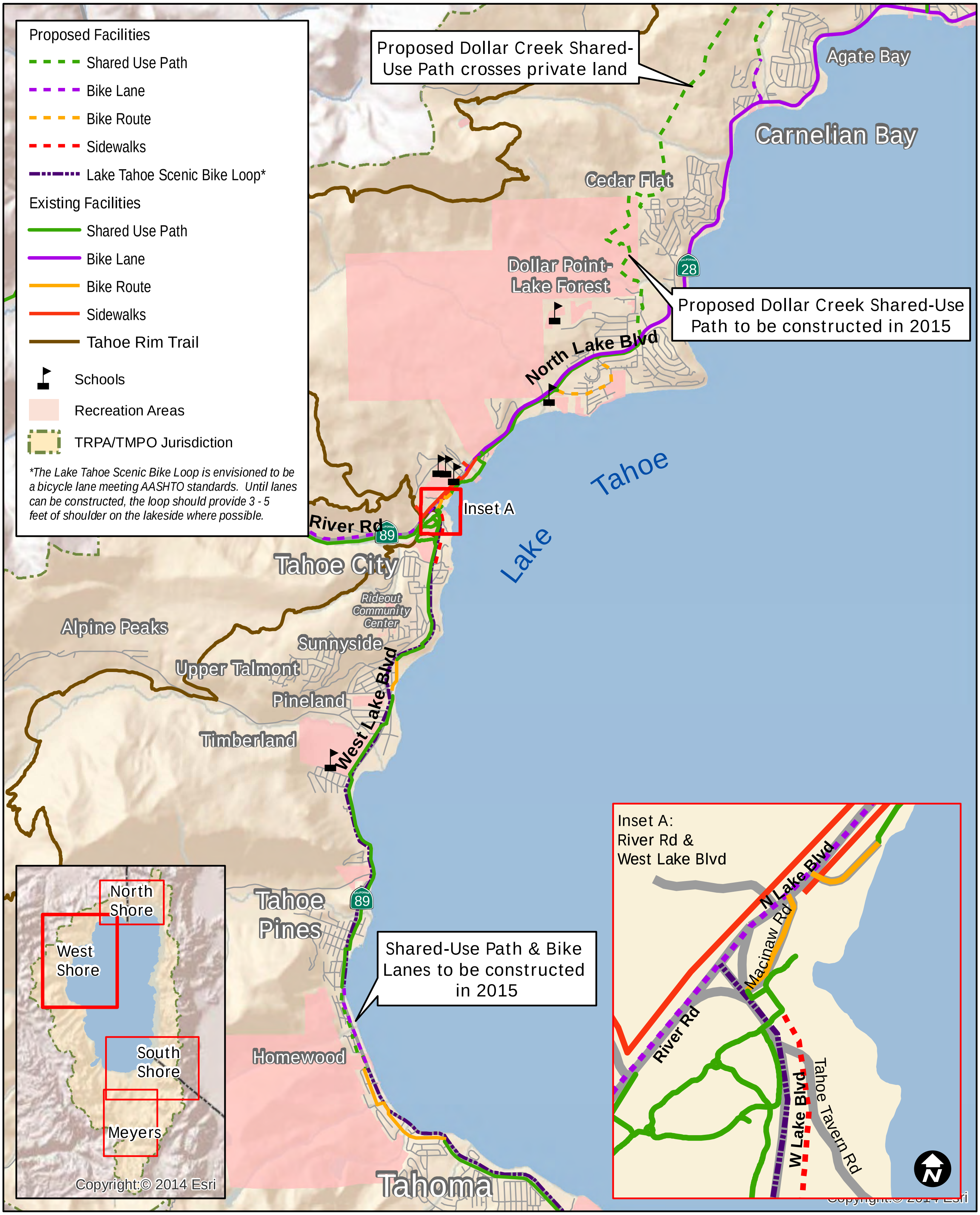


Meyers Area: Existing and Proposed Bicycle and Pedestrian Network

Tahoe Regional Planning Agency
TRPA Bicycle and Pedestrian Plan

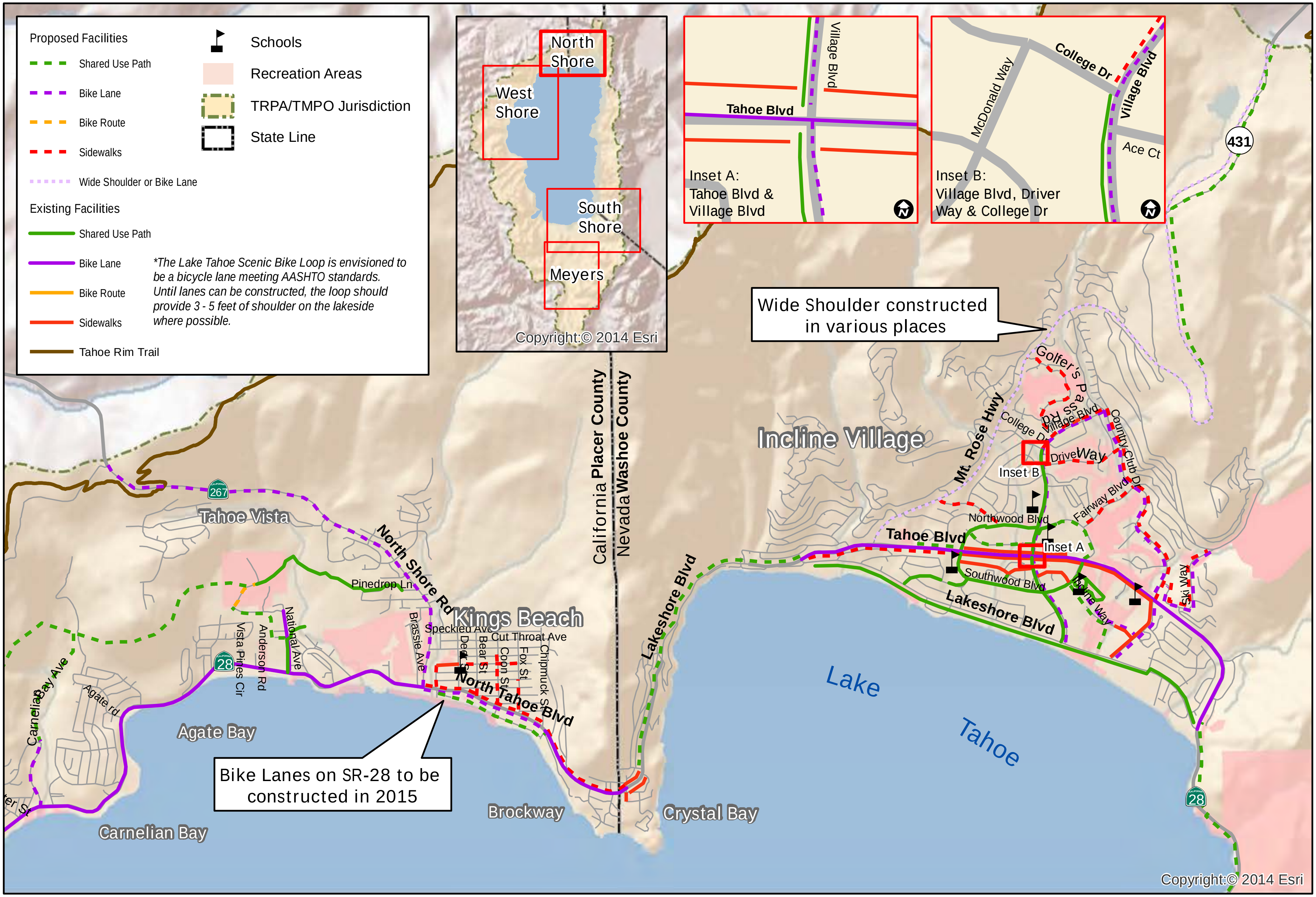
0 0.4 0.8 Miles

Source: Data obtained from TRPA
Date:12/12/14 TTC Approved
All Proposed facilities are conceptual only. For specific information, please contact implementing agency.



West Shore: Existing and Proposed Bicycle and Pedestrian Network

Tahoe Regional Planning Agency
TRPA Bicycle and Pedestrian Plan
Source: Data obtained from TRPA
Date: 12/12/14 TTC Approved
All Proposed facilities are conceptual only. For specific information, please contact implementing agency.



North Shore: Existing and Proposed Bicycle and Pedestrian Network

Tahoe Regional Planning Agency
TRPA Bicycle and Pedestrian Plan

0 0.375 0.75 Miles

alta PLANNING + DESIGN

Source: Data obtained from TRPA
Date: 12/12/14 TTC Approved
All Proposed facilities are conceptual only. For specific information, please contact implementing agency.

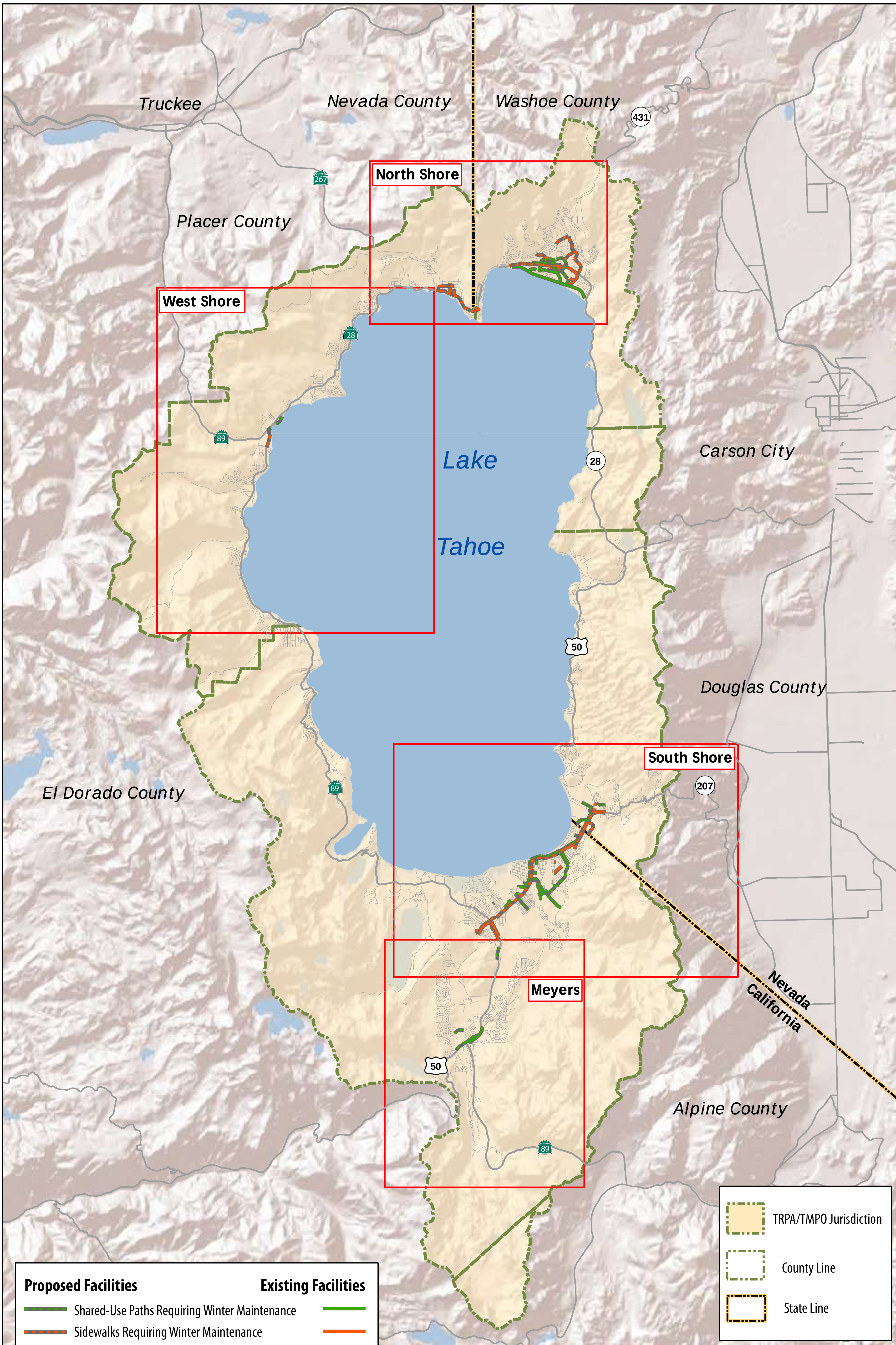


Figure 12: Shared-Use Path Sidewalk Maintenance

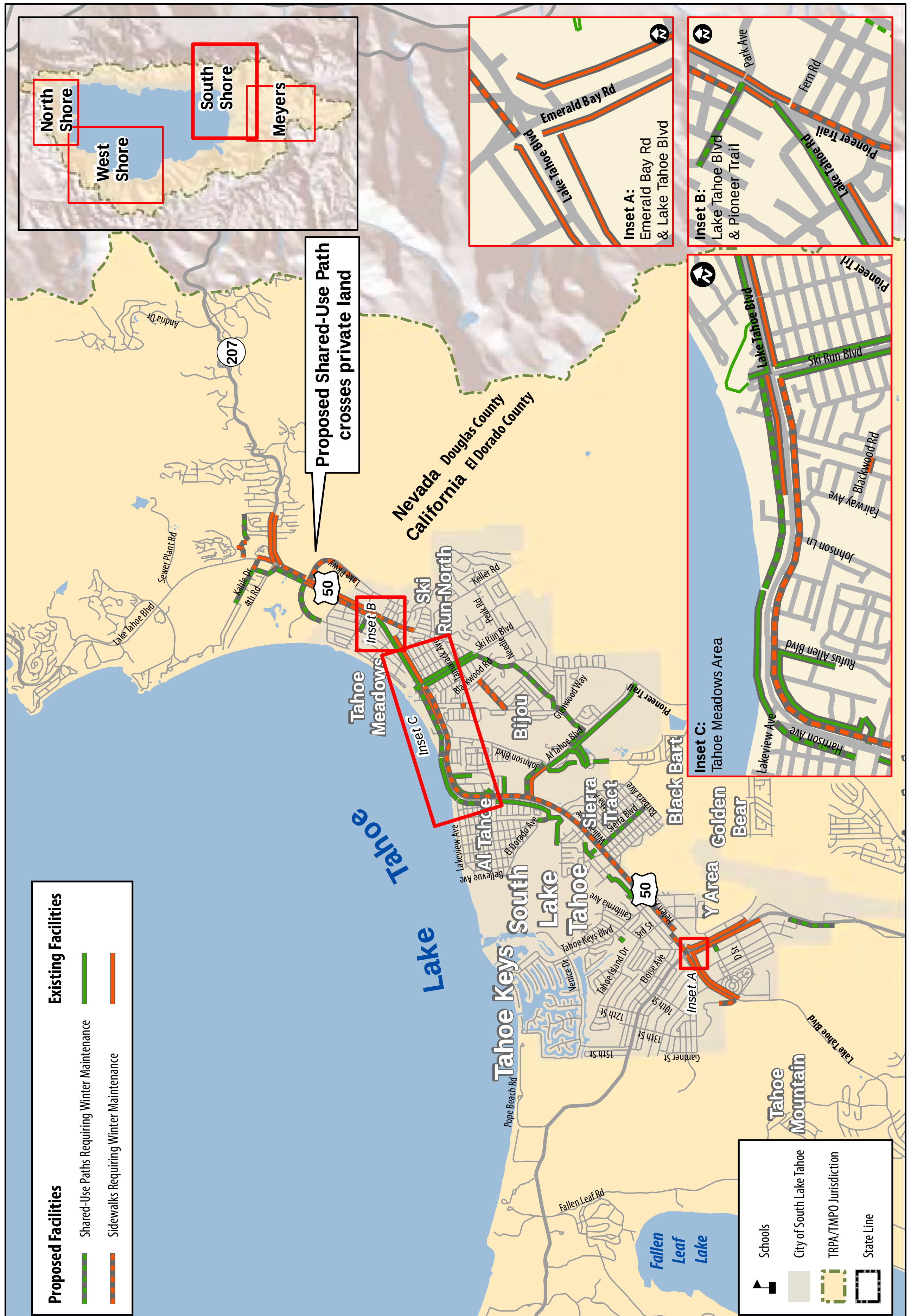


Figure 12: Shared-Use Path Sidewalk Maintenance, South Shore

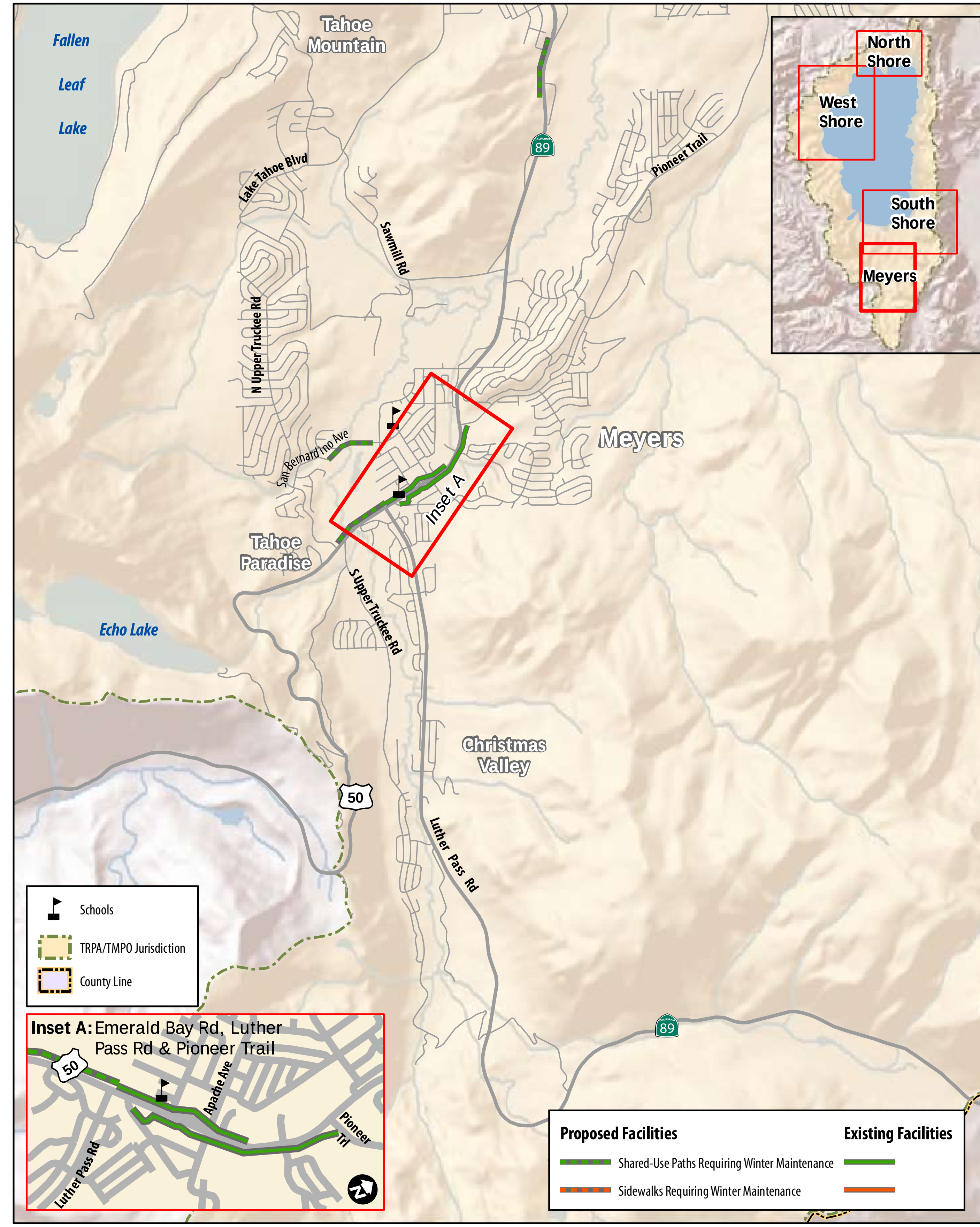


Figure 12: Shared-Use Path Sidewalk Maintenance, Meyers

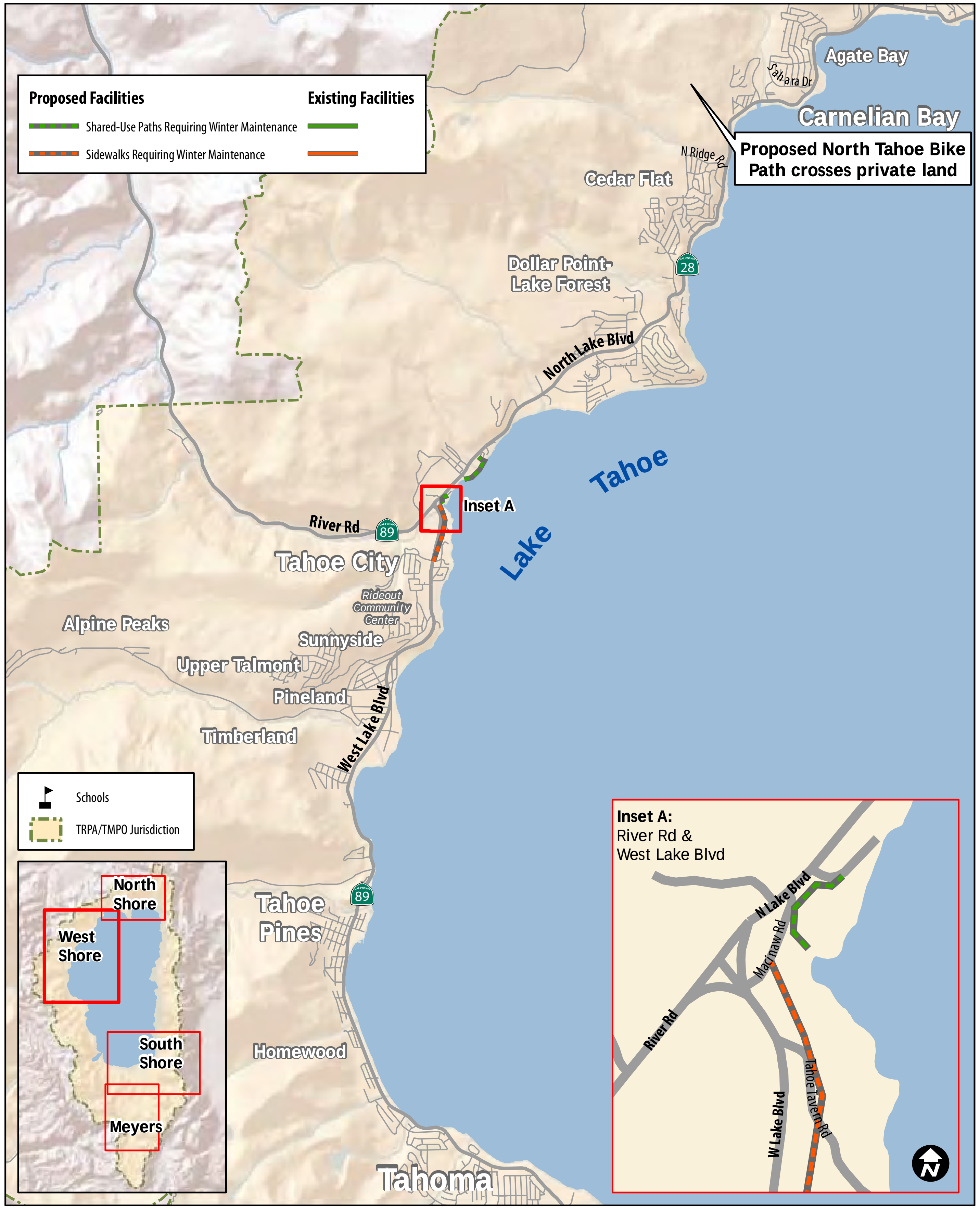


Figure 12: Shared-Use Path Sidewalk Maintenance, West Shore

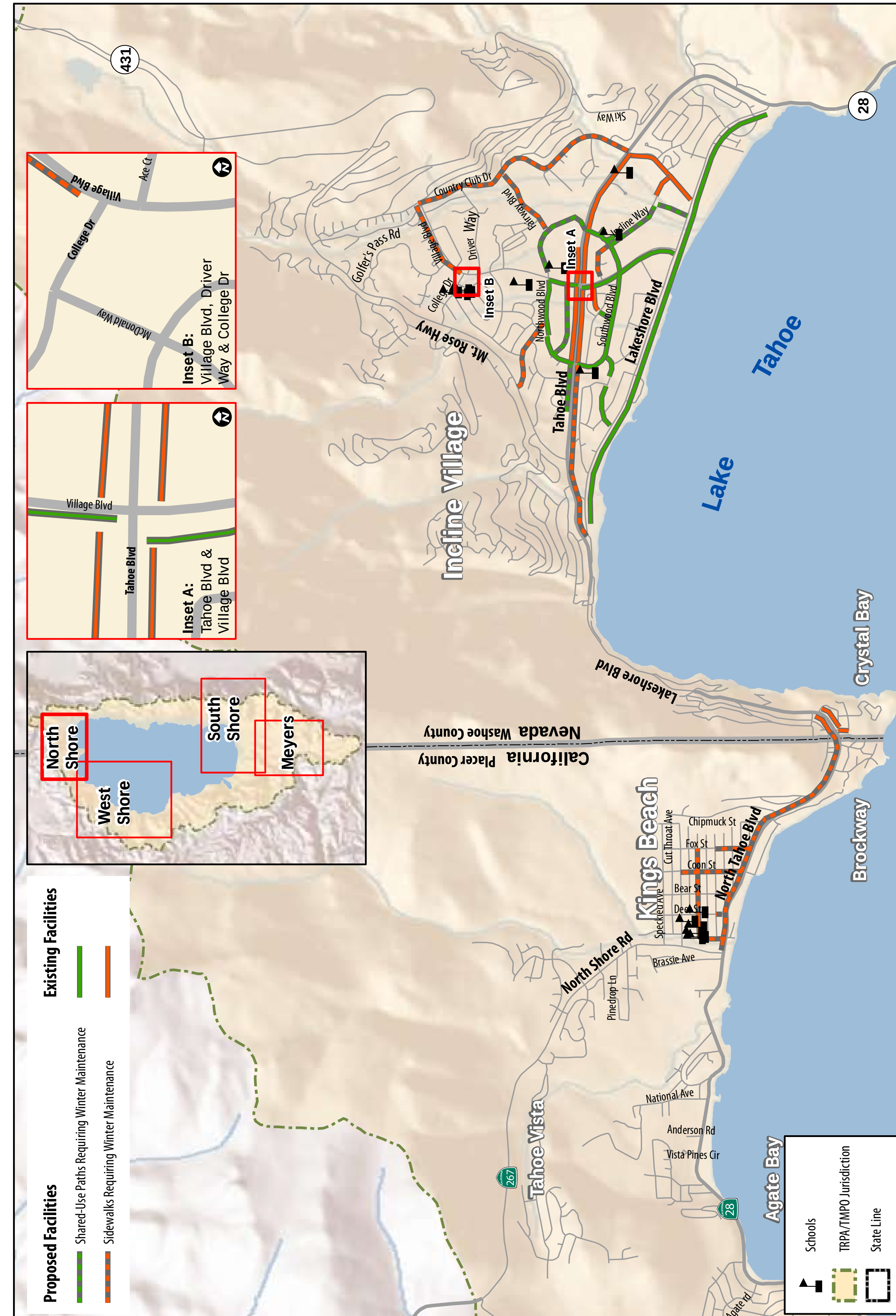


Figure 12: Shared-Use Path Sidewalk Maintenance, North Shore

CLASSIFICATION	LOCATION	NAME	FROM	TO	DISTANCE IN MILES
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	LINEAR PARK	SKI RUN BLVD	PIONEER TRAIL	0.77
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	LINEAR PARK SPUR	BEHIND MCDONALDS	SKI RUN MARINA	0.32
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	EL DORADO BEACH	FREMONT AVE	LAKEVIEW AVE	0.30
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	SOUTH LAKE TAHOE REC CENTER	R.ALLEN TOSEN CNTR	RUFUS ALLEN	0.59
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	SOUTH LAKE TAHOE REC CENTER	R.ALLEN TOSEN CNTR	SOUTH LAKE TAHOE REC CENTER	0.06
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	SOUTH LAKE TAHOE REC CENTER	R.ALLEN TOSEN CNTR	SOUTH LAKE TAHOE REC CENTER	0.10
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	LYONS AVE	RUFUS ALLEN BLVD	US HWY 50	0.18
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	SOUTH LAKE TAHOE BIKE ROUTE	LOS ANGELES AVE	MACKINAW RD	0.94
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	LAKE TAHOE COMMUNITY COLLEGE	AL TAHOE BLVD	LAKE TAHOE COMMUNITY COLLEGE	0.33
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	LAKE TAHOE COMMUNITY COLLEGE	CAMPUS	AL TAHOE BLVD	0.50
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	AL TAHOE BLVD	E. COLLEGE DR	PIONEER TRAIL	1.12
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	SOUTH LAKE TAHOE BIKE PATH	RUBICON TRAIL	SILVER DOLLAR	0.18
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	SOUTH LAKE TAHOE BIKE PATH	PONDEROSA	ELOISE AVE	0.34
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	B STREET (NORTH SIDE)	PARKING LOT	HELEN AVE	0.07
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	B STREET (NORTH SIDE)	PARKING LOT	SOUTH AVE	0.07
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	SKI RUN BLVD (SOUTH SIDE)	US HWY 50	PIONEER TRAIL	0.56
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	COMMUNITY PLAYFIELDS	AL TAHOE BLVD	LAKE TAHOE COMMUNITY COLLEGE	0.32
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	LAKE TAHOE COMMUNITY COLLEGE	SOUTH TAHOE PUBLIC UTILITY DISTRICT	LAKE TAHOE COMMUNITY COLLEGE	0.14
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	SKI RUN BLVD (NORTH SIDE)	US HWY 50	PIONEER TRAIL	0.55
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	SAWMILL 2A	LAKE TAHOE BLVD	ECHO VIEW ESTATES	0.62
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	RIVERSIDE AVENUE	LOS ANGELES	LAKEVIEW AVE	0.47
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	BLACK ROCK ROAD BIKE PATH	PINE BLVD	BLACK ROCK ROAD	0.07
C-1/SHARED USE PATH	DOUGLAS COUNTY	ROUND HILL BIKE PATH	ROUND HILL	KINGSBURY MIDDLE SCHOOL	1.04
C-1/SHARED USE PATH	DOUGLAS COUNTY	ROUND HILL BIKE PATH	KINGSBURY MIDDLE SCHOOL	PINERIDGE DRIVE	0.64
C-1/SHARED USE PATH	DOUGLAS COUNTY	ELKS POINT ROAD	NEVADA BEACH	ELKS POINT ROAD	0.41
C-1/SHARED USE PATH	DOUGLAS COUNTY	NEVADA STATELINE TO STATELINE PATH	KAHLE DRIVE	ELKS POINT ROAD	1.02
C-1/SHARED USE PATH	DOUGLAS COUNTY	NEVADA STATELINE TO STATELINE PATH	NEVADA STATELINE TO STATELINE PATH	ROUND HILL PINES BEACH	0.11
C-1/SHARED USE PATH	DOUGLAS COUNTY	NEVADA STATELINE TO STATELINE PATH	ELKS POINT ROAD	ROUND HILL PINES BEACH	1.01
C-1/SHARED USE PATH	EL DORADO COUNTY	WEST SHORE BIKE PATH	EL DORADO COUNTY LINE	GENERAL CREEK (SUGAR PINE STATE PARK)	1.26
C-1/SHARED USE PATH	EL DORADO COUNTY	WEST SHORE BIKE PATH	GENERAL CREEK	SUGAR PINE STATE PARK	0.46
C-1/SHARED USE PATH	EL DORADO COUNTY	POPE/BALDWIN PATH	STATE ROUTE 89	SPRING CREEK ROAD	3.88
C-1/SHARED USE PATH	EL DORADO COUNTY	PAT LOWE (NORTH)	APACHE	STATE ROUTE 89/US HWY 50 JUNCTION	0.52
C-1/SHARED USE PATH	EL DORADO COUNTY	PAT LOWE (SOUTH)	PIONEER TRAIL	VISITOR CENTER	0.93
C-1/SHARED USE PATH	EL DORADO COUNTY	15TH STREET BIKE PATH	15TH STREET	POPE/BALDWIN PATH	0.32
C-1/SHARED USE PATH	EL DORADO COUNTY	SAWMILL BIKE PATH	SAWMILL ROAD	PAT LOWE BIKE PATH	1.54
C-1/SHARED USE PATH	EL DORADO COUNTY	ARAPAHOE	EXISTING BIKE PATH	NEIGHBORHOOD	0.09
C-1/SHARED USE PATH	EL DORADO COUNTY	LAKE TAHOE BLVD BIKE PATH	D STREET	SAWMILL ROAD	1.59
C-1/SHARED USE PATH	EL DORADO COUNTY	FALLEN LEAF LAKE TRAIL	STATE ROUTE 89	FALLEN LEAF CAMPGROUND	0.39
C-1/SHARED USE PATH	PLACER COUNTY	PINEDROP TRAIL	NORTH TAHOE REGIONAL PARK	PINEDROP LANE	1.19
C-1/SHARED USE PATH	PLACER COUNTY	NORTH SHORE PATH	LAKEFOREST ROAD	DOLLAR DRIVE	0.56
C-1/SHARED USE PATH	PLACER COUNTY	NORTH SHORE PATH	BURTON CREEK STATE PARK	LAKEFOREST ROAD	1.67
C-1/SHARED USE PATH	PLACER COUNTY	TRUCKEE RIVER TRAIL	TAHOE CITY	SQUAW VALLEY ROAD	5.07
C-1/SHARED USE PATH	PLACER COUNTY	WEST SHORE BIKE PATH	CHERRY LANE	FANNY BRIDGE	5.83
C-1/SHARED USE PATH	PLACER COUNTY / EL DORADO COUNTY	WEST SHORE BIKE PATH	GENERAL CREEK	FREMONT WAY	2.77
C-1/SHARED USE PATH	PLACER COUNTY	LAKESIDE PATH PHASES V,VI,VII	EXISTING PATH WEST OF TAHOE CITY MARINA	EXISTING PATH EAST OF TAHOE CITY MARINA	0.37

Table 17: Existing Bicycle and Pedestrian Network, Class I/Shared-Use Path
Technical Amendment, December 2014

CLASSIFICATION	LOCATION	NAME	FROM	TO	DISTANCE IN MILES
C-1/SHARED USE PATH	PLACER COUNTY	NATIONAL AVENUE	STATE ROUTE 28	TOYON ROAD	0.23
C-1/SHARED USE PATH	PLACER COUNTY	NATIONAL AVE EAST SIDE	TOYON ROAD/CONNECTION WITH NTPUD PATH	EXISTING FOREST SERVICE TRAIL SYSTEM	0.16
C-1/SHARED USE PATH	PLACER COUNTY	NORTH SHORE PATH CONNECTOR	NORTH SHORE PATH	STATE ROUTE 28	0.02
C-1/SHARED USE PATH	WASHOE COUNTY	VILLAGE BLVD (NORTH)	ACE COURT	STATE ROUTE 28	0.73
C-1/SHARED USE PATH	WASHOE COUNTY	NORTHWOOD BLVD	VILLAGE BLVD (NORTH)	STATE ROUTE 28	0.61
C-1/SHARED USE PATH	WASHOE COUNTY	MAYS BLVD	LAKESHORE BLVD	ALLEN WAY	0.27
C-1/SHARED USE PATH	WASHOE COUNTY	MAYS BLVD	BURNT CEDAR CREEK	SOUTHWOOD BLVD	0.15
C-1/SHARED USE PATH	WASHOE COUNTY	SOUTHWOOD BLVD	STATE ROUTE 28-SKATE PARK	INCLINE WAY	0.05
C-1/SHARED USE PATH	WASHOE COUNTY	SOUTHWOOD BLVD	STATE ROUTE 28	VILLAGE BLVD	0.48
C-1/SHARED USE PATH	WASHOE COUNTY	VILLAGE BLVD (SOUTH)	STATE ROUTE 28	LAKESHORE BLVD	0.64
C-1/SHARED USE PATH	WASHOE COUNTY	SOUTHWOOD BLVD	STATE ROUTE 28	VILLAGE BLVD (SOUTH)	0.75
C-1/SHARED USE PATH	WASHOE COUNTY	SOUTHWOOD BLVD	SOUTHWOOD BLVD	SKATE PARK	0.53
C-1/SHARED USE PATH	WASHOE COUNTY	LAKESHORE BLVD	WEST TERMINUS PARK	EAST TERMINUS PARK	2.97
C-1/SHARED USE PATH	WASHOE COUNTY	NORTHWOOD BLVD	VILLAGE BLVD	NORTHWOOD BLVD SCHOOL	0.14

Table 17: Existing Bicycle and Pedestrian Network, Class I/Shared-Use Path
Technical Amendment, December 2014

CLASSIFICATION	LOCATION	NAME	FROM	TO	DISTANCE IN MILES
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	US HIGHWAY 50	SKI RUN BLVD	WILDWOOD AVE	0.25
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	MELBA	B STREET	HWY 50	0.31
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	HWY 50	SOUTH TAHOE "Y"	E STREET	0.51
C-2/BIKE LANES	CITY OF SOUTH LAKE TAHOE	HEAVENLY VILLAGE WAY	US HWY 50	PARK AVE	0.12
C-2/BIKE LANES	CITY OF SOUTH LAKE TAHOE	LAKEVIEW AVE	US HWY 50	BERKELEY AVE	0.59
C-2/BIKE LANES	CITY OF SOUTH LAKE TAHOE	PIONEER TRAIL	US HWY 50 (SOUTH LAKE TAHOE)	BLACK BART	3.07
C-2/BIKE LANES	CITY OF SOUTH LAKE TAHOE	PIONEER TRAIL	US HWY 50	GLEN ROAD	0.21
C-2/BIKE LANES	CITY OF SOUTH LAKE TAHOE	HELEN AVE	SOUTH AVE	WINNEMUCCA AVE	0.29
C-2/BIKE LANES	CITY OF SOUTH LAKE TAHOE	15TH STREET	ELOISE AVE	VENICE AVE	0.34
C-2/BIKE LANES	CITY OF SOUTH LAKE TAHOE	SIERRA BLVD	PALMIRA AVE	FOUNTAIN AVE	0.54
C-2/BIKE LANES	CITY OF SOUTH LAKE TAHOE	LAKE TAHOE BLVD	GLORENE AVE	D STREET	0.47
C-2/BIKE LANES	CITY OF SOUTH LAKE TAHOE	TAHOE KEYS BLVD	ELOISE AVE	VENICE DRIVE	0.80
C-2/BIKE LANES	CITY OF SOUTH LAKE TAHOE	VENICE DRIVE	MARINA	TAHOE KEYS BLVD	0.41
C-2/BIKE LANES	CITY OF SOUTH LAKE TAHOE	US HIGHWAY 50 BIKE LANE	TROUT CREEK	SKI RUN BLVD	1.95
C-2/BIKE LANES	CITY OF SOUTH LAKE TAHOE	JOHNSON LANE	US HWY 50	AL TAHOE BLVD	0.92
C-2/BIKE LANE	DOUGLAS COUNTY	LAKE PARKWAY (WEST)	STATELINE	US HIGHWAY 50	0.51
C-2/BIKE LANE	DOUGLAS COUNTY	LAKE PARKWAY (EAST)	STATELINE	US HIGHWAY 50	0.61
C-2/BIKE LANES	DOUGLAS COUNTY	ELKS POINT ROAD	ELKS POINT CLASS I SHARED USE TRAIL	US HWY 50	0.14
C-2/BIKE LANE	EL DORADO COUNTY	APACHE AVE (WEST)	EAST SAN BERNADINO	US HIGHWAY 50	0.38
C-2/BIKE LANES	EL DORADO COUNTY	PIONEER TRAIL	BLACK BART	GLEN EAGLES ROAD	2.76
C-2/BIKE LANES	EL DORADO COUNTY	PIONEER TRAIL	GLEN EAGLES ROAD	US HWY 50 (MEYERS)	1.92
C-2/BIKE LANES	EL DORADO COUNTY	NORTH UPPER TRUCKEE	LAKE TAHOE BLVD	US HWY 50	4.62
C-2/BIKE LANES	EL DORADO COUNTY	LAKE TAHOE BLVD	BOULDER MOUNTAIN DRIVE	MOUNT RAINER DRIVE	0.70
C-2/BIKE LANES	PLACER COUNTY	NATIONAL AVE	STATE ROUTE 28	TOYON-KB	0.41
C-2/BIKE LANES	PLACER COUNTY	STATE ROUTE 89	DOLLAR DRIVE	STATE ROUTE 267	6.37
C-2/BIKE LANES	PLACER COUNTY	STATE ROUTE 28	CHIPMUNK STREET	STATELINE RD	0.78
C-2/BIKE LANES	PLACER COUNTY	STATE ROUTE 28 TAHOE CITY	TAHOE STATE RECREATION AREA	DOLLAR DRIVE	2.13
C-2/BIKE LANES	WASHOE COUNTY	STATE ROUTE 28	LAKESHORE BLVD (WEST)	SOUTHWOOD BLVD	1.97
C-2/BIKE LANES	WASHOE COUNTY	STATE ROUTE 28	SOUTHWOOD BLVD	LAKESHORE BLVD (EAST)	1.72
WIDE SHOULDER	WASHOE COUNTY	STATE ROUTE 431	STATE ROUTE 28	BASIN BOUNDARY	6.53

Table 17: Existing Bicycle and Pedestrian Network, Class II/Bike Lane or Wide Shoulder
Technical Amendment, December 2014

CLASSIFICATION	LOCATION	NAME	FROM	TO	DISTANCE IN MILES
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	PONDEROSA	SILVER DOLLAR	CLASS I BIKE PATH	0.21
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	RUFUS ALLEN BLVD	US HWY 50	LYONS AVE	0.52
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	BELLEVUE AVE/EL DORADO AVE	LAKEVIEW AVE	OAKLAND AVE	0.96
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	RUBICON TRAIL	MACKINAW	SUSSEX AVE	0.22
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	SUSSEX AVE	RUBICON TRAIL	CLASS 1 BIKE PATH	0.05
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	WILLIAM ST/RIVER DRIVE	RIVER DRIVE/US HWY 50	BLUE LAKE AVE	0.57
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	13TH STREET	ELOISE AVE	STATE ROUTE 89	0.10
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	TAHOE ISLAND DRIVE/12 STREET	TAHOE KEYS BLVD	ELOISE AVE	1.20
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	RIVER DRIVE/WILLIAM STREET	US HWY 50	SIERRA BLVD	0.33
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	ELOISE AVE	SOUTH LAKE TAHOE BIKE PATH NEAR TAHOE KEYS	15TH STREET	1.70
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	BLACKWOOD ROAD	PIONEER TRAIL	FAIRWAY AVE	0.67
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	TAMARACK AVE	PIONEER TRAIL	BLACKWOOD ROAD	0.48
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	HELEN AVE	4TH STREET	CLASS I	0.20
C-3/BIKE ROUTE	PLACER COUNTY	STATE ROUTE 89	TAHOE SKI BOWL WAY	MCKINNEY DRIVE	0.11
C-3/BIKE ROUTE	PLACER COUNTY	MCKINNEY DRIVE	STATE ROUTE 89	STATE ROUTE 89 (NEAR FREMONT WAY)	0.74
C-3/BIKE ROUTE	PLACER COUNTY	SAN SOUCI/TAHOE SKI BOWL WAY	MCKINNEY DRIVE	FAWN STREET	0.46
C-3/BIKE ROUTE	PLACER COUNTY	SEQUOIA AVE	CA-89	WEST SHORE TRAIL	0.34
C-3/BIKE ROUTE	PLACER COUNTY	MACKINAW ROAD	WEST LAKE BLVD	NORTH LAKE BLVD	0.12
C-3/BIKE ROUTE	PLACER COUNTY	COMMONS BEACH ROAD	STATE ROUTE 28	END OF COMMONS BEACH ROAD	0.10

Table 17: Existing Bicycle and Pedestrian Network, Class III/Bike Route
Technical Amendment, December 2014

CLASSIFICATION	LOCATION	NAME	FROM	TO	DISTANCE IN MILES
PED	CITY OF SOUTH LAKE TAHOE	US HWY 50 (WEST SIDE)	SOUTH TAHOE "Y"	F STREET	0.72
PED	CITY OF SOUTH LAKE TAHOE	AL TAHOE BLVD	US HWY 50	JOHNSON BLVD	0.36
PED	CITY OF SOUTH LAKE TAHOE	US HWY 50 (EAST SIDE)	PIONEER TRAIL	PARK AVE	0.13
PED	CITY OF SOUTH LAKE TAHOE	US HWY 50 (BOTH SIDES)	PARK AVE	STATELINE AVE	0.60
PED	CITY OF SOUTH LAKE TAHOE	US HWY 50 (WEST SIDE)	PARK AVE	PIONEER TRAIL	0.14
PED	CITY OF SOUTH LAKE TAHOE	US HWY 50 (EAST SIDE)	WILDWOOD AVE	MIDWAY ROAD	0.28
PED	CITY OF SOUTH LAKE TAHOE	US HWY 50 (EAST SIDE)	SKI RUN BLVD	WILDWOOD AVE	0.23
PED	CITY OF SOUTH LAKE TAHOE	US HWY 50 (WEST SIDE)	SKI RUN BLVD	BIJOU CREEK	0.63
PED	CITY OF SOUTH LAKE TAHOE	LAKE TAHOE BLVD (BOTH SIDES)	D STREET	SOUTH TAHOE "Y"	1.24
PED	CITY OF SOUTH LAKE TAHOE	BLACKWOOD ROAD	GLENWOOD WAY	LAKE TAHOE CHRISTIAN FELLOWSHIP	0.05
PED	CITY OF SOUTH LAKE TAHOE	US HWY 50 (EAST SIDE)	SOUTH TAHOE "Y"	E STREET	0.62
PED	CITY OF SOUTH LAKE TAHOE	US HWY 50 (EAST SIDE)	TROUT CREEK	SKI RUN BLVD	2.04
PED	CITY OF SOUTH LAKE TAHOE	US HWY 50 (WEST SIDE)	TROUT CREEK	LAKEVIEW BLVD	0.97
PED	CITY OF SOUTH LAKE TAHOE	HEAVENLY VILLAGE WAY	HWY 50	LAKE PARKWAY	0.36
PED	CITY OF SOUTH LAKE TAHOE	SR 89 SIDEWALK (BOTH SIDES)	HWY 50	5TH STREET	0.38
PED	CITY OF SOUTH LAKE TAHOE	SR 89 SIDEWALK (BOTH SIDES)	10TH STREET	11TH STREET	0.24
PED	CITY OF SOUTH LAKE TAHOE	WILDWOOD AVE	HWY 50	OSGOOD AVE	0.12
PED	CITY OF SOUTH LAKE TAHOE	PIONEER TRAIL (BOTH SIDES)	LARCH AVE	HWY 50	0.92
PED	CITY OF SOUTH LAKE TAHOE	PINE BLVD SIDEWALK	STATELINE	PARK AVE & MANAZITA	0.43
PED	CITY OF SOUTH LAKE TAHOE	PINE BLVD SIDEWALK	STATELINE	PARK AVE	0.26
PED	CITY OF SOUTH LAKE TAHOE	PARK AVE SIDEWALK	MANZANITA	PINE BLVD	0.06
PED	DOUGLAS COUNTY	US HWY 50 (SOUTH SIDE)	KAHLE DRIVE	KINGSBURY GRADE	0.15
PED	DOUGLAS COUNTY	KINGSBURY GRADE	US HWY 50	DAGGETT WAY	0.49
PED	DOUGLAS COUNTY	US HWY 50 (BOTH SIDES)	LAKE PARKWAY	STATELINE AVE	0.72
PED	DOUGLAS COUNTY	US HWY 50 (NORTH SIDE)	STATE ROUTE 207/KINGSBURY GRADE	LAKE PARKWAY	0.34
PED	DOUGLAS COUNTY	LAKE PARKWAY EAST	US HWY 50	STATELINE AVE	0.27
PED	DOUGLAS COUNTY	LAKE PARKWAY WEST	STATELINE	US HIGHWAY 50	0.59
PED	DOUGLAS COUNTY	KINGSBURY GRADE	US HWY 50	PINERIDGE DRIVE	0.49
PED	DOUGLAS COUNTY	KAHLE COMMUNITY PARK PATH	SR 207	HWY 50	0.40
PED	DOUGLAS COUNTY	US HWY 50 (NORTH SIDE)	KAHLE DRIVE	4TH ROAD	0.14
PED	EL DORADO COUNTY	US HWY 50 (SOUTHSIDE)	SOUTH UPPER TRUCKEE	POMO STREET	0.15
PED	PLACER COUNTY	STATE ROUTE 28 (SOUTH SIDE)	TAHOE STATE RECREATION AREA--TRUCKEE RIVER OUTLET	BURTON CREEK STATE PARK	0.56
PED	PLACER COUNTY	STEELHEAD AVE	SECLINE STREET	DEER STREET	0.16
PED	PLACER COUNTY	RED CEDAR STREET	N. LAKE BLVD (CA-28)	TAHOE STREET	0.09
PED	PLACER COUNTY	STATE ROUTE 28 (NORTH SIDE)	GROVE STREET	FAIRWAY DRIVE	0.70
PED	WASHOE COUNTY	STATE ROUTE 28 (BOTH SIDES)	NORTH / SOUTH WOOD BLVD	VILLAGE BLVD	0.94
PED	WASHOE COUNTY	STATE ROUTE 28 (NORTH SIDE)	VILLAGE BLVD	3RD CREEK TOWNHOMES	0.23
PED	WASHOE COUNTY	STATE ROUTE 28 (SOUTH SIDE)	VILLAGE BLVD	SOUTHWOOD BLVD	0.32
PED	WASHOE COUNTY	TANAGER ST	ORIOLE WAY	VILLAGE BLVD	0.18
PED	WASHOE COUNTY	COUNTRY CLUB DRIVE	STATE ROUTE 28	INCLINE WAY	0.30
PED	WASHOE COUNTY	INCLINE WAY	INCLINE CREEK	COUNTRY CLUB DRIVE	0.16
PED	WASHOE COUNTY	COUNTRY CLUB DRIVE	INCLINE WAY	LAKESHORE BLVD	0.21
PED	WASHOE COUNTY	STATE ROUTE 28 (NORTH SIDE)	STATELINE ROAD	CALNEVA DRIVE	0.14
PED	WASHOE COUNTY	STATE ROUTE 28 (SOUTH SIDE)	SOUTHWOOD BLVD	COUNTRY CLUB DRIVE	0.55
PED	WASHOE COUNTY	STATE ROUTE 28 (SOUTH SIDE)	STATELINE RD	POST OFFICE	0.16

Table 17: Existing Bicycle and Pedestrian Network, Pedestrian Facilities
Technical Amendment, December 2014

CLASSIFICATION	LOCATION	NAME	FROM	TO	DISTANCE IN MILES
PED	WASHOE COUNTY	STATELINE RD	STATE ROUTE 28	END OF STATELINE RD	0.06
PED	WASHOE COUNTY	INCLINE WAY	VILLAGE BLVD	NORTHWOOD BLVD	0.26
PED	WASHOE COUNTY	ORIOLE WAY	SOUTHWOOD BLD	TANAGER WAY	0.35
PED	WASHOE COUNTY	STATE ROUTE 28 (NORTH SIDE)	NORTHWOOD BLVD	VILLAGE BLVD	0.28

Table 17: Existing Bicycle and Pedestrian Network, Pedestrian Facilities
Technical Amendment, December 2014

CLASS	LOCATION	OWNERSHIP	NAME	FROM	TO	MILES	COST PER MILE	TOTAL ESTIMATED COST	STATUS
C-1/SHARED USE PATH	CARSON CITY	CARSON CITY	NEVADA STATELINE TO STATELINE BIKEWAY	WASHOE COUNTY LINE	DOUGLAS COUNTY LINE	4.00	$4,000,000	$16,014,500	VARIOUS PERMITTED, IMPLEMENTED & IN REVIEW
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	PONDEROSA/SUSSEX CONNECTOR TO SIERRA TRACT	US HWY 50	SOUTH LAKE TAHOE BIKE PATH - PONDEROSA SECTION	0.07	$2,000,000	$132,900	
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	US HWY 50 - EL DORADO BEACH TRAIL	SKI RUN BLVD	EL DORADO BEACH	0.83	$2,000,000	$1,661,000	FINAL DESIGN, ACQUISION
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	PARK AVE (WEST)	PINE BLVD	US HWY 50 / END OF LINEAR PARK TRAIL	0.21	$500,000	$103,200	
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	US HWY 50	H STREET	CITY OF SOUTH LAKE TAHOE CITY LIMITS	0.40	$2,000,000	$797,200	
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	OAKLAND AVE BIKE PATH CONNECTOR	OAKLAND AVE	SOUTH LAKE TAHOE BIKE PATH BEHIND MEEKS	0.12	$2,000,000	$247,600	
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	JAMES CONNECTOR	JAMES AVE	EXISTING BIKE PATH	0.03	$2,000,000	$67,900	
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	AL TAHOE ELEMENTARY SCHOOL	US HWY 50	JOHNSON BLVD	0.40	$2,000,000	$795,600	
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	TAHOE VALLEY ELEMENTARY/WYOMING CONNECTOR	WYOMING AVE	TAHOE VALLEY ELEMENTARY SCHOOL	0.06	$2,000,000	$118,400	
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	B STREET CONNECTOR	B STREET	US HWY 50	0.08	$1,000,000	$78,400	
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	SIERRA BLVD	US HWY 50	BARBARA AVE	0.54	$1,000,000	$541,400	ENVIRONMENTAL REVIEW
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	RUFUS ALLEN BLVD	US HWY 50	AL TAHOE BLVD	0.22	$2,000,000	$446,300	
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	GREENWAY CONNECTOR	PIONEER VILLAGE	JOHNSON & AL TAHOE INTERSECTION	0.45	$2,000,000	$900,000	
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE / EL DORADO COUNTY	PRIVATE	SOUTH TAHOE "Y" GREENWAY CONNECTOR	SOUTH TAHOE "Y"	SOUTH TAHOE GREENWAY	0.49	$2,500,000	$1,224,700	
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CALIFORNIA TAHOE CONSERVANCY	SOUTH TAHOE GREENWAY PHASE 1	SKI RUN BLVD	AL TAHOE BLVD	1.38	$2,500,000	$3,446,700	PERMITTED & CONSTRUCTION INITATED IN 2015
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CALIFORNIA TAHOE CONSERVANCY	SOUTH TAHOE GREENWAY PHASE 2	LAKE TAHOE COMMUNITY COLLEGE	SIERRA BLVD	0.71	$4,500,000	$3,195,000	PERMITTED
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CALIFORNIA TAHOE CONSERVANCY	SOUTH TAHOE GREENWAY PHASE 3	VAN SICKLE STATE PARK	SKI RUN BLVD	1.37	$2,500,000	$3,427,400	PERMITTED
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CALIFORNIA TAHOE CONSERVANCY	SOUTH TAHOE GREENWAY FUTURE PHASES	SIERRA BLVD	PIONEER BLVD TRAIL	4.96	$2,500,000	$12,400,000	CONCEPTUAL

Table 18: Proposed Bicycle and Pedestrian Project List, Class I/Shared-Use Path
Technical Amendment, December 2014

CLASS	LOCATION	OWNERSHIP	NAME	FROM	TO	MILES	COST PER MILE	TOTAL ESTIMATED COST	STATUS
C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	PINE BLVD PATH	PARK AVE	STATELINE AVE	0.27	$1,000,000	$270,800	
C-1/SHARED USE PATH	DOUGLAS COUNTY	DOUGLAS COUNTY	LAKE PARKWAY WEST (LOOP ROAD, NV SS)	US HWY 50	STATELINE AVE	0.50	$2,000,000	$1,007,300	ENVIRONMENTAL REVIEW
C-1/SHARED USE PATH	DOUGLAS COUNTY	DOUGLAS COUNTY	KINGSBURY CONNECTOR	VAN SICKLE STATE PARK	MARKET STREET	0.77	$2,000,000	$1,545,200	
C-1/SHARED USE PATH	DOUGLAS COUNTY	DOUGLAS COUNTY	NEVADA STATELINE TO STATELINE BIKEWAY	KAHLE DRIVE	LAKE PARKWAY	0.52	$2,000,000	$1,045,400	PERMITTED
C-1/SHARED USE PATH	DOUGLAS COUNTY	DOUGLAS COUNTY	NEVADA STATELINE TO STATELINE BIKEWAY	SPOONER SUMMIT	LOGAN SHOALS VISTA	5.43	$4,000,000	$21,708,200	FEASIBILITY STUDY
C-1/SHARED USE PATH	DOUGLAS COUNTY	DOUGLAS COUNTY	NEVADA STATELINE TO STATELINE BIKEWAY	LOGAN SHOALS VISTA	ROUND HILL PINES BEACH	5.22	$4,000,000	$20,888,500	FEASIBILITY STUDY
C-1/SHARED USE PATH	DOUGLAS COUNTY	UNITED STATES FOREST SERVICE	LPF 2 - ROUND HILL BIKE PATH CONNECTOR	KAHLE PARK	ROUND HILL BIKE PATH	0.26	$2,000,000	$520,900	
C-1/SHARED USE PATH	EL DORADO COUNTY	EL DORADO COUNTY	STATE ROUTE 89 THROUGH CHRISTMAS VALLEY	US HWY 50	SANTA CLAUS DR	1.49	$1,000,000	$1,494,700	
C-1/SHARED USE PATH	EL DORADO COUNTY	EL DORADO COUNTY	US HWY 50 - MEYERS PATH EXTENSION	EXISTING CLASS I	NORTH UPPER TRUCKEE ROAD	0.46	$2,000,000	$918,600	
C-1/SHARED USE PATH	EL DORADO COUNTY	CALTRANS	STATE ROUTE 89	SPRING CREEK ROAD	CASCADE ROAD	0.51	$4,000,000	$2,048,400	
C-1/SHARED USE PATH	EL DORADO COUNTY	TAHOE TRANSPORTATION DISTRICT	WEST SHORE TRAIL EXTENSION	MEEKS BAY	SUGAR PINE POINT STATE PARK	0.59	$3,000,000	$1,761,100	90% DESIGN
C-1/SHARED USE PATH	EL DORADO COUNTY	EL DORADO COUNTY	US HWY 50	CITY OF SOUTH LAKE TAHOE CITY LIMITS	SAWMILL BLVD	1.29	$2,000,000	$2,575,100	
C-1/SHARED USE PATH	EL DORADO COUNTY	EL DORADO COUNTY	MEYERS ELEMENTARY SCHOOL/TAHOE PARADISE CONNECTOR	SAN BERNADINO W. (N. UPPER TRUCKEE NEIGHBORHOOD)	TAHOE PARADISE PARK	0.32	$4,000,000	$1,285,300	
C-1/SHARED USE PATH	EL DORADO COUNTY	EL DORADO COUNTY	STATE ROUTE 89 THROUGH CHRISTMAS VALLEY	SANTA CLAUS DR	PORTAL	0.95	$4,000,000	$3,810,600	
C-1/SHARED USE PATH	EL DORADO COUNTY	UNITED STATES FOREST SERVICE	FALLEN LEAF BIKE LOOP	FALLEN LEAF LAKE ROAD	15TH STREET	3.76	$1,000,000	$3,757,500	PRELIMINARY PLANNING
C-1/SHARED USE PATH	EL DORADO COUNTY	CA STATE PARKS	WEST SHORE TRAIL	EMERALD BAY SERVICE ROAD	DL BLISS STATE PARK	0.73	$4,000,000	$2,914,400	
C-1/SHARED USE PATH	EL DORADO COUNTY	TAHOE TRANSPORTATION DISTRICT	WEST SHORE TRAIL	EMERALD BAY SERVICE ROAD	SCENIC DRIVE	3.22	$2,000,000	$6,440,000	
C-1/SHARED USE PATH	EL DORADO COUNTY	EL DORADO COUNTY	STATE ROUTE 89	CASCADE ROAD	EMERALD BAY	1.74	$4,000,000	$6,955,500	
C-1/SHARED USE PATH	EL DORADO COUNTY	EL DORADO COUNTY	SAWMILL 2 PATH	US HWY 50	ECHO VIEW ESTATES	1.20	$2,000,000	$2,408,600	IN CONSTRUCTION 2015 -2014
C-1/SHARED USE PATH	EL DORADO COUNTY/CITY OF SOUTH LAKE TAHOE	CALIFORNIA TAHOE CONSERVANCY	SOUTH TAHOE GREENWAY	AL TAHOE	MEYERS	5.68	$2,500,000	$14,187,500	ENVIRONMENTAL REVIEW
C-1/SHARED USE PATH	PLACER COUNTY	PLACER COUNTY	NORTH TAHOE BIKE TRAIL CONNECTOR	NORTH TAHOE BIKE TRAIL	STATE ROUTE 28	0.84	$2,000,000	$1,680,000	PLANNING
C-1/SHARED USE PATH	PLACER COUNTY	NORTH TAHOE PUBLIC UTILITY DISTRICT	NATIONAL AVENUE	STATE ROUTE 28	NORTH TAHOE REGIONAL PARK ENTRANCE	0.53	$1,000,000	$526,900	

Table 18: Proposed Bicycle and Pedestrian Project List, Class I/Shared-Use Path
Technical Amendment, December 2014

CLASS	LOCATION	OWNERSHIP	NAME	FROM	TO	MILES	COST PER MILE	TOTAL ESTIMATED COST	STATUS
C-1/SHARED USE PATH	PLACER COUNTY	TAHOE CITY PUBLIC UTILITY DISTRICT	HOMEWOOD MULTI-USE TRAIL	FAWN STREET	CHERRY STREET	0.98	$2,000,000	$1,957,000	IN CONSTRUCTION 2015 -2014
C-1/SHARED USE PATH	PLACER COUNTY	PLACER COUNTY	BROCKWAY VISTA MULTI-USE TRAIL	SECLINE	CHIPMUNK	0.82	$1,000,000	$817,400	IN CONSTRUCTION 2015 -2015
C-1/SHARED USE PATH	PLACER COUNTY	PLACER COUNTY	DOLLAR CREEK SHARED-USE PATH	DOLLAR DRIVE	FULTON CRESCENT DRIVE	2.31	$2,000,000	$4,616,500	IN CONSTRUCTION 2015 -2016
C-1/SHARED USE PATH	PLACER COUNTY	PLACER COUNTY	NORTH TAHOE BIKE PATH	DOLLAR CREEK SHARED-USE PATH	NORTH TAHOE REGIONAL PARK	4.35	$2,000,000	$8,700,000	ENVIRONMENTAL REVIEW
C-1/SHARED USE PATH	WASHOE COUNTY	DOUGLAS COUNTY	NEVADA STATELINE TO STATELINE BIKEWAY	SAND HARBOR	CARSON CITY COUNTY LINE	2.41	$4,000,000	$9,643,400	FEASIBILITY STUDY
C-1/SHARED USE PATH	WASHOE COUNTY	NEVADA DEPARTMENT OF TRANSPORTATION	NEVADA STATELINE TO STATELINE BIKEWAY	STATELINE ROAD	LAKESHORE DRIVE (WEST)	2.15	$4,000,000	$8,583,100	PRELIMINARY PLANNING
C-1/SHARED USE PATH	WASHOE COUNTY	WASHOE COUNTY	NEVADA STATELINE TO STATELINE BIKEWAY	INCLINE VILLAGE	SAND HARBOR	2.61	$8,000,000	$20,890,900	IN CONSTRUCTION 2015 -2016
C-1/SHARED USE PATH	WASHOE COUNTY	WASHOE COUNTY	STATE ROUTE 28 (NORTH SIDE)	PRESTON FIELD	NORTHWOOD BLVD	0.30	$2,000,000	$591,600	
C-1/SHARED USE PATH	WASHOE COUNTY	WASHOE COUNTY	ALDER AVE	NORTHWOOD BLVD	VILLAGE BLVD	0.47	$1,000,000	$467,200	
C-1/SHARED USE PATH	WASHOE COUNTY	WASHOE COUNTY	TANAGER STREET	ORIOLE WAY	SOUTHWOOD BLVD	0.09	$1,000,000	$89,600	
C-1/SHARED USE PATH	WASHOE COUNTY	WASHOE COUNTY	VILLAGE GREEN	RECREATION CENTER PATH	LAKESHORE BLVD	0.20	$1,000,000	$199,800	
C-1/SHARED USE PATH	WASHOE COUNTY	WASHOE COUNTY	INCLINE WAY	SOUTHWOOD BLVD	INCLINE CREEK	0.37	$1,000,000	$374,600	
C-1/SHARED USE PATH	WASHOE COUNTY	WASHOE COUNTY	NORTHWOOD BLVD	VILLAGE BLVD-EAST	STATE ROUTE 28	0.44	$2,000,000	$888,900	
C-1/SHARED USE PATH	WASHOE COUNTY	WASHOE COUNTY	OLD MT ROSE HWY	DIRT PARKING LOT	BASIN BOUNDARY	2.54	$1,000,000	$2,542,900	

Table 18: Proposed Bicycle and Pedestrian Project List, Class I/Shared-Use Path
Technical Amendment, December 2014

CLASS	LOCATION	OWNERSHIP	NAME	FROM	TO	MILES	COST PER MILE	TOTAL ESTIMATED COST	STATUS
WIDE SHOULDR OR LN	CARSON CITY	NEVADA DEPARTMENT OF TRANSPORTATION	LAKE TAHOE SCENIC BIKE LOOP	CARSON CITY COUNTY LINE	SPOONER SUMMIT	5.14	$5,000	$25,700	
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	EL DORADO COUNTY	LAKE TAHOE BLVD	SOUTH TAHOE "Y"	GLORENE INTERSECTION CONNECTOR	0.16	$500,000	$80,000	
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CALTRANS	STATE ROUTE 89	SOUTH TAHOE "Y"	CITY OF SOUTH LAKE TAHOE CITY LIMITS	1.38	$5,000	$6,900	CONSTRUCTION 2015 -2016
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CALTRANS	US HWY 50	TROUT CREEK	SOUTH TAHOE "Y"	1.89	$2,000,000	$3,787,000	FINAL DESIGN
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	AL TAHOE BLVD	US HWY 50	PIONEER BLVD	1.55	$500,000	$775,100	
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CALTRANS	US HWY 50	STATELINE RD	WILDWOOD AVENUE	0.90	$4,000,000	$3,588,500	
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	PINE BLVD	STATELINE AVE	PARK AVE	0.31	$5,000	$1,500	
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	PARK AVE (EAST)	EXISTING BIKE LANE	MONTREAL ROAD	0.06	$500,000	$28,000	
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	GLENWOOD AVE	BLACKWOOD RD	FAIRWAY DR	0.25	$500,000	$123,200	
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	PARK AVE BIKE LANES	HWY 50	PINE BOULEVARD	0.20	$300,000	$60,700	
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	SKI RUN BLVD	HWY 50	PIONEER	0.59	$500,000	$293,200	
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	INTERSECTION GAP CLOSURES	VARIOUS	VARIOUS	0.31	$5,000	$1,600	
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	LAKE PARKWAY EAST (LOOP ROAD)	PARK AVE	EXISTING BIKE LANE ON LAKE PARKWAY EAST	0.22	$500,000	$108,400	
C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE / EL DORADO COUNTY	CALTRANS	HWY 50 TOWARD MEYERS	E STREET	SAWMILL ROAD	2.11	$500,000	$1,055,000	PLANNED
WIDE SHOULDR OR LN	DOUGLAS COUNTY	NEVADA DEPARTMENT OF TRANSPORTATION	LAKE TAHOE SCENIC BIKE LOOP--CASINO CORE	LAKE PARKWAY (LOOP ROAD)	STATELINE AVE	0.36	$5,000	$1,800	PLANNING
WIDE SHOULDR OR LN	DOUGLAS COUNTY	NEVADA DEPARTMENT OF TRANSPORTATION	LAKE TAHOE SCENIC BIKE LOOP	ELKS POINT ROAD	LAKE PARKWAY (LOOP ROAD)	1.58	$5,000	$7,900	PLANNING
WIDE SHOULDR OR LN	DOUGLAS COUNTY	NEVADA DEPARTMENT OF TRANSPORTATION	LAKE TAHOE SCENIC BIKE LOOP	GLENBROOK	ELKS POINT ROAD	7.88	$5,000	$39,400	PLANNING
WIDE SHOULDR OR LN	DOUGLAS COUNTY	NEVADA DEPARTMENT OF TRANSPORTATION	LAKE TAHOE SCENIC BIKE LOOP	SPOONER SUMMIT	GLENBROOK	2.48	$5,000	$12,400	
WIDE SHOULDR OR LN	DOUGLAS COUNTY	DOUGLAS COUNTY	KINGSBURY GRADE	US HWY 50	SUMMIT	3.11	$5,000,000	$15,542,700	CONSTRUCTED IN VARIOUS LOCATIONS
C-2/BIKE LANE	EL DORADO COUNTY	EL DORADO COUNTY	NORTH UPPER TRUCKEE/LAKE TAHOE BLVD	EXISTING BIKE LANE ON LAKE TAHOE BLVD	EXISTING BIKE LANE ON NORTH UPPER TRUCKEE	0.71	$50,000	$35,500	FINAL DESIGN
C-2/BIKE LANE	EL DORADO COUNTY	CALTRANS	STATE ROUTE 89	US HWY 50 AND SR 89 INTERSECTION	PORTAL DRIVE	2.50	$500,000	$1,249,700	CONSTRUCTED IN VARIOUS LOCATIONS

Table 18: Proposed Bicycle and Pedestrian Project List, Class II/Bike Lane or Shoulder
Technical Amendment, December 2014

CLASS	LOCATION	OWNERSHIP	NAME	FROM	TO	MILES	COST PER MILE	TOTAL ESTIMATED COST	STATUS
WIDE SHOULDR OR LN	EL DORADO COUNTY	CALTRANS	STATE ROUTE 89 - MEYERS	PORTAL DRIVE	LUTHER PASS / BASIN BOUNDARY	6.02	$500,000	$3,010,000	CONSTRUCTED IN VARIOUS LOCATIONS
C-2/BIKE LANE	EL DORADO COUNTY	EL DORADO COUNTY	LAKE TAHOE BLVD	SAWMILL BLVD	BOULDER MOUNTAIN COURT	0.39	$500,000	$195,400	FINAL DESIGN
WIDE SHOULDR OR LN	EL DORADO COUNTY	CALTRANS	LAKE TAHOE SCENIC BIKE LOOP - STATE ROUTE 89	SPRING CREEK ROAD	EMERALD BAY	1.98	$4,000,000	$7,911,100	
WIDE SHOULDR OR LN	EL DORADO COUNTY	CALTRANS	LAKE TAHOE SCENIC BIKE LOOP	EMERALD BAY	MEEKS BAY	7.35	$4,000,000	$29,391,500	
WIDE SHOULDR OR LN	EL DORADO COUNTY	CALTRANS	LAKE TAHOE SCENIC BIKE LOOP - STATE ROUTE 89	MEEKS BAY	PINE STREET	2.56	$5,000	$12,800	
WIDE SHOULDR OR LN	EL DORADO COUNTY	CALTRANS	LAKE TAHOE SCENIC BIKE LOOP	CITY OF SOUTH LAKE TAHOE CITY LIMITS	FOREST SERVICE VISTOR CENTER	3.22	$1,000,000	$3,220,000	IN CONSTRUCTION 2015
WIDE SHOULDR OR LN	EL DORADO COUNTY	CALTRANS	LAKE TAHOE SCENIC BIKE LOOP - STATE ROUTE 89	CASCADE LAKE ROAD	EMERALD BAY	1.80	$4,000,000	$7,202,100	
WIDE SHOULDR OR LN	EL DORADO COUNTY	EL DORADO COUNTY	LAKE TAHOE BLVD	D STREET	SAWMILL ROAD	1.59	$500,000	$795,200	
C-2/BIKE LANE	PLACER COUNTY	CALTRANS	STATE ROUTE 89	TAHOE CITY "Y"	BASIN BOUNDARY	3.50	$500,000	$1,749,300	FINAL DESIGN
C-2/BIKE LANE	PLACER COUNTY	CALTRANS	STATE ROUTE 267	STATE ROUTE 28 IN KINGS BEACH	BROCKWAY SUMMIT	3.20	$500,000	$1,599,100	FINAL DESIGN
C-2/BIKE LANE	PLACER COUNTY	CALTRANS/PLACER COUNTY	LAKE TAHOE SCENIC BIKE LOOP - STATE ROUTE 28	CSR 267	CHIPMUNK STREET	0.93	$5,000	$4,600	IN CONSTRUCTION 2015-2017
C-2/BIKE LANE	PLACER COUNTY	TAHOE CITY PUBLIC UTILITY DISTRICT	STATE ROUTE 89	FAWN STREET	CHERRY STREET	0.82	$500,000	$411,400	IN CONSTRUCTION 2016
C-2/BIKE LANE	PLACER COUNTY	CALTRANS	STATE ROUTE 89 THROUGH TAHOE CITY	TAHOE CITY "Y"	EASTERN END OF TAHOE CITY	0.72	$300,000	$216,300	
WIDE SHOULDR OR LN	PLACER COUNTY	CALTRANS	LAKE TAHOE SCENIC BIKE LOOP - STATE	CHERRY STREET	TAHOE CITY "Y"	5.51	$5,000	$27,500	UNDER
WIDE SHOULDR OR LN	PLACER COUNTY	CALTRANS	LAKE TAHOE SCENIC BIKE LOOP - STATE ROUTE 89	PINE STREET	FAWN STREET	2.21	$5,000	$11,000	UNDER CONSTRUCTION
C-2/BIKE LANE	PLACER COUNTY	PLACER COUNTY	CARNELIAN WOODS AVE	STATE ROUTE 28	END OF CARNELIAN WOODS AVE	0.47	$2,000,000	$940,000	
C-2/BIKE LANE	WASHOE COUNTY	WASHOE COUNTY	COUNTRY CLUB DRIVE	INCLINE WAY	LAKESHORE BLVD	0.18	$2,000,000	$350,700	
C-2/BIKE LANE	WASHOE COUNTY	WASHOE COUNTY	COUNTRY CLUB DRIVE	STATE ROUTE 28	INCLINE WAY	0.32	$2,000,000	$638,600	
C-2/BIKE LANE	WASHOE COUNTY	WASHOE COUNTY	VILLAGE BLVD	EAGLE DRIVE	COLLEGE DRIVE	0.50	$500,000	$250,200	
C-2/BIKE LANE	WASHOE COUNTY	WASHOE COUNTY	VILLAGE BLVD	STATE ROUTE 28	LAKESHORE BLVD	0.67	$2,000,000	$1,334,000	
C-2/BIKE LANE	WASHOE COUNTY	WASHOE COUNTY	INCLINE WAY	SOUTHWOOD BLVD	COUNTRY CLUB DRIVE	0.58	$500,000	$288,700	
C-2/BIKE LANE	WASHOE COUNTY	WASHOE COUNTY	COUNTRY CLUB DRIVE	VILLAGE BLVD (NORTH)	STATE ROUTE 28	1.45	$500,000	$726,100	
C-2/BIKE LANE	WASHOE COUNTY	WASHOE COUNTY	SKI WAY	COUNTRY CLUB DRIVE	FAIRVIEW BLVD	0.81	$2,000,000	$1,618,900	
C-2/BIKE LANE	WASHOE COUNTY	WASHOE COUNTY	VILLAGE BLVD	COLLEGE DRIVE	STATE ROUTE 28	0.75	$500,000	$377,300	
WIDE SHOULDR OR LN	WASHOE COUNTY	NEVADA DEPARTMENT OF TRANSPORTATION	LAKE TAHOE SCENIC BIKE LOOP - STATE ROUTE 28	STATELINE ROAD	LAKESHORE BLVD (WEST)	2.30	$5,000	$11,500	

Table 18: Proposed Bicycle and Pedestrian Project List, Class II/Bike Lane or Shoulder
Technical Amendment, December 2014

CLASS	LOCATION	OWNERSHIP	NAME	FROM	TO	MILES	COST PER MILE	TOTAL ESTIMATED COST	STATUS
WIDE SHOULDR OR LN	WASHOE COUNTY	NEVADA DEPARTMENT OF TRANSPORTATION	LAKE TAHOE SCENIC BIKE LOOP - STATE ROUTE 28	LAKESHORE BLVD	SAND HARBOR	2.36	$5,000	$11,800	
WIDE SHOULDR OR LN	WASHOE COUNTY	NEVADA DEPARTMENT OF TRANSPORTATION	LAKE TAHOE SCENIC BIKE LOOP	SAND HARBOR	CHIMNEY BEACH	2.63	$5,000	$13,100	
WIDE SHOULDR OR LN	WASHOE COUNTY	WASHOE COUNTY	LAKE TAHOE SCENIC BIKE LOOP - LAKESHORE BLVD	STATE ROUTE 28 (WEST)	STATE ROUTE 28 (EAST)	2.97	$2,000,000	$5,930,200	

Table 18: Proposed Bicycle and Pedestrian Project List, Class II/Bike Lane or Shoulder
Technical Amendment, December 2014

CLASS	LOCATION	OWNERSHIP	NAME	FROM	TO	MILES	COST PER MILE	TOTAL ESTIMATED COST	STATUS
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	D STREET	LAKE TAHOE BLVD	US HWY 50	0.69	$5,000	$3,500	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	KYBURZ AVE	US HWY 50	E STREET	0.48	$5,000	$2,400	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	FOUNTAIN AVENUE	SIERRA BLVD	MARTIN AVE	0.27	$5,000	$1,400	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	SPRUCE AVE	GLENWOOD AVE	BLACKWOOD RD	0.37	$5,000	$1,800	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	FAIRWAY DRIVE	JOHNSON BLVD	BLACKWOOD RD	0.18	$5,000	$900	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	VENICE DRIVE EAST	TAHOE KEYS BLVD	15TH STREET	0.88	$5,000	$4,400	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	MARTIN/BLACK BART	FOUNTAIN AVE	PIONEER TRAIL	1.05	$5,000	$5,200	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	STATELINE RD	US HWY 50	PINE BLVD	0.25	$5,000	$1,200	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	E STREET	KYBURZ AVE	MELBA DR	0.11	$5,000	$500	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	MELBA DRIVE	E STREET	SOUTH AVE	0.47	$5,000	$2,400	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	SOUTH AVE	MELBA DRIVE	THIRD STREET	0.25	$5,000	$1,300	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	THIRD STREET	US HWY 50	BARTON HOSPITAL	0.40	$5,000	$2,000	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	WINNAMUCCA AVE	HELEN AVE	US HWY 50	0.13	$5,000	$700	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	FAIRWAY AVE	GLENWOOD WAY	BLACKWOOD RD	0.16	$5,000	$800	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	C STREET	US HWY 50	MELBA DRIVE	0.08	$5,000	$400	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	JAMES AVE	ELOISE	PROPOSED BIKE PATH	0.60	$5,000	$3,000	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	STATELINE AVE/LAKESHORE BLVD/PARK AVE	PINE BLVD	PINE BLVD/PARK AVE	0.53	$5,000	$2,700	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	B STREET CONNECTION	MELBA STREET	HWY 50	0.10	$5,000	$500	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	TATA LANE	LAKE TAHOE BLVD	BONANZA AVE	0.28	$5,000	$1,400	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	DUNLAP DR.	HWY 50	PATRICIA LANE	0.27	$5,000	$1,300	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	WASHINGTON AVE	3RD STREET	CTC USER TRAIL	0.04	$5,000	$200	
C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	LOS ANGELES AVE	OAKLAND AVE	US HWY 50 BIKE PATH	0.52	$5,000	$2,600	
C-3/BIKE ROUTE	DOUGLAS COUNTY	DOUGLAS COUNTY	PINE RIDGE DRIVE	STATE ROUTE 207	ROUND HILL BIKE PATH	0.27	$5,000	$1,400	
C-3/BIKE ROUTE	DOUGLAS COUNTY	DOUGLAS COUNTY	MARKET STREET	PROPOSED SHARED USE PATH	STATE ROUTE 207/KINGSBURY GRADE	0.19	$5,000	$1,000	
C-3/BIKE ROUTE	DOUGLAS COUNTY	DOUGLAS COUNTY	ROUND HILL BIKE PATH CONNECTOR	KINGSBURY MIDDLE SCHOOL	ECHO DRIVE	0.13	$5,000	$700	
C-3/BIKE ROUTE	DOUGLAS COUNTY	DOUGLAS COUNTY	ROUND HILL BIKE PATH CONNECTOR 2	ROUND HILL BIKE PATH	MCFAUL WAY	0.06	$5,000	$300	
C-3/BIKE ROUTE	EL DORADO COUNTY	UNITED STATES FOREST SERVICE	FALLEN LEAF TRAIL CONNECTOR	FALLEN LEAF SHARED USE PATH	FALLEN LEAF ROAD	0.24	$5,000	$1,200	
C-3/BIKE ROUTE	EL DORADO COUNTY	EL DORADO COUNTY	SOUTH UPPER TRUCKEE ROAD	US HWY 50	LUTHER PASS CAMPGROUND	4.87	$5,000	$24,300	
C-3/BIKE ROUTE	EL DORADO COUNTY	EL DORADO COUNTY	LAKE TAHOE BLVD	ANGORA CREEK DRIVE	NORTH UPPER TRUCKEE	0.76	$5,000	$3,800	
C-3/BIKE ROUTE	EL DORADO COUNTY	EL DORADO COUNTY	PORTAL DRIVE	STATE ROUTE 89	SOUTH UPPER TRUCKEE	0.16	$5,000	$800	
C-3/BIKE ROUTE	EL DORADO COUNTY	EL DORADO COUNTY	ELKS CLUB ROAD	US HWY 50	PIONEER TRAIL	0.80	$5,000	$4,000	
C-3/BIKE ROUTE	EL DORADO COUNTY	EL DORADO COUNTY	MEADOW VALE/SOUTHERN PINES	US HWY 50	PIONEER TRAIL	1.23	$5,000	$6,100	
C-3/BIKE ROUTE	EL DORADO COUNTY	EL DORADO COUNTY	SAN BERNADINO AVE	MEYERS ELEMENTARY SCHOOL	TAHOE PARADISE PARK	0.25	$5,000	$1,300	
C-3/BIKE ROUTE	EL DORADO COUNTY	EL DORADO COUNTY	SAN BERNADINO AVE (WEST)	NORTH UPPER TRUCKEE RD	PROPOSED SHARED USE PATH IN STATE PARK	0.39	$5,000	$1,900	

Table 18: Proposed Bicycle and Pedestrian Project List, Class III/Bike Route

Technical Amendment, December 2014

CLASS	LOCATION	OWNERSHIP	NAME	FROM	TO	MILES	COST PER MILE	TOTAL ESTIMATED COST	STATUS
C-3/BIKE ROUTE	EL DORADO COUNTY	EL DORADO COUNTY	BLITZEN RD	STATE ROUTE 89 NEAR MEYERS	SANTA CLAUSE DR	1.53	$5,000	$7,700	
C-3/BIKE ROUTE	EL DORADO COUNTY	EL DORADO COUNTY	PIONEER CONNECTOR SIGNAGE	PAT LOWE CLASS 1 ON PIONEER	CROSSING 50 TO SAWMILL CLASS I	0.09	$5,000	$400	
C-3/BIKE ROUTE	PLACER COUNTY	NORTH TAHOE PUBLIC UTILITY DISTRICT	DONNER RD	NORTH TAHOE REGIONAL PARK ENTRANCE	PINEDROP TRAIL	0.22	$5,000	$1,100	
C-3/BIKE ROUTE	PLACER COUNTY	PLACER COUNTY	LAKE FOREST ROAD	POMIN PARK	SKYLANDIA PARK	0.90	$5,000	$4,500	

Table 18: Proposed Bicycle and Pedestrian Project List, Class III/Bike Route
Technical Amendment, December 2014

CLASS	LOCATION	OWNERSHIP	NAME	FROM	TO	MILES	COST PER MILE	TOTAL ESTIMATED COST	STATUS
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	US HWY 50 PHASE II (BOTH SIDES)	SOUTH TAHOE "Y"	BLUE LAKE AVE	3.41	$1,000,000	$3,410,000	FINAL DESIGN
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	SOUTH TAHOE HIGH ACCESS ROAD	LAKE TAHOE BLVD	SOUTH TAHOE HIGH	0.17	$1,000,000	$166,200	
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	SPRUCE AVENUE (SOUTH SIDE)	GLENWOOD WAY	BLACKWOOD DRIVE	0.38	$1,000,000	$380,200	
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	SPRUCE AVENUE (NORTH SIDE)	GLENWOOD WAY	BLACKWOOD DRIVE	0.37	$1,000,000	$368,700	
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	STATELINE AVE	US HWY 50	LAKESHORE BLVD	0.41	$1,000,000	$412,700	ENVIRONMENTAL REVIEW
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	PIONEER TRAIL	SKI RUN BLVD	SHEPHERDS DRIVE	0.49	$4,000,000	$1,941,100	
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	BLACKWOOD AVE SR2S	HERBERT AVE	PIONEER TRAIL	0.51	$1,000,000	$511,500	
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	PARK AVE	BLACK ROCK ROAD	LAKESHORE BLVD	0.15	$1,000,000	$148,000	
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	US HWY 50 (SOUTH SIDE)	PIONEER	MIDWAY ROAD	0.18	$1,000,000	$178,200	
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	BLACKWOOD ROAD	GLENWOOD WAY	FAIRWAY AVE	0.10	$1,000,000	$104,600	
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	GLENWOOD WAY	FAIRWAY AVE	BLACKWOOD RD	0.25	$1,000,000	$251,700	
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	PIONEER TRAIL	SKI RUN BLVD	LARCH AVE	0.43	$4,000,000	$1,705,800	
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	STATE ROUTE 89 SIDEWALKS (BOTH SIDES)	5TH STREET	10TH STREET	0.67	$1,000,000	$670,000	IN CONSTRUCTION 2015 - 2016
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	STATE ROUTE 89 SIDEWALKS (BOTH SIDES)	11TH STREET	15TH STREET	0.80	$1,000,000	$800,000	IN CONSTRUCTION 2015 - 2018
PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	LAKE PARKWAY EAST (LOOP ROAD)	STATELINE	PARK AVE	0.19	$1,000,000	$193,200	
PED	DOUGLAS COUNTY	DOUGLAS COUNTY	US HWY 50 (SOUTH SIDE)	ELK'S POINT ROAD	KAHLE DRIVE	1.07	$1,000,000	$1,068,000	
PED	DOUGLAS COUNTY	SIERRA COLINA	LPF 5	LAKE VILLAGE DRIVE	KAHLE PARK	0.13	$1,000,000	$126,000	
PED	DOUGLAS COUNTY	SIERRA COLINA	LPF 4	LAKE VILLAGE DRIVE	US HWY 50	0.10	$1,000,000	$101,900	
PED	DOUGLAS COUNTY	DOUGLAS COUNTY	US HWY 50 (SOUTH SIDE)	KINGSBURY GRADE (STATE ROUTE 207)	LAKE PARKWAY (LOOP ROAD)	0.25	$1,000,000	$252,200	
PED	PLACER COUNTY	TCPUD	FANNY BRIDGE	TAHOE TAVERN ROAD	MACKINAW RD	0.54	$1,200,000	$648,000	ENVIRONMENTAL REVIEW
PED	PLACER COUNTY	PLACER COUNTY	STATE ROUTE 28	STATE ROUTE 267	CHIPMUNK STREET	0.89	$2,500,000	$2,217,200	IN CONSTRUCTION 2015-2017
PED	PLACER COUNTY	PLACER COUNTY	STATE ROUTE 28	STATELINE RD	CHIPMUNK STREET	0.79	$8,000,000	$6,336,800	
PED	PLACER COUNTY	PLACER COUNTY	FOX STREET	STATE ROUTE 28	RAINBOW AVE	0.21	$317,000	$66,100	IN CONSTRUCTION 2015-2017
PED	PLACER COUNTY	PLACER COUNTY	COON STREET	STATE ROUTE 28	DOLLY VARDEN AVE	0.39	$317,000	$122,600	IN CONSTRUCTION 2015-2018
PED	PLACER COUNTY	PLACER COUNTY	BEAR STREET	STATE ROUTE 28	TROUT AVE	0.06	$317,000	$18,500	IN CONSTRUCTION 2015-2019
PED	PLACER COUNTY	PLACER COUNTY	DEER STREET	STATE ROUTE 28	PAST TROUT AVE	0.04	$317,000	$12,100	IN CONSTRUCTION 2015-2020
PED	PLACER COUNTY	PLACER COUNTY	SECLINE STREET	STATE ROUTE 28	STEELHEAD AVE	0.16	$317,000	$51,000	IN CONSTRUCTION 2015-2021
PED	PLACER COUNTY	PLACER COUNTY	STEELHEAD AVE	DEER STREET	FOX STREET	0.41	$317,000	$130,800	IN CONSTRUCTION 2015-2022
PED	WASHOE COUNTY	WASHOE COUNTY	STATE ROUTE 28	LAKESHORE BLVD (WEST END)	NORTHWOOD BLVD	1.10	$2,000,000	$2,193,900	
PED	WASHOE COUNTY	WASHOE COUNTY	DRIVER WAY	VILLAGE BLVD	COUNTRY CLUB DRIVE	0.58	$1,000,000	$579,100	
PED	WASHOE COUNTY	WASHOE COUNTY	FAIRWAY BLVD	NORTHWOOD BLVD	COUNTRY CLUB DRIVE	0.44	$2,000,000	$875,300	
PED	WASHOE COUNTY	WASHOE COUNTY	VILLAGE BLVD	COUNTRY CLUB DRIVE	COLLEGE DRIVE	0.25	$2,000,000	$505,700	
PED	WASHOE COUNTY	WASHOE COUNTY	GOLFERS PASS ROAD	STATE ROUTE 431	VILLAGE BLVD	0.85	$1,000,000	$847,300	
PED	WASHOE COUNTY	WASHOE COUNTY	MCCOURRY BLVD	STATE ROUTE 431	NORTHWOOD BLVD	0.46	$1,000,000	$456,700	
PED	WASHOE COUNTY	WASHOE COUNTY	SKI WAY	COUNTRY CLUB DRIVE	FIRST GREEN DRIVE	0.73	$2,000,000	$1,455,300	
PED	WASHOE COUNTY	WASHOE COUNTY	COUNTRY CLUB DRIVE	VILLAGE BLVD	STATE ROUTE 28	1.56	$2,000,000	$3,113,900	
PED	WASHOE COUNTY	WASHOE COUNTY	VILLAGE BLVD	LAKE COUNTRY DR.	COUNTRY CLUB DR.	0.16	$1,000,000	$160,400	

Table 18: Proposed Bicycle and Pedestrian Project List, Pedestrian Facilities
Technical Amendment, December 2014

CLASS	LOCATION	OWNERSHIP	NAME	FROM	TO	MILES	COST PER MILE	TOTAL ESTIMATED COST	STATUS
C-1/SHARED USE PATH	EL DORADO COUNTY	UNITED STATES FOREST SERVICE	POPE/BALDWIN PATH - UPGRADE	15TH STREET	SPRING CREEK	3.30	$750,000	$2,475,000	
C-1/SHARED USE PATH	PLACER COUNTY	TAHOE CITY PUBLIC UTILITY DISTRICT / CALTRANS	TRUCKEE RIVER TRAIL RECONSTRUCTION	TAHOE CITY	SQUAW VALLEY	5.07	$750,000	$3,802,500	
C-1/SHARED USE PATH	EL DORADO COUNTY / PLACER COUNTY	TAHOE CITY PUBLIC UTILITY DISTRICT	WEST SHORE TRAIL IMPROVEMENTS	STATE ROUTE 28 & 89	EMERALD BAY	12.10	$1,000,000	$12,100,000	

Table 18: Proposed Bicycle and Pedestrian Project List, Other Technical Amendment, December 2014

PLANNING-LEVEL PROJECTS		
Ranking Criteria	Weight	Evaluators should use professional judgement when ranking. Not all situations conform to the criteria below.
Fixes gap in existing network	15	Project that connects two high use facilities that were not linked before, or that links a facility with a high-density residential or commercial area = 1 pt Project that connects medium or low use facilities that were not linked before = 0.75 pt Project fixes a section that deterred use, or adds length to an existing facility = 0.5 pt Project upgrades a section not built to current standards = 0.25 pt
Estimated use	40	Based on the Lake Tahoe Bicycle and Pedestrian User Models. Over 1,500 estimated users per day = 1 pt 1,000 to 1,500 = 0.75 pt 500 to 1,000 = 0.5 pt 100 to 500 = 0.25 pt Less than 100 = 0.1 pt Note: Destination connectivity is incorporated into this criterion through the model calculations.
Improves network	10	Provides unduplicated, direct link between residences and recreational or commercial area. Facility where no parallel facility exists within 1300 feet (exception: sidewalk or shared-use path next to a bike lane receives 1 pt) = 1 pt Facility that serves different users (such as a bike lane where there is an existing parallel shared-use path), or a sidewalk across the street from an existing sidewalk = 0.5 The focus of this criterion is on avoiding duplication, not on gap closure or connecting destinations.
Multi-modal connectivity	5	Provides additional support to existing transit stops and routes. Sidewalk or shared use path directly connecting to a transit stop = 1 pt Bike lane or bike route connecting to a transt stop = 0.5 pt
Safety	10	Project can address a problem location where there have been reported accidents = 1 pt Addresses a location that the public or planners have identified as a safety hazard = 1 pt
Cost benefit	20	Cost per annual user served. Less than $5 per person = 1 pt $5-$20 per person = 0.75 pt $20-$100 per person = 0.5 pt $100-$500 per person = 0.25 pt Over $500 per person = 0 pt.
Environmental Impact	-20	Greater than 50% of project might result in new SEZ disturbance = 1 pt 25-50% new SEZ disturbance = 0.5 pt 5 - 25% new SEZ disturbance = 0.25 pt Additional strong potential for scenic or wildlife disturbance = 0.5 pts with total points not to surpass 1. Other environmental impacts that don't fit into above categories = up to 1 pt
DESIGN-LEVEL PROJECTS		
Criteria are the same as for Planning-level projects, with addition of one criterion below.		
Timeline	20	Permitted or Permit Requested = 1 pt Final Design = 0.75 pt Environmental Review = 0.5 pt Preliminary Design or Feasibility Study = 0 Feasibility Study = 0

Table 19. Prioritization Criteria

EIP#/Caltrans EA#	CLASS	LOCATION	OWNERSHIP	NAME	FROM	TO	PROJECT_TYPE	MILES (1)	COST_PER_MILE (5)	TOTAL_COST	STATUS	PRIORITIZATION_SCORE
HIGHEST PRIORITY "DESIGN-LEVEL" PROJECTS (6)												
10033	C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	US HWY 50-EL DORADO BEACH TRAIL	SKI RUN BLVD	EL DORADO BEACH	Design-Level	0.69	$2,000,000	$1,387,449	FINAL DESIGN	100
763	C-1/SHARED USE PATH	PLACER COUNTY	TCPUD	LAKESIDE TRAIL PHASES V, VI, VII	GROVE STREET	STATE ROUTE 28	Design-Level	1.10	$4,462,209	$4,908,430	PERMIT APPROVED	100
	C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	HARRISON AVE	LAKEVIEW AVE	LOS ANGELES AVE	Design-Level	0.28	$2,000,000	$566,312	PRELIMINARY PLANNING	90
777	C-1/SHARED USE PATH	DOUGLAS COUNTY	DOUGLAS COUNTY	NV STATELINE TO STATELINE BIKEWAY	KAHLE DRIVE	LAKE PARKWAY	Design-Level	0.89	$2,000,000	$1,772,420	ENVIRONMENTAL REVIEW	88
	C-1/SHARED USE PATH	DOUGLAS COUNTY	DOUGLAS COUNTY	NV STATELINE TO STATELINE BIKEWAY SOUTH DEMO	ELK'S POINT ROAD	KAHLE DRIVE	Design-Level	0.62	$2,000,000	$1,231,911	ENVIRONMENTAL REVIEW	83
769	C-1/SHARED USE PATH	DOUGLAS COUNTY	DOUGLAS COUNTY	NV STATELINE TO STATELINE BIKEWAY SOUTH DEMO	ROUND HILL PINES BEACH	ELK'S POINT ROAD	Design-Level	0.75	$2,000,000	$1,490,575	ENVIRONMENTAL REVIEW	83
NA/03-2A920	C-2/BIKE LANE	PLACER COUNTY	CALTRANS	STATE ROUTE 89-HOMEWOOD	FAWN STREET	CHERRY STREET	Design-Level	0.82	$50,000	$41,141	95% DESIGN	83
NA/03-1A842	C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CALTRANS	STATE ROUTE 89-EMERALD BAY ROAD	SOUTH TAHOE "Y"	SO. LAKE TAHOE CITY LIMITS	Design-Level	1.36	$5,000	$6,791	95% DESIGN--CII NEEDS TO BE REINSTATED HERE	80
761	C-1/SHARED USE PATH	PLACER COUNTY	NTPUD	NORTH TAHOE BIKE PATH	DOLLAR HILL	NORTH TAHOE REGIONAL PARK	Design-Level	8.00	$2,000,000	$16,000,000	ENVIRONMENTAL REVIEW	80
	PED	PLACER COUNTY	PLACER COUNTY	BEAR STREET	STATE ROUTE 28	TROUT AVE	Design-Level	0.06	$317,000	$18,489	ENVIRONMENTAL REVIEW	79
	PED	PLACER COUNTY	PLACER COUNTY	DEER STREET	STATE ROUTE 28	PAST TROUT AVE	Design-Level	0.04	$317,000	$12,083	ENVIRONMENTAL REVIEW	79
787	C-2/BIKE LANE	PLACER COUNTY	CALTRANS/PLACER COUNTY	LAKE TAHOE SCENIC BIKE LOOP - STATE ROUTE 28	CSR 267	CHIPMUNK STREET	Design-Level	0.93	$5,000	$4,632	ENVIRONMENTAL REVIEW	77
	PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	US HWY 50	STATELINE RD	PARK AVE	Design-Level	0.28	$8,000,000	$2,266,406	IN CONSTRUCTION--HELD UP	75
777	C-1/SHARED USE PATH	DOUGLAS COUNTY	DOUGLAS COUNTY	LAKE PARKWAY WEST (LOOP ROAD, NV SS)	US HWY 50	STATELINE AVE	Design-Level	0.44	$2,000,000	$881,223	ENVIRONMENTAL REVIEW	75
	PED	PLACER COUNTY	PLACER COUNTY	COON STREET	STATE ROUTE 28	DOLLY VARDEN AVE	Design-Level	0.39	$317,000	$122,595	ENVIRONMENTAL REVIEW	74
	PED	PLACER COUNTY	PLACER COUNTY	FOX STREET	STATE ROUTE 28	RAINBOW AVE	Design-Level	0.21	$317,000	$66,131	ENVIRONMENTAL REVIEW	74
	C-3/BIKE ROUTE	PLACER COUNTY	PLACER COUNTY	LAKE FOREST ROAD	POMIN PARK	SKYLANDIA PARK	Design-Level	0.62	$5,000	$3,078	IN CONSTRUCTION 09_11	74
	PED	PLACER COUNTY	PLACER COUNTY	SECLINE STREET	STATE ROUTE 28	STEELHEAD AVE	Design-Level	0.16	$317,000	$51,017	ENVIRONMENTAL REVIEW	74
	PED	PLACER COUNTY	PLACER COUNTY	STEELHEAD AVE	DEER STREET	FOX STREET	Design-Level	0.41	$317,000	$130,811	ENVIRONMENTAL REVIEW	74
NA/03-3C380	C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CALTRANS	US HWY 50 (PM 75.4/77.3)	TROUT CREEK	SOUTH TAHOE "Y"	Design-Level	1.89	$4,000,000	$7,573,067	60% DESIGN	70
787	PED	PLACER COUNTY	PLACER COUNTY	STATE ROUTE 28	STATE ROUTE 267	CHIPMUNK STREET	Design-Level	0.89	$2,500,000	$2,217,179	ENVIRONMENTAL REVIEW	70
775	C-1/SHARED USE PATH	PLACER COUNTY	TCPUD	HOMEWOOD MULTI-USE TRAIL	FAWN STREET	CHERRY STREET	Design-Level	0.85	$2,474,462	$2,103,293	PRELIMINARY PLANNING	70
752	C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CALIFORNIA TAHOE CONSERVANCY	SOUTH TAHOE GREENWAY	SKI RUN BLVD	SIERRA TRACT	Design-Level	1.50	$2,500,000	$3,751,598	ENVIRONMENTAL REVIEW	69
	C-1/SHARED USE PATH	PLACER COUNTY	PLACER COUNTY	LAKE FOREST ROAD	SKYLANDIA PARK	STATE ROUTE 28	Design-Level	0.18	$1,000,000	$184,199	IN CONSTRUCTION	69
752	C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CALIFORNIA TAHOE CONSERVANCY	SOUTH TAHOE GREENWAY	VAN SICKLE STATE PARK	SKI RUN BLVD	Design-Level	1.33	$2,500,000	$3,327,520	ENVIRONMENTAL REVIEW	68
763	C-1/SHARED USE PATH	PLACER COUNTY	TCPUD	LAKESIDE TRAIL PHASE 2C	MACKINAW RD	COMMONS BEACH	Design-Level	0.30	$10,000,000	$3,000,000	ENVIRONMENTAL REVIEW	65
786	PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	PIONEER TRAIL	SHEPHARDS ROAD	US HWY 50	Design-Level	0.37	$4,000,000	$1,487,399	PRELIMINARY PLANNING	65
854	PED	PLACER COUNTY	TCPUD	FANNY BRIDGE PEDESTRIAN/BICYCLE IMPROVEMENTS	TAHOE TAVERN ROAD	MACKINAW RD	Design-Level	0.61	$1,200,000	$735,488	ENVIRONMENTAL REVIEW	65
NA/03-1A733	C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CALTRANS	US HWY 50 (PM 77.3/79.3)	SKI RUN BLVD	TROUT CREEK	Design-Level	1.95	$9,000,000	$17,591,210	95% DESIGN	63
736/10034	C-1/SHARED USE PATH	EL DORADO COUNTY	EL DORADO COUNTY	SAWMILL 2 PATH	US HWY 50	LAKE TAHOE BLVD	Design-Level	1.86	$2,000,000	$3,710,012	FINAL DESIGN	63
	C-1/SHARED USE PATH	WASHOE COUNTY	NDOT	NV STATELINE TO STATELINE BIKEWAY	STATELINE ROAD	LAKESHORE DRIVE (WEST)	Design-Level	2.15	$4,000,000	$8,583,035	PRELIMINARY PLANNING	63
749/03-1A841	C-2/BIKE LANE	EL DORADO COUNTY	CALTRANS	STATE ROUTE 89-MEYERS	US HWY 50 AND SR 89 INTERSECTION	PORTAL DRIVE	Design-Level	2.50	$500,000	$1,249,675	IN CONSTRUCTION	60
	PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	US HWY 50 PHASE I	TROUT CREEK	SKI RUN BLVD	Design-Level	1.44	$8,000,000	$11,519,241	FINAL DESIGN	60
	PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	US HWY 50 PHASE II	FOURTH STREET	TROUT CREEK	Design-Level	2.14	$8,000,000	$17,107,326	FINAL DESIGN	60
	C-1/SHARED USE PATH	PLACER COUNTY	PLACER COUNTY	LAKE FOREST RD	EXISTING BIKE PATH	LAKE FOREST CAMPGROUND ENTRANCE	Design-Level	0.11	$1,000,000	$106,900	FINAL DESIGN	59
	C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	SIERRA BLVD	US HWY 50	BARBARA AVE	Design-Level	0.50	1000000	$500,000	ENVIRONMENTAL REVIEW	58
	PED	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	US HWY 50 PHASE II	SOUTH TAHOE "Y"	FOURTH STREET	Design-Level	0.24	$8,000,000	$1,943,245	FINAL DESIGN	58
752	C-1/SHARED USE PATH	EL DORADO COUNTY/CITY OF SOUTH LAKE TAHOE	CALIFORNIA TAHOE CONSERVANCY	SOUTH TAHOE GREENWAY	SIERRA TRACT	MEYERS	Design-Level	5.67	$2,500,000	$14,187,302	ENVIRONMENTAL REVIEW	55
847	C-1/SHARED USE PATH	WASHOE COUNTY	WASHOE COUNTY	NV STATELINE TO STATELINE BIKEWAY	INCLINE VILLAGE	SAND HARBOR	Design-Level	2.49	$8,000,000	$19,941,899	PRELIMINARY PLANNING	55
NA/03-1A844	5/SCENIC BIKE LOOP	EL DORADO COUNTY	CALTRANS	LAKE TAHOE SCENIC BIKE LOOP (PM 18.0/24.9)	EMERALD BAY	MEEKS BAY	Design-Level	7.35	$500,000	$3,673,878	95% DESIGN	47
NA/03-2A921	C-2/BIKE LANE	PLACER COUNTY	CALTRANS	STATE ROUTE 89-TAHOE CITY	TAHOE CITY "Y"	BASIN BOUNDARY	Design-Level	3.46	$500,000	$1,730,427	IN CONSTRUCTION	45
NA/03-1A842	5/SCENIC BIKE LOOP	EL DORADO COUNTY	CALTRANS	LAKE TAHOE SCENIC BIKE LOOP	CITY OF SOUTH LAKE TAHOE CITY LIMITS	CAMP RICHARDSON	Design-Level	1.70	$1,000,000	$1,702,159	95% DESIGN	43
764C	C-1/SHARED USE PATH	EL DORADO COUNTY	TCPUD	WEST SHORE BIKE TRAIL EXTENSION	MEEKS BAY	SUGAR PINE POINT STATE PARK	Design-Level	0.70	$3,000,000	$2,099,844	PRELIMIINARY PLANNING	43
10036	C-1/SHARED USE PATH	EL DORADO COUNTY	EL DORADO COUNTY	LAKE TAHOE BLVD	D STREET	BOULDER MOUNTAIN DRIVE	Design-Level	1.92	$2,000,000	$3,846,369	PRELIMINARY PLANNING	40
TOTAL								62.2		$164,833,758		

Table 20: Prioritized Project List, Design-Level Projects.

Notes:

1) Mileage is calculated from GIS, not mileposts. 2) From Caltrans SWITRS and Nevada Highway Patrol Databases. 3) Based on the Bike Trail User Model 4) Based on a survey of other regions with snow (172.8 for cleared facilities; 146.5 for non-cleared) (See Bike Trail User Model Tab TK) 5) Costs for Caltrans projects use the "Conceptual Unit Cost Estimates". Since these projects are constructed concurrently with water quality work, actual costs may differ. 6) Any prioritization is dependent on funding, right-of-way availability, and other issues, and the order in which projects are actually completed is based on a variety of factors.7) For full list of project scoring, see web version at www.tahoempo.org.

EIP#/Caltrans EA#	CLASS	LOCATION	OWNERSHIP	NAME	FROM	TO	PROJECT_TYPE	MILES (1)	COST_PER_MILE (5)	TOTAL_COST	STATUS	PRIORITIZATION_SCORE
HIGHEST PRIORITY "PLANNING-LEVEL" PROJECTS (6)												
10042/NA	C-1/SHARED USE PATH	PLACER COUNTY/EL DORADO COUNTY	TCPUD	WEST SHORE TRAIL IMPROVEMENTS	SR 28/89	EMERALD BAY	Planning-level	12.10	$1,000,000	$12,100,000		90
	C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	US HWY 50	EXISTING LINEAR PARK TRAIL	PARK AVE	Planning-level	0.08	$4,000,000	$320,000		83
	C-1/SHARED USE PATH	PLACER COUNTY	TCPUD/CALTRANS	TRUCKEE RIVER TRAIL WIDENING	TAHOE CITY	SQUAW VALLEY	Planning-level	2.50	$750,000	$1,875,000		70
	C-1/SHARED USE PATH	PLACER COUNTY	TCPUD/CALTRANS	SUNNYSIDE TO SEQUOIA TRAIL	SUNNYSIDE RESORT	LOWER SEQUOIA/SR 89	Planning-level	0.65	$1,500,000	$975,000		65
NA/03-1A734	C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CALTRANS	US HWY 50 (PM 79.3/80.4)	STATELINE RD	SKI RUN BLVD	Planning-level	1.15	$8,000,000	$9,185,518		65
	C-1/SHARED USE PATH	PLACER COUNTY	PLACER COUNTY	NATIONAL AVENUE EAST SIDE	TOYON RD/CONNECTION WITH PROPOSED NTPUD PATH	EXISTING FOREST SERVICE PATHS	Planning-level	0.24	$2,000,000	$480,000		65
	C-1/SHARED USE PATH	WASHOE COUNTY	WASHOE COUNTY	STATE ROUTE 28 (NORTH SIDE)	PRESTON FIELD	NORTHWOOD BLVD	Planning-level	0.30	$2,000,000	$591,559		63
	C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	PONDEROSA/SUSSEX CONNECTOR TO SIERRA TRACT	US HWY 50	SOUTH LAKE TAHOE BIKE PATH - PONDEROSA SECTION	Planning-level	0.07	$2,000,000	$132,849		60
	C-2/BIKE LANE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	GLENWOOD AVE	BLACKWOOD RD	FAIRWAY DR	Planning-level	0.25	$500,000	$125,818		58
	C-1/SHARED USE PATH	DOUGLAS COUNTY	DOUGLAS COUNTY	KINGSBURY CONNECTOR	VAN SICKLE STATE PARK	MARKET STREET	Planning-level	0.77	$2,000,000	$1,545,217		58
	C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	FAIRWAY AVE	GLENWOOD WAY	BLACKWOOD RD	Planning-level	0.14	$5,000	$700		55
778	PED	DOUGLAS COUNTY	DOUGLAS COUNTY	STATELINE BLVD/CASINO CORE	US HWY 50	LAKESHORE BLVD	Planning-level	0.41	$1,000,000	$410,000		55
	C-1/SHARED USE PATH	WASHOE COUNTY	WASHOE COUNTY	OLD MT ROSE HWY	DIRT PARKING LOT	BASIN BOUNDARY	Planning-level	2.54	$1,000,000	$2,542,848		55
	C-1/MULTI-USE PATH	EL DORADO COUNTY	USFS	POPE/BALDWIN PATH--UPGRADE	15TH STREET	SPRING CREEK	Planning-level	3.30	$750,000	$2,475,000		54
	C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	TROUT CREEK BRIDGE REPAIR	TULARE	MACKINAW	Planning-level	0.05	$2,000,000	$100,000		53
	C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	UPPER TRUCKEE BRIDGE REPAIR	PONDEROSA STREET	ELOISE AVE	Planning-level	0.05	$2,000,000	$100,000		53
	C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	JAMES CONNECTOR	JAMES AVE	EXISTING BIKE PATH	Planning-level	0.03	$2,000,000	$67,916		53
10037	C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	PARK AVE (WEST)	PINE BLVD	US HWY 50/END OF LINEAR PARK TRAIL	Planning-level	0.21	$500,000	$103,034		53
	C-1/SHARED USE PATH	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	US HWY 50	H STREET	CITY OF SOUTH LAKE TAHOE CITY LIMITS	Planning-level	0.44	$2,000,000	$884,390		53
	C-3/BIKE ROUTE	DOUGLAS COUNTY	DOUGLAS COUNTY	MARKET STREET	PROPOSED SHARED USE PATH	STATE ROUTE 207/KINGSBURY GRADE	Planning-level	0.19	$5,000	$951		53
	C-1/SHARED USE PATH	EL DORADO COUNTY	EL DORADO COUNTY	US HWY 50	CITY OF SOUTH LAKE TAHOE CITY LIMITS	SAWMILL BLVD	Planning-level	1.31	$2,000,000	$2,628,184		53
	C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	SOUTH AVE	MELBA DRIVE	THIRD STREET	Planning-level	0.25	$5,000	$1,268		52
	C-3/BIKE ROUTE	DOUGLAS COUNTY	DOUGLAS COUNTY	ROUND HILL BIKE PATH CONNECTOR 2	ROUND HILL BIKE PATH	MCFAUL WAY	Planning-level	0.07	$5,000	$348		52
	C-3/BIKE ROUTE	EL DORADO COUNTY	EL DORADO COUNTY	MEADOW VALE/SOUTHERN PINES	US HWY 50	PIONEER TRAIL	Planning-level	1.23	$5,000	$6,130		52
760	5/SCENIC BIKE LOOP	WASHOE COUNTY	NDOT	LAKE TAHOE SCENIC BIKE LOOP - STATE ROUTE 28	STATELINE ROAD	LAKESHORE BLVD (WEST)	Planning-level	2.30	$5,000	$11,508		52
	C-3/BIKE ROUTE	CITY OF SOUTH LAKE TAHOE	CITY OF SOUTH LAKE TAHOE	VENICE DRIVE	TAHOE KEYS BLVD	15TH STREET	Planning-level	0.88	$500,000	$440,471		50
781	PED	DOUGLAS COUNTY	DOUGLAS COUNTY	US HWY 50	KINGSBURY GRADE (STATE ROUTE 207)	LAKE PARKWAY (LOOP ROAD)	Planning-level	0.25	$400,000	$100,860		50
	C-3/BIKE ROUTE	EL DORADO COUNTY	EL DORADO COUNTY	BLITZEN RD	STATE ROUTE 89 NEAR MEYERS	SANTA CLAUSE DR	Planning-level	1.53	$5,000	$7,661		50
TOTAL								33.30		$37,212,232		

Table 20: Prioritized Project List, Planning-Level Projects

Location	Segment Name	From	To	Classification	Comments
CITY OF SOUTH LAKE TAHOE	UPPER TRUCKEE MEADOW	ELK'S CLUB ROAD	CARROW'S ON US HWY 50	C-1/SHARED USE PATH	Screened out at this time based on screening criteria #1: duplicative of Greenway and bike routes through Barton neighborhood. Proposed at CSLT Parks and Rec Commission meeting 6-29-09. Follows river from Elk's Club to highway, cross under highway, end near Carrow's. Very difficult with SEZ, property acquisition.
CITY OF SOUTH LAKE TAHOE	56-ACRE CONNECTOR	56-ACRES	BIJOU PARK		Design Workshop suggested this, however I can't figure out where it would go.
CITY OF SOUTH LAKE TAHOE	GREENWAY TO Y CONNECTOR	SOUTH TAHOE GREENW	SOUTH AVE	C-1/SHARED USE PATH	Screened out based on criteria #6, ROW acquisition. This trail would have to cross private property which at the time of plan development was not available for acquisition. This link has been suggested from multiple public sources.
CITY OF SOUTH LAKE TAHOE	BARTON MEADOW	SAN FRANCISCO AVE	VENICE AVE	C-1/SHARED USE PATH	Screened out based on criteria #6, ROW acquisition. This path was suggested at the October open-houses, and has been suggested by other members of the public in the past. CTC asked us to remove it from the bike plan because it is not the preferred alternative for work they are proposing in the Cove East area.
EL DORADO COUNTY	EMERALD BAY--RAISE WHOLE ROAD AROUND EMERALD BAY TO ADD SPACE FOR BIKE LANE, AND ALLOW ANIMALS AND SNOW TO CROSS UNDER ROAD				Screened out based on criteria #8, meeting design standards. Proposed at Lake Tahoe Bicycle Coalition planning meeting. Slopes of path would be beyond AASHTO standards for much of the route, also low predicted use (approx 150 users per day) would not justify expense.
EL DORADO COUNTY	POPE BEACH CONNECTOR	VENICE DRIVE	END OF POPE BEACI	C-1/SHARED USE PATH	Screened out on criteria #1, duplicate route, and #7, environmental impacts. This direct connection would have to go through waterfowl habitat that was recently restored by the Forest Service. Impact mitigation would be very difficult if not impossible. Also, although it would be direct for people in the Keys who wanted to access the western-most portion of Pope Beach, most other people would not experience significant time savings, particularly as they could visit the more eastern portions of Pope or Jameson Beach. There is a walking trail connecting Venice Drive to Pope Beach during dry periods.
EL DORADO COUNTY	SAWMILL ROAD	US HWY 50	LAKE TAHOE BLVD	C-3/BIKE ROUTE	Screened out on criteria #8--meeting design standards. At a Sawmill TAC meeting, it was suggested to sign this CIII until the C-1 is constructed, but this road seems too dangerous to sign as C-III right now.
EL DORADO COUNTY	WEST SHORE DL BLISS SERVICE ROAD	DL BLISS SOUTH ENTRANCE	DL BLISS NORTH ENTRANCE	C-3/BIKE ROUTE	Screened out on criteria #8--meeting design standards. This alternative was recommended in the SR-89 Cascade to Rubicon Bay Bikeway Study, 2003. However, it seems too steep to be useful as an alternative route to the highway.
DOUGLAS COUNTY	PONY EXPRESS TRAIL	VAN SICKLE STATE PARK	TAHOE RIM TRAIL	C-1/SHARED USE PATH	Screened out on criteria #6 (right-of-way) and #8 (meeting design standards). This is currently a mountain bike path and is planned to remain as a mountain bike path. Crosses multiple private properties, is very steep. The Pony Express on the other side of Kingsbury, the Carson Valley side, is planned as a paved path, however.

Table 21: Proposed Projects, Screened Out

Preventive Medicine 50 (2010) S106–S125

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Review

Infrastructure, programs, and policies to increase bicycling: An international review

John Pucher [a,*], Jennifer Dill [b], Susan Handy [c]

[a] Bloustein School of Planning and Public Policy, Rutgers University, 33 Livingston Avenue, New Brunswick, NJ 08901, USA
[b] Toulan School of Urban Studies and Planning, Portland State University, PO Box 751, Portland, OR 97207, USA
[c] Department of Environmental Science and Policy, University of California, 1 Shields Avenue, Davis, CA 95616, USA

ARTICLE INFO

Available online 16 September 2009

Keywords:
Bicycling
Active travel
Active transport
Health
Intervention
Policy
Infrastructure
Sustainable transportation

ABSTRACT

Objectives. To assess existing research on the effects of various interventions on levels of bicycling. Interventions include infrastructure (e.g., bike lanes and parking), integration with public transport, education and marketing programs, bicycle access programs, and legal issues.

Methods. A comprehensive search of peer-reviewed and non-reviewed research identified 139 studies. Study methodologies varied considerably in type and quality, with few meeting rigorous standards. Secondary data were gathered for 14 case study cities that adopted multiple interventions.

Results. Many studies show positive associations between specific interventions and levels of bicycling. The 14 case studies show that almost all cities adopting comprehensive packages of interventions experienced large increases in the number of bicycle trips and share of people bicycling.

Conclusions. Most of the evidence examined in this review supports the crucial role of public policy in encouraging bicycling. Substantial increases in bicycling require an integrated package of many different, complementary interventions, including infrastructure provision and pro-bicycle programs, supportive land use planning, and restrictions on car use.

Contents

Introduction

Bicycling is healthy. That is the conclusion of an increasing number of scientific studies assessing the impacts of bicycling on levels of physical activity, obesity rates, cardiovascular health, and morbidity (Anderson et al., 2000; Bassett et al., 2008; Bauman et al., 2008; BMA, 1992; Cavill et al., 2006; Dora and Phillips, 2000; Gordon-Larsen et al., 2009; Hamer and Chida, 2008; Hillman, 1993; Huy et al., 2008; Matthews et al., 2007; Roberts et al., 1996; Shephard, 2008). The combined evidence presented in these studies indicates that the health benefits of bicycling far exceed the health risks from traffic injuries, contradicting the widespread misperception that bicycling is a dangerous activity. Moreover, as bicycling levels increase, injury rates fall, making bicycling safer and providing even larger net health benefits (Elvik, 2009; Jacobsen, 2003; Robinson, 2005).

* Corresponding author.
E-mail address: pucher@rutgers.edu (J. Pucher).

0091-7435/$ – see front matter © 2009 Elsevier Inc. All rights reserved.
doi:10.1016/j.ypmed.2009.07.028

Perhaps due to the increasing evidence of the health benefits of bicycling, many government agencies and public health organizations have explicitly advocated more bicycling as a way to improve individual health as well as reduce air pollution, carbon emissions, congestion, noise, traffic dangers, and other harmful impacts of car use (BMA, 1992; Cavill et al., 2006; Godlee, 1992; OECD, 2004; USDHHS, 1996, 2008; USDOT, 1994, 2004; WHO, 2002a,b).

Given the growing consensus on the benefits of bicycling, the important question for researchers is how to increase bicycling. That is the topic of this review paper. Our purpose is threefold: (1) To list, describe, and categorize the wide range of infrastructure, program, and policy interventions to promote bicycling; (2) To summarize the available information on where and to what extent these interventions are currently being implemented; and (3) To assess the actual impacts of the various interventions on levels of bicycling.

An extensive and rapidly growing literature suggests the need to facilitate bicycling through appropriate infrastructure (such as bike paths and bike parking), traffic calming, training and education programs, and other supportive measures. Countries and cities with high levels of bicycling and good safety rates tend to have extensive infrastructure, as well as pro-bicycle policies and programs, whereas those with low bicycling rates and poor safety records generally have done much less (Pucher and Dijkstra, 2003; Fietsberaad, 2006; Pucher and Buehler, 2008).

Such aggregate comparisons across cities and countries support the general importance of policies for encouraging bicycling and improving safety. However, it is not clear which measures are the most effective and should be given priority in designing and implementing a pro-bicycle policy package. This article assembles the available evidence on the actual impacts of a wide range of policies and programs, first according to specific categories of individual policy measures and then as packages of coordinated policies and programs.

Methods

We first developed a list of interventions hypothesized to encourage bicycling directly. The list did not include measures such as congestion pricing, gasoline taxation, and car parking policies, which probably influence bicycling levels indirectly. The initial list was reviewed by other experts and practitioners and expanded. Although the final list is extensive, it may exclude promising but rare or recently implemented interventions for which studies are not available.

Because few studies measuring the effects of such interventions appear in peer-reviewed journals, we conducted a broad search that also included non–peer-reviewed research found in government documents, conference proceedings, and other sources. Using the list of interventions, we conducted electronic searches using Google, Google Scholar, TRIS Online (National Transportation Library), TRANweb, MEDLINE, PUBMED, and ISI Web of Knowledge. We also consulted about 30 Internet websites devoted specifically to pedestrian and bicycling information, which post many articles and reports on policy interventions to promote bicycling. The reference lists in each of the located publications were used to identify additional information. We also contacted bicycle researchers and practitioners in the US, Europe, South America, and Australia to identify potential studies.

The small number of high quality studies prevented us from applying the strict criteria for inclusion used in other related reviews (e.g., Ogilvie et al., 2004). We decided that including a wider range of studies would help in building the evidence base and assessing research gaps and needs, particularly with respect to methodology.

We only included studies that reported impacts specifically on bicycling as a dependent variable. Studies that combined both walking and bicycling as an outcome measure (e.g., minutes of physical activity) were not included, in contrast to Ogilvie et al. (2004). Combined measures were often used in studies evaluating interventions such as paths and trails, which accommodate both walking and bicycling. Many studies on bicycling interventions focus on safety measures as an outcome, including the number of crashes or interim measures such as distance between bicyclists and motor vehicles. Although real or perceived safety levels likely influence levels of bicycling, these studies were not systematically included in this review. Some examples, however, are included when studies with bicycling outcomes are not available.

Studies conducted at both the individual and aggregate (e.g., city or district) levels were included. Both revealed and stated preference studies were included. Revealed preference studies measure actual behavior, either through self-report (e.g., surveys) or more objective means (e.g., automatic counters or global positioning systems [GPS]). Stated preference studies measure people's opinions or intended behaviors. They are often perceived as being less reliable than revealed preference studies. Stated preference methods are often used to test interventions (or packages of interventions) that do not currently exist and, therefore, could not be recorded by revealed preference methods. Sophisticated stated preference studies provide respondents pairs of choices with different characteristics. For example, a bicyclist might be asked to choose between a shorter route that does not have a bike lane and a longer route that includes a bike path.

We selected only studies that included some quantitative measure of an outcome related to bicycling. Because of the small number of studies and lack of consistency in approaches, we included a wide range of outcomes. Studies that measured the amount of bicycling were of highest priority. At the individual level, this could include, for example, the number of bicycle trips, distance bicycled, or whether or not a person was a bicyclist. At the aggregate level, the share of people bicycling to work was a common measure; the share of all trips by bicycle was reported in some studies. More indirect measures included cyclists' opinions or ratings of interventions.

In some cases, a single evaluation was reported in more than one source, such as a government report, a conference paper, and a peer-reviewed journal article. This review includes only the journal article, unless unique information appears in one of the other sources. Finally, we limited the search to studies in English and focused on studies conducted since 1990. Our search resulted in 139 sources that included evidence of the effect of specific interventions on bicycling, of which 65 appeared in peer-reviewed publications (see Tables 1–4). That number does not include citations used for the case study cities. Nearly all of the studies were of adults, except for those that focused on school-based interventions.

Results

Travel-related infrastructure

Perhaps the most common types of intervention are those that aim to separate cyclists from motor vehicles. (See Table 1 for descriptions of each intervention and results.) Striped bike lanes and separate paths are common in North America and Europe, but many European cities also use pavement coloring and other innovations such as “cycle-tracks,” which function like a bike lane but have greater physical separation from motor vehicles (Fig. 1). Contraflow lanes permit cyclists to ride against motor vehicle traffic on one-way streets (Fig. 2). Forty studies attempted to evaluate the effect or value of bike lanes and/or separate paths. Study methodologies varied widely, including both stated and revealed preference and individual- and aggregate-level analysis. Very few of the studies were longitudinal, and they yielded few quantitative estimates of the effect of facilities on overall rates of bicycling sometimes because of the methodologies employed. For example, many of the studies used convenience samples of avid cyclists instead of random samples.

Most of the aggregate-level studies found a positive and statistically significant relationship between bike lanes and levels of bicycling, whereas the individual-level studies had mixed findings. A cross-sectional study at the city level of over 40 US cities found that each additional mile of bike lane per square mile was associated with an increase of approximately one percentage point in the share of workers regularly commuting by bicycle (Dill and Carr, 2003). A study of Seattle, Washington residents found no relationship between the presence of a bike lane (objectively measured) and the odds of bicycling, but did find that being near a path mattered. For example, people living within a half-mile of a path were at least 20% more likely to bicycle at least once a week, compared to people living between one-half and one mile away from a path (Vernez-Moudon et al., 2005).

Table 1
Travel-related infrastructure for bicycling.

Measure	Description	Examples and extent of implementation	Measured effects on amount of bicycling
Overall measures of "bikeability"	Some studies combine several infrastructure features into single indices or ask respondents to rate the overall environment for bicycling	Not applicable	One Austrian study found that people who agreed that there were bicycle "tracks" along their route and possible shortcuts were about twice as likely to bicycle as those who did not (Titze et al., 2008). One revealed preference (RP) survey of cyclists found a positive association between their overall rating of the quality of bicycle facilities and frequency of bicycle commuting (Sener et al., 2009a). One study did not find a significant relationship between ratings for the bikeability on streets around elementary schools and the number of bicycles parked at the schools (Sisson et al., 2006).
On-road bicycle lanes	In the US, bicycle lanes are usually designated by a white stripe, a bicycle icon on the pavement, and signage. The lanes are on each side of the road, to the right of motor vehicle lanes, and are recommended to be at least five feet wide (American Association of State Highway and Transportation Officials (AASHTO), 1999).	Lanes are very common in US cities, though to varying degrees. Data for 43 of the 50 largest cities in the US found from 0 to 1.5 linear miles of bike lanes per square mile (Dill and Carr, 2003).	Cross-sectional studies at the city or district level show positive correlation between bike lanes or paths and levels of bicycle commuting (Dill and Carr, 2003; LeClerc, 2002; Nelson and Allen, 1997; Parkin et al., 2008; Pucher and Buehler, 2005). Two longitudinal studies found that new bike lanes and paths were associated with increases in bicycle commuting, though effects were sometimes mediated (Barnes et al., 2006; Cleaveland and Douma, 2009). Four of five RP studies conducted at the individual level did not show a positive correlation (Cervero et al., 2009; de Geus et al., 2008; Dill and Voros, 2007; Vernez-Moudon et al., 2005). Krizek and Johnson (2006) found that people living within 400 meters of a bike lane were more likely to bicycle. Two of the studies found positive association between the *perception* of having bike lanes and paths and bicycling (Dill and Voros, 2007; Vernez-Moudon et al., 2005). Some RP studies of route choices show that cyclists go out of their way to use bike lanes or paths (Dill, 2009; Dill and Gliebe, 2008; Howard and Burns, 2001; Krizek et al., 2007). Several stated preference (SP) studies show a preference for bike lanes over no facilities or that bike lanes would encourage more bicycling (Abraham et al., 2002; Akar and Clifton, in press; Antonakos, 1994; Bureau of Transportation Statistics, 2004; Emond et al., 2009; Hunt and Abraham, 2007; Krizek, 2006; Landis et al., 1998; Madera, 2009; Parkin et al., 2007; Stinson and Bhat, 2003; Tilahun et al., 2007; Wardman et al., 2007). Experienced cyclists may prefer bike lanes to off-road paths (Akar and Clifton, in press; Antonakos, 1994; Bureau of Transportation Statistics, 2004; Hunt and Abraham, 2007; Stinson and Bhat, 2003; Tilahun et al., 2007) or have little or no preference for striped lanes over no striping (Taylor and Mahmassani, 1996; Sener et al., 2009b). Before-and-after counts in several North American cities and London (UK) show increases in number of cyclists after bike lanes installed (City of San Francisco, 2004; City of Toronto, 2001; City of Vancouver, 1999; Federal Highway Administration, 1994; Sallaberry, 2000; San Francisco Department of Parking and Traffic, 2001; Transport for London, 2004a). However, only one city included counts on nearby streets, where it was found that cyclists were likely diverted to the bike lane (City of San Francisco, 2004). Four studies looked at the effect of bike lane markings on behavior related to safety, but did not include measures of changes in the amount of bicycling. (Hunter et al., 1999; Harkey and Stewart, 1998; Daff and Barton, 2005; Van Houton and Seiderman, 2005).
Two-way travel on one-way streets	**Contraflow bike lanes** allow bicyclists to travel in the opposite direction on one-way streets (Fig. 2). **False one-way streets** use signage or barriers to allow cyclists to enter a street, but not motor vehicles. Two-way motor vehicle travel is allowed, but less common because of the entry restriction.	Contraflow lanes and similar treatments are common in many European cities, usually on urban residential streets with low traffic speeds. They are rare in the US (Nabti and Ridgway, 2002), where current guidance discourages the practice (AASHTO, 1999).	No studies were found that assessed changes in levels of bicycling. A study of six sites in the UK concluded that the treatments were safe when designed correctly. A large majority of surveyed cyclists felt safer with the treatments (Ryley and Davies, 1998). A German study found no negative effect on traffic safety (Alrutz et al., 2002). A before-after study of three locations in London found no significant change in the number of crashes. At a fourth location where bicycling flow rates were available, a significant decrease in the crash rate was found (Transport for London, 2005).
Shared bus/bike lanes	Bus-only lanes, usually in downtown environments, that allow bicycle travel.	Shared bus/bike lanes have been used in many European and Australian, and some North American, cities, including Toronto, Ontario; Santa Cruz, CA; Philadelphia, PA; and Washington, DC (Nabti and Ridgway, 2002).	Surveys in the UK found that shared bus/bike lanes were popular with cyclists. For about one-quarter of the cyclists, the lane influenced their route choice, and few delays to buses were observed (Reid and Guthrie, 2004).
Off-street paths	Off-street paths are paved and separated from motor vehicle traffic. They usually accommodate two-direction bicycle traffic. The minimum recommended width is 10 feet (AASHTO, 1999). The term "trail" is sometimes used for this type of facility. However, transportation planners use the term trails to refer to unimproved (e.g., unpaved)	Off-street paths are common in US cities, though the number of miles is often limited. A survey of 50 large cities found a range of <0.1 to >3.0 linear miles of paths per square mile (Thunderhead Alliance, 2007). Most paths in the US are for mixed travel, though some have lane markings to separate cyclists from	One RP study showed a positive correlation between likelihood of bicycling and proximity to separate paths (Vernez-Moudon et al., 2005), while another found no effect (Krizek and Johnson, 2006). RP studies have found conflicting evidence as to whether cyclists go out of their way to use paths (Aultman-Hall et al., 1998; Dill, 2009). One SP survey found that about 40% of cyclists preferred a longer route using a path to a shorter route using a motor vehicle lane (Shafizadeh and Niemeier, 1997). One observational study found that women cyclists preferred separate paths over bike lanes, and both facilities over no facilities (Garrard et al., 2008). One intercept survey of bicyclists on paths found that

	recreational facilities (AASHTO, 1999). Paths can be mixed use (including pedestrians, rollerbladers, etc.) or limited to cyclists.	pedestrians and other users.	20% stated they would change modes if off-road facilities were not available (Rose, 2007). Several SP studies found that less confident cyclists prefer separate paths over lanes (see On-road bicycle lanes section, above; Jackson and Ruehr, 1998). Respondents in one survey were more comfortable on a path compared to a four-lane local street with a bike lane, though there was no difference between the path and a two-lane local street with a bike lane (Emond et al., 2009). Five sources looked at paths before and after construction or the introduction of bicycles. Two did not show a change in levels of bicycling for nearby residents (Burbidge and Goulias, in press; Evenson et al., 2005). One showed an increase in minutes of bicycling among residents living within 1.5 km, when combined with a marketing campaign (Merom et al., 2003). Two studies showed an increase in the number of cyclists (Cohen et al., 2008; Transport for London, 2004a).
Signed bicycle routes	"A shared roadway which has been designated by signing as a preferred route for bicycle use." (AASHTO, 1999) For this review, these routes do not include striped lanes or other pavement markings.	Signed bicycle routes are very common in US cities. They may be more common on residential streets or other streets with less motor vehicle traffic.	One RP survey found a positive correlation between cyclists' perception of facility quality and the presence of signed shared roadways, though not as strong as with bike lanes. Facility quality was then positively associated with the frequency of commuting by bicycle (Sener et al., 2009a). One SP study found that cyclists preferred residential roads designated as a bicycle route slightly more than residential roads without such designation (Abraham et al., 2002).
Bicycle boulevards (Fig. 3)	Bicycle boulevards are signed bicycle routes, usually on low-traffic streets, that also include other traffic calming features that discourage motor vehicle traffic, such as speed bumps, diverters and traffic circles.	Bicycle boulevards are much less common in the US than bike lanes or paths. Portland, OR; Berkeley, CA; and Palo Alto, CA have implemented bicycle boulevards (Nabti and Ridgway, 2002).	One RP study found that cyclists went out of their way to use bicycle boulevards. Women and less-experienced cyclists demonstrated a particular attraction to the facilities, more so than to bike lanes on major streets (Dill and Gliebe, 2008). One survey found that respondents were most comfortable bicycling on a "quiet street" (Emond et al., 2009).
Cycletracks (sometimes referred to as sidepaths or raised bike lane) (Fig. 1)	Cycletracks are similar to bike lanes, but are physically more separated from motor vehicles, for example with a curb, vehicle parking, or other barriers (Fig. 1). They are often wider than a typical US bike lane and usually do not allow pedestrian travel.	Cycletracks are common in European cities on major streets with higher volumes of motor vehicle traffic, but very rare in the US (Nabti and Ridgway, 2002).	One before-after study of new cycletracks in Copenhagen reported a 20% increase in bicycle and moped traffic and a 10% decrease in motor vehicle traffic. However, it was not known how much of the change was due to changes in route choice versus people shifting from driving or other modes to bicycling (Jensen, 2008a). An evaluation of a two-way cycletrack in London showed a decrease in the *rate* of bicycling crashes (Transport for London, 2005) and a 58% increase in the number of cyclists on the roadway in 3.5 years (Transport for London, 2004a). Surveys of Danish adults and German cyclists both found that respondents rated cycletracks higher than striped bike lanes (Bohle, 2000; Jensen, 2007).
Colored lanes	Paint or other methods are used to color bike lanes, making them more visible to motorists.	Colored on-street bike lanes are common in European cities, but rare in the US. Some US cities have used color to mark short segments of lanes at potential conflict points, such as intersections or on-ramps.	Two studies looked at raised and colored cycletracks through intersections in Sweden. One found that the volume of cyclists increased compared to two non-treatment intersections, and estimated that the safety risk declined (Garder et al., 1998). Several studies looked at various safety measures as outcomes, but not levels of bicycling (Konig, 2006; Jensen, 2008b; Hunter et al., 2000; Sadek et al., 2007; Hunter, 1998).
Shared lane markings (also known as sharrows) (Fig. 4)	Shared lane markings are used in lanes shared by motor vehicles and bicycles to alert drivers to the potential presence of cyclists and to show cyclists where to ride.	Shared lane markings are rare in the US, though use is expected to increase.	No studies were found that measured levels of bicycling. Two studies measured safety outcomes, such as distances between cyclists and parked cars and cyclists and passing motorists (Alta Planning + Design, 2004; Pein et al., 1999).
Bike boxes (also known as advanced stop lines) (Fig. 5)	Bike boxes are marked areas at a signalized intersection, in front of the motor vehicle lane, where cyclists can wait while the light is red. The boxes are intended to make cyclists more visible to motor vehicles and give them a head start through the intersection (depending on the design).	Bike boxes and advanced stop lines are used in many European cities. They have also been installed in Melbourne, Australia; Christchurch, New Zealand; and three cities in Canada (Toronto, Vancouver, Victoria). The concept is relatively new in the US, though at least eight US cities have installed bike boxes, including several in Portland, OR.	Studies show a wide range of results in terms of appropriate usage by cyclists and encroachment by motor vehicles (Allen et al., 2005; Atkins, 2005; Daff and Barton, 2005; Hunter, 2000; Newman, 2002; Rodgers, 2005; Wall et al., 2003). Four studies did not find a reduction in conflicts, because there were either no or too few conflicts observed (Allen et al., 2005; Atkins, 2005; Hunter, 2000; Wall et al., 2003). A London study concluded that advanced stop lines did not have a significant positive or negative effect on cyclist safety (Transport for London, 2005). Surveys of cyclists in three studies indicate that a majority felt safer with the bike box (Newman, 2002; Rodgers, 2005; Wall et al., 2003). One study found that a majority of cyclists did not understand the purpose of the bike box (Hunter, 2000).
Bicycle phases – traffic signals	Separate traffic signal phases for bicycles at intersections can provide time for cyclists to cross an intersection without motor vehicle traffic.	Bicycle phases for signals are common in European cities, particularly with cycletracks, but rare in the US. They have been used in Davis, CA; New York, NY; and Portland, OR (Nabti and Ridgway, 2002).	One study in Davis, CA estimated that the benefits (mainly reduced crashes) greatly outweighed the costs and potential harms (including changes in vehicle capacity) of a separate bicycle phase at an intersection with a high volume of bicycle traffic connecting to an off-street path. In the 35 months before installation there were 10 auto-bicycle collisions at or near the intersection, compared to none in the 35 months afterwards (Korve and Niemeier, 2002).
Maintenance of facilities	Pavement quality and the presence of debris on paths and in lanes could influence bicycling decisions and safety.	No data is available assessing the quality of bicycle facilities nationally.	One study found that pavement quality was negatively correlated with the share of residents in an area bicycling to work (Parkin et al., 2008). The number of cyclists on a path in London doubled after the path was resurfaced (Transport for London, 2004a). A US study found that pavement quality was a significant predictor of cyclists' rating of a road segment (Landis et al., 1998). In one survey, cyclists rated "smooth pavement" as high as having a direct route and higher than having a bike path, though lower than having a bike lane (Antonakos, 1994).

(continued on next page)

Table 1 *(continued)*

Measure	Description	Examples and extent of implementation	Measured effects on amount of bicycling
Wayfinding signage	Wayfinding signs for cyclists usually include common destinations and the distance or time to bicycle there.	Wayfinding signs are being used by more US cities.	No studies measured the effects of wayfinding signage on levels of bicycling.
Techniques to shorten cyclists' routes	Cut-throughs provide cyclists but not motor vehicles with a more direct connection. Right-turn shortcuts allow cyclists to turn before reaching an intersection.	Cut-throughs are sometimes used as a traffic calming technique in the US. We could not identify any examples in the US of right-turn shortcuts specifically for cyclists that were not already separate paths.	No studies measured the effects of cut-throughs or right-turn shortcuts.
Other traffic controls			A Netherlands study found that 0.3 fewer stops per km along a route meant a 4.9% higher share of bicycling (Rietveld and Daniel, 2004).
Traffic calming	"A combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized users" (Lockwood, 1997). Physical measures include vertical deflection (e.g., speed humps) or horizontal deflection (e.g., bulb-outs, neck-downs, or chicanes). Traffic calming programs tend to focus on pedestrians more than cyclists.	Traffic calming has its roots in neighborhood-based efforts in the Netherlands in the 1960s to tame traffic on residential streets (Clarke and Dornfeld, 1994). Officially endorsed by the Dutch government in 1976, the concept spread throughout Europe and to Japan, Australia, and North America over the next decade. In 1999, the Institute of Transportation Engineers (ITE) published a report on the state of traffic calming practice in the US (Institute of Transportation Engineers, 1999). Traffic calming programs for local streets are common throughout the US, though the scale and sophistication of the programs varies considerably.	Although a 1994 study concludes that "the experience from Europe clearly shows that bicycle use has been encouraged by traffic calming" (Clarke and Dornfeld, 1994), few rigorous studies are available to support this claim. The impact of traffic calming on vehicle speeds is well documented, but evidence on the degree to which reduced speeds lead to reductions in accidents or increases in bicycling is slim. Studies in Germany in the early 1980s showed a doubling of bicycling in the small town of Buxehude (Doldissen and Draeger, 1990) and a 50% increase in bicycle use in the Berlin-Moabit area (Commission of the European Communities, 1989). A study in Japan in the 1980s found that bicycle traffic volumes rose along most routes, though the magnitude of the increase was not reported (Clarke and Dornfeld, 1994). A Danish study noted a 20% increase in bicyclists crossing a major road after traffic calming in one of three towns (Herrstedt, 1992). In the 1990s, a traffic calming project in the city of Cambridge, Massachusetts led to an increase in perceived safety: 33% of residents reported that cyclist safety was better, while only 8% said it was worse (Watkins, 2000). In the Berlin-Moabit area, bicyclist accidents declined by 16% (Commission of the European Communities, 1989). Bicycle accidents rose in Buxtehude, but these were primarily non-injury accidents (Doldissen and Draeger, 1990).
Home zones	Home zones are a form of traffic calming that focuses on residential streets. Streets are designed or altered to serve as play areas as well as streets, and speed limits of 10 mph are enforced. Physical elements may include benches, flowerbeds, trees, lamp posts, play structures, and pavement treatments.	The home zone concept derives from the "woonerf" – or "living yard" – movement in the Netherlands in the 1960s. Home zones are common in the Netherlands, Germany, the UK, and other parts of Europe. The UK Department for Transport promotes the home zone concept. The concept has not been adopted in the US, though examples of streets that follow the principles of home zones can be found.	An evaluation of nine home zone schemes in the UK found no change in adult bicycle ownership. Among adults with bikes, 80% said the home zone made no difference in how often they bicycled within the zone, 10% said they bicycled more often, 10% said they bicycled less often. Among cyclists, 60% said bicycling in home zones was not different, 30% said more pleasant, 10% said less pleasant. Among children with bicycles, 57% used it with the same frequency, 22% used it more often, 21% used it less often; 28% thought bicycling more fun now, 10% less fun, and 62% about the same (Webster et al., 2006).
Car-free zones	Car-free zones generally take one of three forms: (1) Temporary closure of roads to motor vehicle traffic. In South America, these programs are called "ciclovias" (see Table 4). (2) Pedestrian malls, usually in central business districts, where several blocks have been closed to vehicle traffic, with limited exceptions. (3) Car-free neighborhoods, in which residents must park motor vehicles at a remote parking facility.	Although common in European cities, pedestrian malls are limited in the US. Well-known examples include Pearl Street in Boulder, CO; Third Street Promenade in Santa Monica, CA; Ithaca Commons, in Ithaca, NY; and Faneuil Hall/Quincy Market in Boston, MA. Many cities in the US experimented with pedestrian malls in the 1960s and 1970s but later removed them when businesses in the mall failed to thrive. Car-free neighborhoods are much less common than pedestrian malls. One of the most famous examples is Vaubon in Freiberg, Germany. In North America, examples are mostly limited to resort-oriented islands, such as Mackinac Island in Michigan.	Several case studies provide evidence of a shift in mode split for people entering the central business district after conversion to a pedestrian mall, though the impact on bicycling appears limited. In Bologna, Italy, vehicle traffic declined by 50%, and 8% of people arriving at the center came by bicycle after the conversion (Topp and Pharoah, 1994). In Lubeck, Germany, of those who used to drive, 12% switched to transit, walking, or bicycling; bicycling was not separately reported (Topp and Pharoah, 1994). In Aachen, Germany, car travel declined from 44% to 36%, but bicycling stayed constant at 3% (Topp and Pharoah, 1994).
Complete streets	The complete streets concept asserts that streets are not just for vehicles but for all potential users, including pedestrians, cyclists, transit users, wheelchair users, shopkeepers, and residents. Complete streets policies, taking many different forms, establish the complete streets concept as the guiding design principle for new and rebuilt streets.	Complete streets policies had been adopted by 25 local and regional governments in the US and by 10 states as of 2007 (Thunderhead Alliance, 2007). The US Congress is considering a federal complete streets policy. The number of projects built according to complete streets principles is growing.	No studies on the impact of complete streets policies or projects on bicycling levels are publicly available at this time.

AASHTO, American Association of State Highway and Transportation Officials; RP, revealed preference; SP, stated preference.

Table 2
Bike parking and end-of-trip facilities.

Measure	Description	Examples and extent of implementation	Measured effects on bicycling
Bike parking	General	Quantity and quality of bike parking rising sharply in many European, North American, and Australian cities, and in some Asian and South American cities. No comprehensive national data available, but selected city data show doubling or tripling of bike parking supply in many cities over past two decades (Pucher and Buehler 2005, 2007, 2008, and in press; Fietsberaad, 2006; Litman, 2009; Thunderhead Alliance, 2007). Incomplete statistics generally include public bike parking but not privately provided parking at residences, workplaces, and commercial buildings, or at schools and universities. Increasingly, cities are requiring provision of specific levels of bike parking in newly constructed buildings and offer incentives via green building guidelines such as LEED (US), BREEAM (UK); CASBEE (Japan); and Green Star (Australia) (Litman, 2009; Kessler, 2008; US Green Building Council, 2005; Pucher, 2008).	Hunt and Abraham (2007) estimated large and statistically significant impacts on bicycling of secure parking at the destination, equivalent to a reduction of 27 minutes in in-route bicycling time. Noland and Kunreuther (1995) estimated that availability of safe bike parking at work significantly raised perception of bicycling convenience and raised likelihood of bicycling to work.
	Unsheltered/sheltered	Most parking is in unsheltered bike racks on sidewalks, plazas, or open parking lots. There is a trend toward sheltered parking, at least covered with a roof of some sort.	Multivariate analysis of UK National Travel Survey by Wardman et al. (2007) found significant impacts on bicycling to work. Compared to base bicycle mode share of 5.8% for work trips, outdoor parking would raise share to 6.3%, indoor secure parking to 6.6%, and indoor parking plus showers to 7.1%. Suggests that such end-of-trip facilities have important impact on decision to bicycle to work.
	Guarded	Trend in northern Europe (esp. Netherlands, Germany, Denmark) toward guarded parking to prevent theft, both in special facilities such as bike stations and in outdoor parking guarded by attendants.	
	Bike lockers	Usually at train or metro stations, especially in North America, where it is the main form of sheltered, secure bike parking.	Taylor and Mahmassani (1996) estimate significant impacts of secure bike lockers for cyclists at public transport stations.
Showers at workplaces	Usually combination of showers, clothes storage, and change facilities; often in conjunction with bike parking facilities.	Infrequent but increasing provision due to building codes in some cities that require such facilities, and encouraged by green building codes such as LEED and BREEAM, which award credit points for such facilities.	Wardman et al. (2007) estimated significant impact of shower facilities on bicycling to work; Hunt and Abraham (2007) estimate small but statistically significant impacts of shower facilities at the destination, equivalent to a reduction of 4 minutes in in-route bicycling time.
Bicycle stations (Fig. 6)	Full-service facilities offering secured, sheltered bike parking in addition to bicycle rentals, bicycle repairs, showers, accessories, bicycle washes, bicycle touring advice, etc. (Pucher and Buehler, 2007, 2008, and in press; Pucher 2008; Litman, 2009; Martens, 2007). Stations are usually adjacent to train or metro stations as a key form of integration with public transport, but sometimes located in commercial districts of city centers.	In 2007, bike stations at 67 Dutch train stations and 70 German train stations, with capacity of up to 10,000 bikes; only 10 bike stations, mostly small (100–300 bikes) in North America in 2009; large bike stations in Tokyo and a few other Japanese cities (Martens, 2007; Harden, 2008).	Although no studies have measured impacts of bike stations on bicycling, they are presumably positive, because such bike stations are generally well utilized due to security, convenience, and wide range of services offered.

Stated preference studies almost uniformly found that both cyclists and non-cyclists preferred having bike lanes to riding in mixed traffic. The findings from the studies of off-street paths were varied, with some showing positive associations and others showing no statistically significant relationship. Only four studies examined bicycle boulevards and traffic-protected cycletracks, types of roadway infrastructure less common in the US. The findings generally showed a positive association between these facilities and bicycling, though without good estimates of the quantitative effects on actual bicycling rates.

Bicycle boulevards employ techniques similar to those for traffic calming streets to reduce the number and speed of cars (Fig. 3). Of the six studies on traffic calming, all but one found positive results, though none rigorously measured the effects on the amount of bicycling. Although car-free zones, home zones, and "complete streets" also improve the street environment for bicyclists, no studies have measured their effects on the amount of bicycling (see Table 1 for definitions and more detail).

Several studies point to the need to consider characteristics of the bicyclist. At least three studies found differences in facility preferences between men and women, with women generally more attracted to infrastructure with less motor vehicle traffic (Dill and Gliebe, 2008; Emond et al., 2009; Garrard et al., 2008). However, Emond et al. (2009) note that although women liked low-traffic streets, they felt less comfortable than men on off-street paths, perhaps because of security concerns. A majority of the stated preference studies that analyzed both bike lanes and bike paths found that more experienced cyclists preferred on-street lanes to bike paths. These cyclists appear less willing to trade off the additional time required to access separated paths, presumably because they feel more confident in bicycling closer to motor vehicle traffic. These findings are consistent with two recent studies using GPS data and samples of cyclists (Dill and Gliebe, 2008; Harvey et al., 2008).

Observational studies were more common for analyzing pavement markings aimed at reducing conflicts between motorists and cyclists, including colored lanes, shared lane markings (Fig. 4), and bike boxes (also known as advanced stop lines; Fig. 5). Some, but not all, of the studies concluded that such treatments reduced behaviors that may lead to crashes, such as motorists not yielding to cyclists. None estimated an effect on levels of bicycling. Many researchers hypothesize that if people perceive an increase in safety, they will be more likely to bicycle. Studies that included surveys of cyclists

Table 3
Integration of bicycles with public transport.

Measure	Examples and extent of implementation	Measured effects on bicycling
Parking at rail stations	Most important form of integration with public transport (PT) in Europe and Japan, with large amounts of bike parking at most suburban rail and many metro stations, often in form of bike stations (Pucher and Buehler, 2008; Fietsberaad, 2006; Dutch National Railways, 2009); massive bike parking at Japanese rail stations, with 740,000 bikes parked at Tokyo's metro and train stations every day (Harden, 2008); over 350,000 bike racks at Dutch train stations (Martens, 2007; Dutch National Railways, 2009).	Rietveld (2000), Martens (2004 and 2007), Brunsing (1997), Hegger (2007), McClintock and Morris (2003), Pucher and Buehler (in press), and Netherlands Ministry of Transport (2009) found that provision of good bike parking at PT stations increases PT use as well as levels of bicycling. TRB (2005) estimates that all forms of bike and ride are much cheaper than park and ride for access to PT stops.
Parking at bus stops	Less common and mostly restricted to northern Europe, due to lack of bike racks on buses.	No studies available.
Bike racks on buses	Most common in North America, with 72% of US buses equipped with bus racks, and 80% of Canadian buses; rare in Europe (APTA, 2008; TRB, 2005; Pucher and Buehler, in press; Thunderhead Alliance, 2007).	Most studies focus on impacts of bike racks on bus use, and find positive impacts, generating more revenues than cost of installing racks (Hagelin, 2005). Surveys of PT systems find high and increasing use of bike racks (USDOT, 1998; TRB, 2005).
Bikes on rail cars	Usually permitted during off-peak hours on most suburban rail, metro, and light rail systems in both Europe and North America; often special space on rail cars reserved for bikes, sometimes with bike racks or hooks; many systems prohibit bikes during peak hours (Pucher and Buehler, in press; TRB, 2005).	Evidence suggests high level of use but insufficient capacity to handle bikes during peak hours; no formal studies of impacts on bicycling levels, but probably positive, because it helps cyclists cover long portions of trip by PT while using their bikes to reach PT stops and access destinations (USDOT, 1998; TRB, 2005; Pucher and Buehler, in press).
Short-term rental bikes	Most widely implemented in Europe, using Smart Card technology, with OV-Fiets public transport bicycle rentals at 156 Dutch rail stations and Call-a-Bike rentals at 16 German train stations (Martens, 2007; Pucher and Buehler, 2008), but expanding with new bicycle rental systems such as Velib' in Paris, Velo'v in Lyon, and Bicing in Barcelona, with many rental stations near metro and train stations (Litman, 2009; Martens, 2007; Holtzman, 2008; DeMaio and Gifford, 2004).	Martens (2007) and Litman (2009) report increased bicycling as well as increased PT usage as a result of such rental programs.

PT, public transport.

found an increased perception of safety. Other traffic controls may also affect bicycling. For example, one study shows that a decrease in the number of stops along a route (e.g., due to stop signs or signals) increases bicycling (Rietveld and Daniel, 2004).

End-of-trip facilities and transit integration

There is consensus on the need to provide good bike parking for cyclists—especially secure, sheltered parking to prevent theft and to protect bicycles from inclement weather (AASHTO, 1999; APBP, 2002; Fietsberaad, 2006; Litman, 2009; Netherlands Ministry of Transport, 2009; Pucher, 2008; USDOT, 2007). Perhaps due to the obvious importance of bike parking, few studies have even attempted to measure the impact of bike parking on bicycling levels. Moreover, it is not clear to what extent providing parking facilities follows increased bicycling levels instead of preceding and encouraging more bicycling. The causation is almost certainly in both directions (Fietsberaad, 2006; USDOT, 2007; Netherlands Ministry of Transport, 2009).

Most of the information in Table 2 relates to the nature and extent of the various types of end-of-trip facilities. In virtually every city we reviewed, the supply of bike parking has been expanding, and many cities have been providing increasing amounts of sheltered parking, guarded parking, and state-of-the-art bike stations which provide a full range of services, including storage, rental, repair, and showers (Fig. 6). No comprehensive statistics on bike parking supply for any country were found, and most city statistics only include publicly provided parking spaces.

Some cities monitor the usage of parking facilities, but that is only an indirect reflection of bicycling rates, because bicycles can be parked for hours, days, or even weeks. There are few rigorous studies of the impacts of bike parking on bicycling levels. Using multivariate analysis of the UK's National Travel Survey—combined with stated preference survey data—Wardman et al. (2007) estimated statistically significant impacts of parking and showers on bicycling levels. Compared to a baseline level of 5.8% of work trips by bicycle, providing outdoor bike parking was estimated to raise the bicycle share to 6.3%. Secure indoor parking raised the bicycle share to 6.6%, and to 7.1% when combined with shower facilities. In a stated preference experiment, Hunt and Abraham (2007) surveyed cyclists in Edmonton, Canada and found a statistically significant impact of secure parking at the destination, equivalent to a reduction of 27 minutes of in-route bicycling time. They estimated a much smaller, but statistically significant impact of shower facilities, equivalent to a reduction of 4 minutes of in-route bicycling time.

Bike parking is one of the key aspects of integrating bicycling with public transport. As noted in Table 3, the focus in Europe and Japan has been on providing massive amounts of bike parking at rail stations. Bike parking at bus stops is far less common and is mostly found in northern Europe, where few if any buses are equipped with bike racks.

Martens (2007) surveyed the impacts of improved bike parking at both rail stations and bus stops in the Netherlands, in the context of specific pilot projects during the 1990s to improve integration of bicycling with public transport. He found significant increases in both public transport use and bicycling, but mainly for bicycle trips between home and the suburban rail station (access trip) and far less for bicycle trips between the terminal station and the activity end of the trip (egress trip). Taylor and Mahmassani (1996) estimated a strong preference of cyclists for secure parking at public transport stations, especially in the form of bike lockers.

Martens (2007) notes the success of the Dutch public transport bicycle system (OV-Fiets), which provides convenient and inexpensive short-term bicycle rentals (using automated smart card technology) for trips from major train stations to the final destinations of travelers, usually near the city center. The evidence compiled by Martens confirms that better integration of bicycling with public transport leads to more bike and ride trips, and probably to more bicycling overall.

Bicycles on buses and bicycles on rail vehicles are also important forms of integration with public transport, but no studies have explicitly measured their impact on bicycling levels (USDOT, 1998; TRB, 2005). Some public transport systems in North America (which has most of the world's rack-equipped buses) report usage rates for bike racks on their buses, but time trends are not usually provided, and the results, at any rate, would not necessarily translate into more bicycling.

Table 4
Programs and legal interventions to promote bicycling.

Measure	Description	Examples and extent of implementation	Measured effects on amount of bicycling
General Travel Programs			
Trip Reduction Programs	Employer-based programs that aim to reduce vehicle travel, usually by shifting commute mode to transit, walking, and/or bicycling. Programs, often mandated by law, may include promotions, financial incentives, and provision of facilities. Called "Travel Plans" in the UK.	Programs are common in the US in metropolitan areas with high levels of congestion and/or air quality problems.	Evaluations usually focus on reductions in vehicle travel rather than increases in bicycling. Examples in the UK show increases in bicycling: Manchester Airport tripled bicycle trips to work, with parking charges and improved bicycle access and facilities, between 1996 and 2000; in Stockley Park, bicycling more than doubled in late 1990s (Rye, 2002). A parking cash-out program in the US led to a 39% increase in walking and bicycling combined (Shoup, 1997). In a study of the "Mobility Management" policy in the Netherlands, eight employers reported increases in bicycling (1% to 8%), one no change, and one a decrease (3%) (Touwen, 1997). A "Walk in to Work Out" educational campaign that included substantial information on bicycling had no impact on bicycling at three Glasgow workplaces (Mutrie et al., 2002). One stated preference study concluded that financial incentives of £2 per day would not increase bicycle commuting (Ryley, 2006).
Individualized Marketing (also known asTravelSmart and SmartTrips)	Comprehensive marketing programs aimed at individuals in a neighborhood, school, or worksite. Programs usually involve targeted information, events, and incentives, such as transit passes or coupons to bicycle stores.	Programs were first implemented in Europe by Socialdata and targeted public transport (Brog, 1998). TravelSmart programs have been implemented throughout Australia and in a handful of US cities, though the number is increasing. More recent programs in US cities are branded under different names, such at SmartTrips in Portland, OR.	A review of before-and-after evaluations found an increase in bicycle trips in 10 of 11 Australian neighborhood programs, as well as increases in bicycling in 8 of 10 worksite programs (Australian Greenhouse Office, 2005). Evaluations of programs in Portland and other US cities found increases in the share of all daily trips made on bicycle (Brog and Barta, 2007; Cooper, 2007; Portland Office of Transportation, 2007; Socialdata America, 2005; City of Portland Office of Transportation, 2006; City of Portland Office of Transportation, 2005). In eight neighborhood programs in Australia and the US, the increase ranged from one to two percentage points (e.g., from 3% to 4% of all trips); in the other cases, the increase was less than one-half of one percentage point. Many of the programs show larger increases in walking and transit use, also targets of the marketing.
Travel Awareness Programs	A wide variety of programs designed to reduce driving and increase use of transit, walking, and bicycling, usually implemented by local governments or community organizations.	The number and variety of programs in this category appear to be growing, although no inventory is available. The "In Town Without My Car!" program, which dates back to the mid-1990s, reportedly affected over 111 million inhabitants in 1,035 participating cities and 428 supporting cities in 2003 (Cairns et al., 2004). Programs are more common in Europe than in the US.	Evaluations of media campaigns tend to focus on marketing-style outcomes— for example, how many people noticed a campaign, what they remember from it—rather than change in travel behavior. Awareness of travel behavior campaigns range from 17% to 76%; 20% to 40% is common (Cairns et al., 2004). The You-Move-NRW campaign in North Rhine-Westphalia, Germany in 2002, involving a contest for school children to propose projects to reduce driving, led to an increase in transit use but a decline in bicycling among participants (Reutter, 2004).
Safe Routes to School	Safe Routes to School (SR2S or SRTS) programs include education, encouragement, infrastructure, and enforcement programs aimed at increasing the safety and number of students walking and bicycling to school.	The movement is believed to have started in Denmark in the 1970s. Programs in the US increased in number starting in the 1990s (Boarnet et al., 2005). SRTS is now funded at the federal level, with programs in every state (Davison et al., 2008). Nearly 4,500 schools were reported to be participating in state-funded programs at the end of 2008 (National Center for Safe Routes to School, 2008).	Only a handful of studies so far measure the effects of SRTS programs on bicycling. A study in Marin County, CA, one of the earliest programs in the US, found a 114% increase in the number of students bicycling to school (Staunton et al., 2003). An examination of infrastructure projects at 10 California schools found some increasing in walking, but no observed effect on bicycling (Boarnet et al., 2005). However, only one of the schools included bicycle-specific improvements. Only four of the 125 SRTS projects reviewed in a California study have measurements of bicycling and walking activity. In only one case did the number of students bicycling to and from school change noticeably, from 23 before the project to 39 after (Orenstein et al., 2007).
Bicycling-Specific Programs			
Bike-to-Work Days	Bike-to-Work Days (BWDs) are promotional events that encourage commuters to try bicycling. Events may take place over a day, week, or month, and may include free breakfasts, giveaways, contests, and other activities.	Bike-to-Work events are popular in metropolitan areas in the US. The number of programs and the numbers of participants in individual programs have increased.	There is some evidence that BWDs increase bicycling beyond the event. The number of "first time riders" has increased in many programs: in Seattle, from 845 new commuters in 2004 to 2474 in 2008; in Portland, from 433 in 2002 to 2869 in 2008 (LAB, 2008). In San Francisco in 2008, bicycle counts at a central point were 100% higher on BWD and 25.4% higher several weeks later; bicycle share was 48.3% before BWD, 64.1% on BWD, and 51.8% afterwards (LAB, 2008). In Victoria, Australia, 27% of first time riders on BWD were still bicycling to work 5 months later (Rose and Marfurt, 2007).
Ciclovias (or "ciclovias-recreativa")	Free mass recreational programs where streets are temporarily closed to motorized traffic and reserved for use by pedestrians, runners, rollerbladers, and cyclists.	These events started in the 1960s in San Francisco, Seattle, and Sao Paolo, and gradually spread throughout the Americas (Sarmiento et al., in press). Since 2000, growth has been rapid: 25 new programs have started, for a total of 38 cities with ongoing programs in the Americas. South America	The most comprehensive study of these events reports minutes of physical activity generated by the ciclovias without distinguishing between bicycling and other means of movement (Sarmiento et al., in press). Using cross-sectional data, Cervero et al. (2009) found that proximity to ciclovia bikeways is associated with higher levels of ciclovia use. Also using cross-sectional data, Gomez et al. (2005) found an association between recreational riding on ciclovias and utilitarian cycling such as bike trips to

(continued on next page)

Table 4 *(continued)*

Measure	Description	Examples and extent of implementation	Measured effects on amount of bicycling
General Travel Programs			
Ciclovias (or "ciclovias-recreativa")		currently has the largest and most frequent ciclovias. Many other cities in the Americas, Europe, and Australia occasionally close off streets for non-motorized events, often as part of car-free days.	work. Bogota has the world's largest ciclovia, with 123 km of streets closed to cars and 700,000 to 1 million participants. Bogota's bicycle mode share has tripled as the popularity of the ciclovia has grown, but the scale of this ciclovia makes it an exceptional case (Parra et al., 2007; IDRD, 2004; IDU, 2009; Montezuma, 2005; Despascio, 2008).
Other Bicycle Promotions	Examples of other types of bicycle promotions include bicycle film festivals (Horton and Salkeld, 2006), bicycle "buses" (Bauman et al., 2008), recreational bicycle events (Bauman et al., 2008), and bicycle awareness campaigns (Greig, 2001).	Promotional programs are common in Europe, Australia, and increasingly in the US. No inventory of all such programs is available.	Recreational bicycling events have led to increased levels of bicycling for participants (Bowles et al., 2006; Godbold, 2005). The Cycle Instead campaign in Perth, Australia, involved two 30-second commercials, shown over a period of 4 weeks, plus supporting activities (e.g., community events) and media (e.g., newspaper ads, giveaway items); bicycling among surveyed respondents increased from 29% to 36% (Greig, 2001). A program in Davis, CA to promote bicycling to youth soccer games appears to have led to an increase in bicycling (Tal and Handy, 2008).
Education/Training	A variety of programs designed to increase bicycling skills and knowledge of bicycling laws.	In the US, the League of American Bicyclists certifies trainers for six different courses; 200 instructors were certified in 2005. Other education/training programs are offered by local governments and community organizations. No inventory of all such programs is available.	There are few rigorous evaluations of bicycling skills programs and their impact on bicycling, but evidence shows an increase in skills and confidence. An evaluation of a program run by Central Sydney Area Health Service showed that 56% of participants were bicycling more two months after the program (Telfer et al., 2006).
Bicycle Access Programs			
Bicycle Sharing Programs	These programs offer short-term rentals for a nominal fee and sometimes require a one-time or annual membership fee. Bicycles can be picked up and returned at designated spots around the city, usually through an automated system.	Bicycle sharing programs have evolved through three generations since the 1960s, starting with a free bicycle program established in Amsterdam in 1964. Recent programs employ advanced technology to provide access to bikes and to track them. Bicycle sharing programs are already operating in 89 European cities and are now spreading to cities elsewhere in the world, including the US (DeMaio, 2009a and 2009b).	Evaluations focus on use of the program rather than impact on bicycling overall. Rentals per bicycle per day average 5–12 in Paris, 6.4 in Lyon, and 6 in Barcelona (Ecoplan, 2009; DeMaio, 2009a; Holtzman, 2008; Buehrmann, 2008). Estimated trips generated per day by bicycle sharing range from 19,100 in Lyon, to 30,000 in Barcelona and 70,000–145,000 in Paris. (Ecoplan, 2009; DeMaio, 2009a; Bonnette, 2007). Evidence on increases in bicycle mode share after implementation of bicycle sharing programs is confounded by improvements in bicycling facilities made at the same time. Bicycle share reportedly increased from 0.75% in 2005 to 1.76% in 2007 in Barcelona (Romero, 2008), from 1.0% in 2001 to 2.5% in 2007 in Paris (Nadal, 2007; City of Paris, 2007), and from 0.5% in 1995 to 2% in 2006 in Lyon, with a 75% increase in bicycle counts from 2005 to 2007 (Bonnette, 2007; Velo'v, 2009). In London, 68% of OYBike trips were for leisure or recreation; 6% of users reported shifting from driving and 34% from transit, while 23% said they would not have travelled (Noland and Ishaque, 2006).
Other Access Programs	Programs to increase bicycle access include giveaway programs, loaner programs, fleet programs, and service and repair programs.	No inventory of such programs is available.	In the BikeBus'ters pilot project in Arhus, Denmark in 1995–1996, participants were given a new bicycle and bus tickets free for a year, as well as other services, in exchange for signing a contract promising to reduce driving; bicycling for "everyday trips" increased from 8% to 40%, while bicycling to work increased from ~15% to ~60% (Bunde, 1997; Overgaard-Madsen et al., in press). In the Cycle 100 program in Australia, 100 participants given a mountain bicycle and equipment replaced 12,000 km of commuting by car with bicycling (Bauman et al., 2008).
Legal Interventions			
Helmet Laws	Helmet laws require cyclists of all ages or of specified ages (e.g., under 18 years old) to wear helmets.	In the US, helmet laws were first adopted by state and local governments in 1985. There are 22 state and at least 192 local helmet laws; only 14 states have no state or local laws (Bicycle Helmet Safety Institute (BHSI), 2009). In Australia, helmets are mandatory in all states and territories. Helmets are generally not required in European countries.	Mandatory helmet laws have been shown to increase helmet use but also to reduce bicycling. Studies in Australia in the 1990s found declines in bicycle counts one year after the implementation of a helmet law of 36% in Melbourne, 36% in New South Wales, and 20% in Perth (Clarke, 2006; Robinson, 2006).
Speed Limits	Reduced speed limits for vehicle traffic to improve safety for cyclists and pedestrians and to improve environmental quality (e.g., reduce noise).	Reduced speed limits are often put in place as a part of traffic calming programs (see Table 1). The Department for Transport in the UK has promoted 20 mph zones.	Reduced speed limits for vehicles potentially increase bicycling in two ways: by increasing the speed of bicycling relative to the speed of driving, and by increasing the safety of bicycling. In Graz, Austria a general 30 km/hr speed limit reduced bicyclist accidents by 4% (Sammer, 1997). Widespread automobile speed limits in Hilden, Germany led to a significant increase in bicycling (Bauman et al., 2008). Studies in the UK show an increase in willingness of residents to bicycle but no evidence of an actual increase in bicycling in 20 mph zones (Babtie Group, 2001).

BWD, Bike-to-Work Day(s).

Fig. 1. Cycletrack in Copenhagen, separated from motor traffic by a curb, and in Paris, separated by curb and parking (photos by P. Berkeley and J. Dill).

In short, the few available studies confirm the logical assumption that better bike parking and better integration of bicycling with public transport encourage more bicycling. But the empirical evidence is limited to a few cities, making the results difficult to generalize.

Programs

Programmatic interventions aim to increase bicycling through promotional activities, media campaigns, educational events, and other means (Table 4). Many programs target travel in general, with the goal of reducing vehicle travel by shifting trips to transit, walking, or bicycling. Examples include trip reduction programs, individualized marketing programs, and travel awareness programs, generally focusing on adults. Safe Routes to School programs focus on children, although infrastructure improvements near schools could also influence adult behavior (Watson and Dannenberg, 2008). Programs that target bicycling specifically include Bike-to-Work Days (or weeks or months) and other promotions, as well as training events.

Evidence on the effect of general travel programs on bicycling is slim. Most evaluations focus on vehicle trip reduction, and impacts on bicycling are often not reported or even measured. The few studies

Fig. 2. Contraflow lane in Copenhagen (photo by J. Dill).

Fig. 3. Bicycle boulevard in Portland, OR with speed hump and traffic circle to slow and divert motor vehicles (photo by J. Dill).

available suggest limited impacts on bicycling, even when programs have a significant effect on vehicle travel; increases in transit use and walking exceed increases in bicycling, in all studies reviewed. Safe Routes to School programs have emphasized walking more than bicycling, and only one study showed a significant increase in the number of students bicycling to school (Staunton et al., 2003).

The findings for bicycle-specific programs are more encouraging, though few rigorous evaluations of these programs are available. Participation in Bike-to-Work Days is increasing in many cities, particularly by new bicycle commuters. In San Francisco, bicycle counts remained 25.4% higher one month after the event (LAB, 2008); in Victoria, Australia, over one quarter of first-time cyclists were still bicycling five months later (Rose and Marfurt, 2007). Other events and promotions have also led to an increase in bicycling. One study shows a lasting effect of a bicycling skills program (Bauman et al., 2008). “Ciclovias” are events where streets are temporarily closed to motor traffic, usually on weekends. They have become more common throughout the Americas and attract large numbers of bicyclists (Sarmiento et al., in press). One study in Bogota found that riding in ciclovias was associated with more utilitarian cycling as well (Gomez et al., 2005).

Fig. 4. Shared lane marking in Columbia, MO (photo by J. Dill).

Bicycle access

People cannot bicycle if they do not have access to a bicycle, and studies show that the availability of a bicycle in a household is the strongest single predictor of bicycling for transportation (Cervero et al., 2009). Several different kinds of programs aim to increase access to bicycles, either through facilitating ownership or enabling temporary use of a bicycle (Table 4). Bike sharing programs, sometimes called city bike programs, have grown in popularity throughout the world.

The impacts of these programs are hard to assess, as they are often accompanied by expansion of the bicycle network in anticipation of increased bicycling. Available studies show that these programs are well used and that bicycling has increased in cities that have implemented bike sharing programs. The proportion of trips by bicycle increased from 0.75% to 1.76% in Barcelona (Romero, 2008) and from 1.0% to 2.5% in Paris (Nadal, 2007; City of Paris, 2007). In Lyon, bicycle counts increased 75% after implementation of the Velo'v program, with bicycle proportion of trips reaching 2% in 2007 (Bonnette, 2007; Velo'v, 2009). A study of the OYBike in London showed that 40% of users shifted from motorized modes (Noland and Ishaque, 2006). These results are confounded, however, by improvements in bicycling facilities implemented at the same time as the bike sharing program. Programs in which participants are given bicycles have also led to an increase in bicycling.

Legal issues

Traffic laws may affect bicycling in different ways (Table 4). Bicycle helmet laws have been controversial. Helmets can help prevent head injuries in falls and crashes, but laws requiring helmet use have been shown to reduce bicycling (Clarke, 2006; Robinson, 2006). Reduced speed limits for motor vehicles increase bicycling in two ways: by increasing the speed of bicycling relative to the speed of driving, and by increasing the safety of bicycling. Most studies, though not all, show an increase in bicycling with lower automobile speed limits.

Case studies of comprehensive packages

It is difficult to isolate the separate impacts of individual policy interventions designed to promote bicycling. For example, the impacts of improved bike parking, bicycling training, and individualized

Fig. 5. Bike box in Portland, OR (photo by N. McNeil).

marketing are probably influenced by the extent and quality of the bikeway network. Similarly, bike-to-school and bike-to-work programs are more likely to be successful in traffic-calmed residential neighborhoods. In short, measures to promote bicycling are expected to be interactive and synergistic.

Case studies provide an opportunity to examine the impacts of packages of mutually supportive pro-bicycle policies. Table 5 summarizes case studies of 14 cities that implemented a wide range of measures to increase bicycling and improve safety. Most of the information comes from detailed case studies of bicycling trends and policies published in Fietsberaad (2006), Pucher and Buehler (2007), Buehler and Handy (2008), and Buehler and Pucher (2009). Some of the information, however, is based on data collected from primary sources for this review (see Table 5 for details).

The most important message from Table 5 is that some cities, even very large cities, have dramatically raised bicycling levels while also improving bicycling safety. Berlin, for example, almost quadrupled the number of bicycle trips between 1970 and 2001 and doubled the bicycle share of trips from 5% in 1990 to 10% in 2007. In spite of the sharp rise in bicycling, serious injuries in Berlin fell by 38% from 1992 to 2006. In only six years, the bicycle share of trips within the City of Paris more than doubled from 1% in 2001 to 2.5% in 2007. The bicycle share of trips in Bogota quadrupled from 0.8% in 1995 to 3.2% in 2006. The total number of bicycle trips in London

Fig. 6. Bike station in Muenster, Germany (photo by P. Berkeley).

Table 5
Case studies of cities implementing multiple interventions.

City (population)	Trends in bicycling levels and safety	Bicycling infrastructure and programs	References
London, UK (7,557,000)	Doubling in total number of bicycle trips from 2000 to 2008 (+99%) and 12% reduction in serious bicyclist injuries over same period. After implementation of congestion charging in 2003, average annual growth of 17% in bicycle trips between 2003 and 2006, and increase in bicycle share of all trips (all trip purposes) from 1.2% to 1.6%.	• Development of London Bicycling Network since 2000, mainly through bike routes on lightly traveled streets, but also selective installation of bike lanes, bus-bike lanes, contraflow bike lanes, and mixed-use pedestrian/bike paths: 4,000 km total length, of which 550 km are special facilities of some sort, but not usually-separated from traffic • Traffic calming of some residential neighborhoods through roadway design modifications and 20 mph speed limit; installation of many pass-throughs (short-cuts) for cyclists and pedestrians to provide more convenient, faster connections • 640 intersections were modified via advance stop lines (bike boxes) for cyclists; some intersections offer bike turning lanes and special marking of lanes where crossing intersection; cyclist-activated traffic signals at some intersections • Installation of over 65,000 bike parking spaces since 2000, of which 15,000 have been at London schools, and over 5,000 additional spaces at public transport stops • Widespread introduction of bicycling training since 2000, now in all 33 boroughs, at over 600 schools in London in 2008 • Over 100 Transport for London (TfL) and London Cycling Campaign (LCC) community bicycling projects to promote bicycling among specific target groups • Over 3 million copies of TfL/LCC bike route maps distributed free of charge • Congestion charging in Central London, begun Feb 2003, imposing £5 per day fee for private cars, between 7:00 and 18:30 on workdays, raised to £8 in Feb 2005; expansion of charging zone in Feb 2007, 7:00–18:00	Transport for London (2004b, 2008a,b)
Bogota, COL (7,881,000)	Increase in bicycling share of trips from 0.8% in 1995 to 3.2% in 2003; participation in ciclovia grew from 5,000 in 1974 to over 400,000 in 2005.	• From 1998 to 2000, 344 km of separate bike paths built, connecting to public transport and major destinations • Ciclovia: closure of 121 km of roadways to cars on Sundays and holidays, used mainly for bicycling • Car-free day, first Thursday of February, starting in 2000 • Restrictions on motor vehicles on certain days of the week depending on license plate numbers (“pico y placa”) • Creation of extensive car-free zones and streets; removal of cars from many public spaces; restrictions on car parking • Extensive educational campaign to raise environmental awareness and improve motorist behavior toward cyclists and pedestrians	Parra et al. (2007); IDRD (2004); IDU (2009); Montezuma (2005); Despascio (2008); Cervero et al. (2009)
Berlin, GER (3,400,000)	Total number of bicycle trips almost quadrupled from 1975–2001 (275% increase); bicycle share increased from 5% of trips in 1990 to 10% in 2007; 38% decline in serious injuries 1992–2006.	• Network of separate bicycling facilities tripled from 271 km in 1970 to 920 km in 2008; also 70 km of bus-bike lanes and 100 km of shared-use paths • 3,800 km of residential streets (72% of all roads) are traffic calmed at 30 km/hr or less, including many home zones with 7 km/hr limit • Internet bicycle trip planning site tailors routes to range of preferences • 22,600 bike parking spots at regional rail and metro stations • Mandatory bicycling education for all schoolchildren • Call-a-bike program of German railways has over 3,000 bikes available for short-term rental at train stations, unlocked for use via mobile phones • Wide range of special bicycle rides, promotional events	City of Berlin (2003); Pucher and Buehler (2007)
Paris, FR (2,168,000)	Increase in bicycle share of trips within City of Paris from 1% in 2001 to 2.5% in 2007; 46% increase in bicycle trips from June to October 2007 after introduction of Velib' bicycle sharing program.	• Bike lane network more than tripled from 122 km in 1998 to 399 km in 2007 • Tripling of bicycle parking on sidewalks from 2,200 in 2000 to 6,500 in 2007 • Started Velib' in 2007, world's largest bicycle sharing program, now with over 20,000 short-term rental bikes • Introduction of 38 “quartiers verts” (green zones), extensive traffic-calmed areas of the city with speed limits of 30 km/hr or less, car-free zones, narrowed roadways and widened sidewalks, and six “civilized travel corridors” of restricted motor vehicle access • National Ministry of Education and insurance companies cooperate to provide extensive bicycling training courses in many schools, with bicycle safety permits issued in 5th grade • Regular series of intensive bicycling training courses for adults offered twice a month in alternating arrondissements throughout Paris • Advance stop lines and priority traffic signals for cyclists at many intersections • Improved, uniform directional street signage for cyclists and special bicycle map and website to provide advice for best bicycle routes within Paris • Free program for engraving registration numbers on bikes to discourage theft • Elimination of free car parking throughout Paris	City of Paris (2007, 2009a, and 2009b); Nadal (2007)
Barcelona, SP	Bicycle share more than doubled in only two years:	• Expansion of bike lane network from less than 10 km in 1990 to 155 km in 2008 (expanded by 28 km,	Romero (2008)

(1,606,000)	0.75% of trips in 2005 to 1.76% in 2007.	2007–2008) • Introduction of Bicing bicycle sharing program in 2005, since expanded to 6,000 short-term rental bikes in 2008, with over 400 bike rental stations • Extensive marketing in schools, combined with annual bike week with lots of special events, bicycle rides, informational workshops, etc. • Increased bike parking throughout city: 13,000 additional racks in 2007 and 2008, total of 20,392 in 2008 • Introduction of four traffic calmed zones with 30 km/hr speed limits • Free bicycle registration and engraving of numbers on bikes to prevent theft	
Amsterdam, NL (735,000)	Bicycle share increased from 25% of trips in 1970 to 37% in 2005; 40% decline in serious injuries, 1985–2005.	• Doubling of separate bicycling facilities between 1980 and 2007, with 450 km in 2006, including construction of many bicycle bridges and short-cuts to create a complete network of separate bicycling facilities • Intersection improvements, advance stop lines and bike boxes, bicycle access lanes, priority traffic signals for cyclists • Bi-directional travel permitted for cyclists on many one-way streets • Extensive bike parking at all train stations; big expansion of guarded, sheltered bike parking • Ov-fiets (public transport bikes) for convenient, cheap, short-term rental at key train stations • Car-free zones in city center; many residential streets are traffic calmed at 30 km/hr, including some woonerfs ("living yards") with 7 km/hr limit • Sharp reduction in car parking in city center • Mandatory bicycling education for all schoolchildren	Fietsberaad (2006); Pucher and Buehler (2007)
Portland, OR (576,000)	Share of workers commuting by bicycle rose from 1.1% in 1990 to 1.8% in 2000 and 6.0% in 2008. Number of workers commuting by bicycle increased 608% from 1990 to 2008, while the number of workers increased only 36%. The number of bicycles crossing four bridges into downtown increased 369% from 1992 to 2008. Number of reported crashes increased only 14% over same period.	• A 247% increase in the number of miles of bikeways (lanes, paths, and boulevards) from 79 in 1991 to 274 in 2008 • Colored bike lanes installed at several places of potential bicycle–motor vehicle conflict, assigning right of way to the cyclist • Special bicycle-only signals at four difficult intersections. Loop detectors for bicycles at all actuated traffic signals on bicycle routes. Bike boxes at 10 intersections. • Bicycle parking required in new development. City installs parking at other locations, including removing on-street parking for bicycle parking "corrals." • Bike racks on all transit buses, and bikes allowed on trains • First "Bike Sundays" held in 2008, closing city streets in one neighborhood to motor vehicles, similar to ciclovias • Education and marketing events conducted year-round and during SmartTrips program each summer. City-wide and neighborhood bicycle maps provided for free.	US Census (2009), City of Portland (2008a and 2008b)
Copenhagen, DK (500,000)	Bicycle share increased from 25% of trips in 1998 to 38% in 2005 for 40+ age group; 70% increase in total bicycle trips 1970–2006 (36% of work trips in 2006); 60% decline in serious injuries 1995–2006.	• Since 1970s, massive expansion of fully separate bike paths and cycletracks protected by curb from motor vehicle traffic (345 km in 2004) plus 14 km of unprotected bicycle lanes • Special intersection modifications: advance stop lines and bike boxes, bicycle access lanes, priority traffic signals for cyclists, bright blue marking of bike lanes crossing intersections • Green wave for cyclists, with traffic signals timed to cyclist speeds • Bi-directional travel permitted for cyclists on one-way streets • Guarded parking facilities increased from one in 1982 to 30 in 2006; 15 schools had guarded bike parking • Car-free zones and reduced car parking in city center; many residential areas are traffic calmed at 30 km/hr or 20 km/hr • Mandatory bicycling education for all schoolchildren • Over 20,000 bike parking spaces (but not enough) • Innovative bi-annual survey of cyclists to evaluate bicycling conditions • Pioneered city bikes program, which places 2,000 free bikes at 110 locations throughout the city; only small deposit required	Pucher and Buehler (2007); Fietsberaad (2006)
Muenster, GER (278,000)	Bicycle share of trips increased from 29% in 1982 to 35% in 2001; one serious injury per 1.03 million bicycle trips in 2001.	• More than doubled network of separate bike paths and lanes from 145 km in 1975 to 320 km in 2005, including 5 km bicycle expressway and 12 bicycling streets • Large car-free zones in city center; almost all residential streets traffic calmed at 30 km/hr, including home zones calmed to 7 km/hr; many contraflow streets for cyclists • Intersections with advance stop lines and bike boxes for cyclists, advance green lights, bicycle turning lanes, and special bicycle access lanes, as well as special colored marking of lanes crossing intersection • Bike station at the main train station and bus terminal, with parking for 3,500 bikes plus bike rentals, repairs, accessories, washing, and touring information. Also, large amounts of bike parking at all suburban rail stations throughout the city and region; bike station with 300 spaces in shopping district. • Comprehensive system of directional signs • Mandatory bicycling education for all schoolchildren • Wide range of special bicycle rides, promotional events	Pucher (1997); Pucher and Buehler (2007); Fietsberaad (2006); Boehme (2005); City of Muenster (2004)

(continued on next page)

Table 5 (continued)

City (population)	Trends in bicycling levels and safety	Bicycling infrastructure and programs	References
Freiburg, GER (220,000)	Bicycle share increased from 15% of trips in 1982 to 27% in 2007; 204% growth in bicycle trips 1976–2007; one serious injury per 896,000 bicycle trips in 2006.	• Expanded separate bicycle paths and lanes from 29 km in 1972 to 160 km in 2007, plus 120 km of bicycle paths through woods and agricultural areas; 2 km of special bicycling streets; 60 contraflow streets for cyclists • Entire city center turned into car-free zone in 1970s; all residential streets (400 km) traffic calmed, including 177 home zones with 7 km/hr limit; plus two car-free residential neighborhoods • Car parking restricted to fringe of city center; parking prices raised • Tripling in bike parking between 1987 and 2009 (2,200 to 6,040 spaces), including full service bike station (with 1,000 parking spaces) at main train station, plus 1,678 bike racks at train and bus stops • City requires new developments to facilitate mixed-use, compact development that generates trips short enough to walk or bicycle • Mandatory bicycling education for all schoolchildren	Pucher (1997); Pucher and Clorer (1992); Buehler and Pucher (2009); Gutzmer (2006); Fietsberaad (2006)
Odense, DK (185,000)	Bicycle share of trips increased from 23% in 1994 to 25% in 2002; 80% increase in bicycle trips 1984–2002; 29% decline in injuries 1999–2004.	• National bicycling city pilot project, 1999–2002, financed huge range of innovative measures to promote bicycling and increase safety • Design improvements to 500 km of separate bike paths and lanes • Many intersections modified via advance stop lines and bike boxes for cyclists, advance green lights, bicycle turning lanes, and special bicycle access lanes, as well as special blue marking of lanes where crossing intersection • Improved signage, bicycle trip counters, bicycle air pumps, free bikes at work • Green wave for cyclists, with traffic signals timed to cyclist speeds • Improved maintenance of all bicycling facilities • Expansion and improvement of bike parking, especially at main train station • Innovative Internet bicycle route planning, also via mobile phones • Car-free zones in city center and traffic calming of residential neighborhoods at 30 km/hr • Mandatory bicycling education for all schoolchildren • Wide range of promotional programs for all age groups, bicycling ambassador program, annual bicycle days, bicycling competitions, etc.	Andersen (2005); City of Odense (2007); Fietsberaad (2006); Pucher and Buehler (2007)
Groningen, NL (181,000)	Stable 40% bicycle share of trips since 1990; 50% decline in serious injuries 1997–2005.	• Separate bicycling facilities doubled to 220 km between 1980 and 2006, including construction of bicycle bridges and short-cuts to create a complete network of separate bicycling facilities • Intersection modifications, advance stop lines and bike boxes, bicycle access lanes, priority traffic signals for cyclists; four-way green lights for cyclists at some intersections • Bi-directional travel permitted for cyclists on one-way streets • Increase in guarded parking facilities, from one in 1982 to 20 by 1995 and 30 in 2006; 15 schools with guarded bike parking • Extensive bike parking at all train stations and key bus stops; roughly 7,000 bike parking spaces at main station • Most residential streets are traffic calmed at 30 km/hr, including many woonerfs with 7 km/hr limit • Car-free zones in several parts of the city center; sharp reduction in car parking • Mandatory bicycling education for all schoolchildren	Fietsberaad (2006); Pucher and Buehler (2007)
Boulder, CO (92,000)	Share of workers commuting by bicycle more than doubled, from 3.8% in 1980 to 8.8% in 2006; bicycle share of all trips (all purposes) rose from 8% in 1990 to 14% in 2006.	• Over 100 miles of multi-use pathways with 74 underpasses and 2 overpasses, plus 74 miles of on-street bike lanes and 195 miles of signed routes and streets with paved shoulders; 95% of major arterials have bike lanes or adjacent pathways. • City regulations requiring bike parking (at least 3 bike parking spaces or 10% of off-street parking) • Bike-to-Work Day events since 2003; Safe Routes to School partnership with local school district • Interactive bicycle routing website and an individualized marketing program • Coordination of transportation coordinators at local businesses • Ambassador Community Outreach Program focused on improving bicycle safety	NRC (2007); Ratzel (2008); Roskowski and Ratzel (2008)
Davis, CA (63,000)	Drop in share of workers commuting by bicycle from 28% in 1980 to 14% in 2000; bicycle share of trips to campus by university students fell from 75% in 1970s to less than 50% in 2006.	• First city in the US to install bike lanes, in the 1960s • From 1970 to 2008, network expanded to over 50 miles of on-street bicycle lanes and 50 miles of off-street bicycle–pedestrian paths, including many bicycle tunnels and bridges • Intersection design improvements for cyclists, including bicycle-activated signals, special turn lanes, advance stop lines, etc. • During 1970s, city support for wide range of bicycling programs, including subsidized helmet programs, elementary school education programs, removal of abandoned bikes from racks, and strict enforcement of traffic laws • Gradual reduction in bicycling programs since mid-1980s	Buehler and Handy (2008); Xing and Handy (2009); Tal and Handy (2008); Pucher et al. (1999)

doubled between 2000 and 2008, while bicyclist injuries fell by 12% over the same period. Amsterdam raised the bicycle share of trips from 25% in 1970 to 37% in 2005; serious bicyclist injuries fell by 40% between 1985 and 2005. From 1995 to 2003, the bicycle share of trips in Copenhagen rose from 25% to 38% among those aged 40 years and older. Yet, there was a 60% decline in serious injuries. Between 1990 and 2008, the number of workers commuting mainly by bicycle in Portland, Oregon increased over 600%, while the share of workers commuting by bicycle rose from 1.1% to 6.0%.

Of the medium-sized cities in Table 5, Freiburg, Germany reported the largest increase in bicycling, almost doubling the bicycle share of trips from 15% in 1982 to 27% in 2007. Modest growth was reported for Muenster, Germany (from 29% to 35% of trips); Odense, Denmark (23% to 25%); and Groningen, Netherlands (stable at around 40%). These data suggest that it may be difficult to increase bicycling beyond already high levels. In both Odense and Groningen, however, the number of serious bicycling injuries fell sharply.

The two smallest cities shown are both in the US and provide interesting contrasts. In Boulder, Colorado, the share of workers commuting by bicycle rose from 3.8% in 1980 to 6.9% in 2000 and 8.8% in 2006 in response to an aggressive program of bikeway expansion and complementary pro-bicycle measures. By comparison, the share of workers commuting by bicycle in Davis, California fell from 28% in 1980 to 14% in 2000, in spite of extensive bikeways and bike parking. The decline of bicycling to work in Davis is mainly attributable to a sharp increase in long-distance commuting to jobs in other cities in the Sacramento and San Francisco areas.

The 14 cities showcased in Table 5 are not necessarily representative, but they illustrate a wide range of policy interventions. With so many measures integrated into the pro-bicycle policy package of each city, it would be virtually impossible to disentangle the impacts of each individual measure. Only in the case of the bike sharing programs in Paris (Velib') and Barcelona (Bicing) can one identify a particular measure that appears to have been most important. Even in Paris and Barcelona, however, several other pro-bicycle interventions were undertaken before and during the bicycle sharing program, including expansion of the bikeway system and bike parking, bicycling education, and traffic calming. Congestion charging in central London (assessing a daily fee for entering a 21-sq.km zone) has been widely credited for increased bicycling there, but it is only one of many programs listed in Table 5 that have encouraged more bicycling since 2000 (Transport for London, 2008a,b).

Discussion

This review summarizes the available evidence on the impacts of a wide variety of bicycling interventions around the world. Most of the studies we surveyed suggest positive impacts of such interventions on bicycling levels. As noted by Ogilvie et al. (2004) in their review of pedestrian and bicycle interventions, "It is difficult to change long-standing and complex patterns of behavior so the evidence that some in-depth, targeted interventions have achieved any measurable shift is encouraging." Moreover, the lack of evidence of a positive effect of some specific interventions is not the same as evidence of a lack of positive effect.

Our review reveals considerable variation in estimated impacts, both by type of intervention and by study design, location, and timing. That makes it difficult to generalize about the effectiveness of individual interventions or of bicycle interventions as a whole. Moreover, measures of bicycling (e.g., number of cyclists, number of bicycle trips, share of trips by bicycle, etc.) are not consistent across studies, making comparisons of estimated impacts difficult. Complicating matters further, some studies do not adequately explain their measures and methods, so it is difficult to assess whether variations across studies are simply an artifact of different methods used rather than a true difference in impacts. Non–peer-reviewed studies conducted by government agencies on their own interventions or by non-governmental organizations that advocate for bicycling policies may raise concerns about potential bias in the reporting of results.

The crucial limitation, however, is that most studies fall far short of the ideal research design for evaluating interventions, involving before-and-after measurements of a "treatment" and a "control" group (Krizek et al., 2009). As a result, these studies do not adequately address the direction of causality, such as whether bicycling infrastructure led to increased levels of bicycling or whether bicycling demand led to investments in bicycle infrastructure. Without an experimental design, it is difficult or impossible to control for other relevant factors such as cost and convenience of car use, income levels, urban form, and other factors that might be more important in affecting bicycling levels than explicitly pro-bicycle policies. In addition, many of the studies we have cited come from the "gray literature" and have not undergone a peer-review process that would provide some assurance of their rigor. Due to these many limitations, the empirical results summarized in this review should be viewed with caution.

Several factors probably moderate the effects of bicycling interventions. For example, land use planning in northern Europe is regionally coordinated and generally restricts low-density, car-oriented sprawl (Schmidt and Buehler, 2007). By promoting compact, mixed-use development, European land use policies generate shorter trip distances, which are more readily covered by bicycle. Restrictions on car use also affect bicycling. The much higher cost of car ownership and use in northern Europe encourages bicycling, especially combined with limited car parking, car-free zones, comprehensive traffic calming, and lower overall speed limits, which reduce the overall convenience and attractiveness of car use (Pucher and Buehler, 2008). The lack of such car-restrictive policies in the US probably reduces the impacts of policy interventions to increase bicycling.

The current level of bicycling in a community also affects bicycling safety and the potential to further increase bicycling. Several studies have demonstrated the principle of "safety in numbers." Using both time-series and cross-sectional data, the studies find that bicycling safety is greater in countries and cities with higher levels of bicycling, and that bicycling injury rates fall as levels of bicycling increase. As the number of cyclists grows, they become more visible to motorists, which is a crucial factor in bicycling safety. In addition, a higher percentage of motorists are likely to be bicyclists themselves, and thus more sensitive to the needs and rights of bicyclists. The presence of large numbers of bicyclists may also help underpin their legal use of roadways and intersection crossings and generate public and political support for more investment in bicycling infrastructure (Elvik, 2009; Jacobsen, 2003; Robinson, 2005).

Culture, custom, and habit tend to foster bicycling in cities with high levels of bicycling but deter bicycling—especially among non-cyclists—in cities with low levels of bicycling, where it is viewed as a fringe mode (Pucher et al., 1999; de Bruijn et al., 2009). Non-cyclists in bicycle-oriented cities may respond differently to policy interventions than non-cyclists in cities with little bicycling. Research has found that non-cyclists who are surrounded by other cyclists may be more likely to have contemplated cycling and thus more responsive to policy interventions (Gatersleben and Appleton, 2007). Thus, the very same infrastructure provision, program, or policy might have different impacts on bicycling in different contexts, making it risky to generalize about the effectiveness of any individual measure.

In addition, there are important limitations to the evidence provided in the studies we surveyed that may mask the full effects of any particular intervention. The small estimated impacts of some of the specific infrastructure improvements examined in this review should not be misinterpreted as justification for not undertaking incremental steps toward a full system. Infrastructure measures are almost always implemented in stages, not all at once. Many studies we examined only measured the impacts of incremental expansions and did not capture the full impact of a completed system. That might account for the small estimated impacts of some specific infrastructure improvements. A complete system of bicycling infrastructure (e.g., lanes, paths, cycletracks, bike boxes, traffic signals, parking, etc.) may have far more impact than the sum of its individual parts. Similarly, some specific programs might appear to have negligible impact when examined in isolation but significant impact when implemented comprehensively. Even more important, a coordinated package of complementary infrastructure measures, programs, and policies may enhance the impact of any intervention that is a component of that package.

Indeed, the most compelling evidence we found came from communities that have implemented a fully integrated package of strategies to increase bicycling. The cases reviewed here suggest that a comprehensive approach produces a much greater impact on bicycling than individual measures that are not coordinated. The impact of any particular measure is enhanced by the synergies with complementary measures in the same package. In that sense, the whole package is more than the sum of its parts. However, the more successfully a city implements a wide range of policies and programs simultaneously and fully integrates them with each other, the more difficult it becomes to disentangle the separate impacts of each measure. Both the apparent success of the comprehensive approach and the complexity of dissecting its effects point to a need for a meta-level approach to evaluation that examines the impacts of different sets of strategies across a large number of cases, taking into consideration the potential moderating factors in each of the cases examined, rather than a focus on the impacts of specific interventions in isolation.

It is also important to note the small number of studies, whether peer-reviewed or from the gray literature, for many of the interventions we examined. The vast majority of interventions do not include an evaluation component that would provide evidence of the impact of the intervention on the amount of bicycling. Public agencies and other organizations implementing interventions should collect before-and-after data on bicycling to facilitate the analysis of effectiveness. The development of standardized instruments to measure bicycling (e.g., household survey instruments, or protocols for bicycling counts) would facilitate data collection for resource-strapped agencies and organizations. Ideally, these groups should work with academic researchers in designing and carrying out the evaluation, including data collection and analysis, and would publish the results through the peer-review process. Research funding targeted at evaluating interventions through such partnerships would help to build a reliable and valid evidence base.

Despite all these caveats and the pressing need for additional research, a clear message emerges from our review: Some individual interventions can increase bicycling to varying degrees, but the increases are not usually large. That does not mean that individual interventions are not important, but they are most effective as a part of a more comprehensive effort. Substantial increases in bicycling require an integrated package of many different, complementary interventions, including infrastructure provision and pro-bicycle programs, as well as supportive land use planning and restrictions on car use.

There are many role models for cities to follow, as suggested by Table 5. Indeed, Bogota became a bicycling success story by importing Dutch bicycle planners and adopting many of the pro-bicycle measures found in the Netherlands. But it added its own particularly South American program of ciclovias. Cities with successful bicycling policies can be found in many countries, providing experience about the most appropriate package of policies for local conditions.

Virtually all the available evidence indicates that policies make an important difference: not only explicitly pro-bicycle policies but also transport policies in general, housing and land use policies, and car pricing and restraint policies. Designing the appropriate mix of policies for each city's particular situation requires careful planning and ongoing citizen input, especially from bicyclists. Emphasizing the proven health benefits of bicycling will be key to garnering the public and political support necessary to implement a truly comprehensive package of policies. That multifaceted, coordinated approach offers the promise of substantial growth in bicycling, even in cities with low bicycling levels.

Conflict of interest statement

All authors declare that they have no conflict of interest.

Acknowledgments

The authors would like to thank Lisa Dewey-Mattia and Mallory Atkinson, who assisted in gathering materials for the review, and Emmanuel de Lanversin, Rose Ades, and Bernhard Gutzmer for contributing information on the case studies of Paris, London, and Freiburg. Jan Garrard, Jim Sallis, Nick Cavill, Ralph Buehler, Andrew Dannenberg, Michael Pratt, Peter Jacobsen, Olga Sarmiento, and four anonymous referees provided extensive feedback on earlier drafts that greatly improved the final version. This review was financed by a grant from the Active Living Research program of the Robert Wood Johnson Foundation.

References

AASHTO, 1999. Guide for the development of bicycle facilities. American Association of State Highway and Transportation Officials, Washington, DC. Accessible at: http://www.wsdot.wa.gov/bike/pdf/bikebook.pdf.

Abraham, J.E., McMillan, S., Brownlee, A.T., Hunt, J., 2002. Investigation of cycling sensitivities. 81st Annual Meeting of the Transportation Research Board. Transportation Research Board, Washington, DC.

Akar, G., Clifton, K.J., 2009, in press. The influence of individual perceptions and bicycle infrastructure on the decision to bike. Transp Res Rec.

Allen, D., Bygrave, S., Harper, H., 2005. Behaviour at cycle advanced stop lines. Published project report. Transport Research Laboratory, London, England.

Alrutz, D., Angenendt, W., Draeger, W., Gundel, D., 2002. Traffic safety on one-way streets with contraflow bicycle traffic. Translated by J.S. Allen from pdf from Strabenverkehrstechnik, June 2002. Accessible at: http://www.bikexprt.com/research/contraflow/gegengerichtet.htm.

Alta Planning + Design, 2004. San Francisco's shared lane pavement markings: Improving bicycle safety. Final report. San Francisco Department of Parking & Traffic, San Francisco, CA.

Anderson, L., Schnor, P., Schroll, M., Hein, H., 2000. All-cause mortality associated with physical activity during leisure time, work, sports, and cycling to work. Arch. Intern. Med. 160, 1621–1628.

Andersen, T., 2005. Odense: The national cycle city of Denmark. PowerPoint presentation. Annual Conference of the Bicycling Federation of Australia. Brisbane, Australia. October 6, 2005.

Antonakos, C., 1994. Enviromental and travel preferences of cyclists. Transp. Res. Rec. 1438, 25–33.

APBP, 2002. Bicycle parking guidelines. Association of Pedestrian and Bicycle Professionals, Washington, DC. Accessible at: http://www.apbp.org/resource/resmgr/publications/bicycle_parking_guidelines.pdf.

APTA, 2008. 2008 public transportation vehicle database. American Public Transportation Association, Washington, DC.

Atkins, 2005. Advanced stop line variations research study. Research findings. Prepared for Transport for London. Accessible at: http://www.tfl.gov.uk/assets/downloads/businessandpartners/ASL-Findings-Report-October-011106.pdf.

Aultman-Hall, L., Hall, F.L., Baetz, B.B., 1998. Analysis of bicycle commuter routes using Geographic Information Systems: Implications for bicycle planning. Transp. Res. Rec. 1578, 102–110.

Australian Greenhouse Office, 2005. Evaluation of Austalian TravelSmart Projects in the ACT, South Australia, Queensland, Victoria and Western Australia: 2001–2005. Department of the Environment and Heritage.

Babtie Group, 2001. Urban street activity in 20 mph zones: Final report. Department for Transport, Local Government and the Regions, London.

Barnes, G., Thompson, K., Krizek, K., 2006. A longitudinal analysis of the effect of bicycle facilities on commute mode share. 85th Annual Meeting of the Transportation Research Board. Transportation Research Board, Washington, DC.

Bassett, D., Pucher, J., Buehler, R., Thompson, D., Crouter, S., 2008. Walking, cycling, and obesity rates in Europe, North America, and Australia. J. Phys. Act. Health 5, 795–814.

Bauman, A., Rissel, C., Garrard, J., Kerr, I., Speidel, R., Fishman, E., 2008. Getting Australia moving: Barrriers, facilitators and interventions to get more Australians physically

active through cycling. Funded by the Australian Government, Department of Health and Ageing. Cycling Promotion Fund, Melbourne.
Bicycle Helmet Safety Institute (BHSI), 2009. Helmet laws for bicycle riders. Accessible at: http://www.bhsi.org/mandator.htm.
BMA, 1992. Cycling: Towards health and safety. Oxford University Press, Oxford.
Boarnet, M.G., Day, K., Anderson, C., McMillan, T., Alfonzo, M., 2005. California's safe routes to school program. Impacts on walking, bicycling, and pedestrian safety. J. Am. Plann. Assoc. 71, 301–317.
Boehme, S., 2005. Fahrradfahren in Muenster. PowerPoint presentation. Department of Transport Planning, City of Muenster, Muenster, Germany.
Bohle, W., 2000. Attractiveness of bicycle-facilities for the users and evaluation of measures for the cycle-traffic.
Bonnette, B., 2007. Implementation of a public use bicycle program in Philadelphia. Senior Thesis. Unpublished. Univ. of Pennsylvania, Philadelphia.
Bowles, H.R., Rissel, C., Bauman, A.E., 2006. Mass cycling events: Who participates and is their post-event behaviour influenced by participation? Int. J. Behav. Nutr. Phys. Act 3, 39. doi:10.1186/1479-5868-3-39.
Brog, W., 1998. Individualized marketing implications for transportation demand management. Transp. Res. Rec. 1618, 116–121.
Brog, W., Barta, F., 2007. National demonstration project (FTA): Individualized marketing demonstration program. 86th Annual Meeting of the Transportation Research Board. Transportation Research Board, Washington, DC.
Brunsing, J., 1997. Public transport and cycling: experience of modal integration in Germany. In: Tolley, R. (Ed.), The greening of urban transport. Wiley, Chichester, UK, pp. 357–373.
Buehler, T., Handy, S., 2008. Fifty years of bicycle policy in Davis, CA. Transp. Res. Rec. 2074, 52–57.
Buehler, R., Pucher, J., 2009. Sustainable transport that works: Lessons from Germany. World Transport Policy and Practice 15 (2), 13–46 Accessible at: http://www.eco-logica.co.uk/pdf/wtpp15.1.pdf.
Buehrmann, S., 2008. Public bicycles. Niches policy notes. Accessible at: http://ange.archangelis.com/typo3/niches/fileadmin/New_folder/Deliverables/D4.3b_5.8_B._PolicyNotes/14397_pn4_public_bikes_ok_low.pdf.
Bunde, J., 1997. The BikeBus'ters from Arhus, Denmark: 'We'll park our cars for 200 years…'. In: Tolley, R. (Ed.), The greening of urban transport. Wiley, Chichester, UK, pp. 373–378.
Burbidge, S.K., Goulias, K.G., 2009, in press. Evaluating the impact of neighborhood trail development on active trail behavior and overall physical activity among suburban residents. Transp. Res. Rec.
Bureau of Transportation Statistics, 2004. How bike paths and lanes make a difference. BTS Issue Brief. Bureau of Transportation Statistics, Washington, DC.
Cairns, S., Sloman, L., Newson, C., Anable, J., Kirkbride, A., Goodwin, P., 2004. Smarter choices – Changing the way we travel. UCL, Transport for Quality of Life, The Robert Gordon University and Eco-Logica. Final report to the Department for Transport, London, UK.
Cavill, N., Kahlmeier, S., Racioppi, F. (Eds.), 2006. Physical activity and health in Europe: Evidence for action. WHO Regional Office for Europe, Copenhagen.
Cervero, R, Sarmiento, O., Jacoby, E., Gomez, L., Neiman, A., 2009. Influences of built environment on walking and cycling: Lessons from Bogota. Int. J. Sustain. Transp. 3 (4), 203–226.
City of Berlin, 2003. Urban transport in Berlin: Focus on bicycling. Senatsverwaltung fuer Stadtentwicklung. Office of Urban Development, Berlin, Germany.
City of Muenster, 2004. Fahrradhauptstadt Muenster. Department of City Planning, City of Muenster, Muenster, Germany.
City of Odense, 2007. National Cycle City (Cycleby) website. Accessible in English at: http://www.cykelby.dk/eng/index.asp.
City of Paris, 2007. Le bilan des deplacements en 2007 a Paris. La Mairie de Paris, L'Observatoire de Deplacements, Paris, France.
City of Paris, 2009a. Le bilan des deplacements en 2009 a Paris. La Mairie de Paris, L'Observatoire de Deplacements, Paris, France.
City of Paris, 2009b. Paris a velo: Le bon plan. La Mairie de Paris, France. Accessible at: http://www.paris.fr/portail/deplacements/Portal.lut?page_id=2&document_type_id=2&document_id=66229&portlet_id=21994.
City of Portland Office of Transportation, 2005. Eastside Hub Target Area Program comprehensive evaluation report. City of Portland, Portland, OR.
City of Portland Office of Transportation, 2006. SmartTrips Northeast Hub comprehensive evaluation report. City of Portland, Portland, OR.
City of Portland, 2008a. Portland bicycle counts 2008. Portland Bureau of Transportation, Portland, OR.
City of Portland, 2008b. Portland's 2008 bicycle friendly community application, Portland, OR.
City of San Francisco, 2004. Fell Street Bike Lane (Scott to Baker) and Tow-Away Zone Proposal. City of San Francisco, San Francisco, CA. Accessible at: http://www.sfmta.com/cms/uploadedfiles/dpt/bike/rewrite%20of%20memo%20for%20website%2011_22_04.pdf.
City of Toronto, 2001. City of Toronto bike plan: Shifting gears. Toronto, Ontario.
City of Vancouver, 1999. 1999 bicycle plan: Reviewing the past, planning the future. City of Vancouver, Engineering Services, Vancouver, BC.
Clarke, C., 2006. The case against bicycle helmets and legislation. World Transp. Policy Pract. 12 (2), 6–16.
Clarke, A., Dornfeld, M.J., 1994. National bicycling and walking study, case study No. 19: Traffic calming, auto-restricted zones and other traffic management techniques – Their effects on bicycling and pedestrians. Federal Highway Administration, Washington, DC. Available at: http://safety.fhwa.dot.gov/PED_BIKE/docs/case19.pdf. Accessed 3/2/09.
Cleaveland, F., Douma, F., 2009. The impact of bicycling facilities on commute mode share. 88th Annual Meeting of the Transportation Research Board, Washington, DC.
Cohen, D., Sehgal, A., Williamson, S., et al., 2008. Impact of a new bicycle path on physical activity. Prev. Med. 46, 80–81.
Commission of the European Communities, 1989. Policy and provision for cyclists in Europe. Brussels.
Cooper, C., 2007. Successfully changing individual travel behavior: Applying community-based social marketing to travel choice. 86th Annual Meeting of the Transportation Research Board. Transportation Research Board, Washington, DC.
Daff, M., Barton, T., 2005. Marking Melbourne's arterial roads to assist cyclists. ITE 2005 Annual Meeting and Exhibit. Institute of Transportation Engineers, Melbourne, Australia.
Davison, K.K., Werder, J.L., Lawson, C.T., 2008. Children's active commuting to school: Current knowledge and future directions. Prev. Chronic Dis. 5, A100.
de Bruijn, G., Kremers, S., Singh, A., van den Putte, B., van Mechelen, W., 2009. Adult active transportation: Adding habit strength to the theory of planned behavior. Am. J. Health Promot. 36 (3), 189–194.
de Geus, B., De Bourdeaudhuij, I., Jannes, C., Meeusen, R., 2008. Psychosocial and environmental factors associated with cycling for transport among a working population. Health Educ. Res. 23, 697–708.
DeMaio, P., 2009a. The bike-sharing blog. Accessible at: http://bike-sharing.blogspot.com.
DeMaio, P., 2009b. The bike-sharing map. Accessible at: http://maps.google.com/maps/ms?ie=UTF8&hl=en&msa=0&msid=104227318304000014160.00043d80f9456b3416ced&z=2.
DeMaio, P., Gifford, J., 2004. Will smart bikes succeed as public transportation in the United States? J. Public Transp. 7 (2), 1–14.
Despascio, A., 2008. Bogotá: Edging back from the brink. Sustainable Transport 20, 14–18.
Dill, J., 2009. Bicycling for transportation and health: The role of infrastructure. J. Publ. Health Policy 30, S95–S110.
Dill, J., Carr, T., 2003. Bicycle commuting and facilities in major U.S. cities: If you build them, commuters will use them. Transp. Res. Rec. 1828, 116–123.
Dill, J., Gliebe, J., 2008. Understanding and measuring bicycling behavior: A focus on travel time and route choice. Oregon Transportation Research and Education Consortium, Portland, OR.
Dill, J., Voros, K., 2007. Factors affecting bicycling demand: Initial survey findings from the Portland, Oregon, Region. Transp. Res. Rec. 2031, 9–17.
Doldissen, A., Draeger, W., 1990. Environmental traffic management strategies in Buxehude. In: Tolley, R. (Ed.), The greening of urban transport. Belhaven Press, London.
Dora, C., Phillips, M., 2000. Transport, environment and health. WHO Regional Office for Europe, Copenhagen.
Dutch National Railways, 2009. Bicycling parking at train stations. Nederlandse Spoorwegen, Utrecht, The Netherlands.
Ecoplan, 2009. World City Bike Cooperative: Public bike system inventory. Accessible at: http://www.ecoplan.org/wtpp/citybike_index.htm.
Elvik, R., 2009. The non-linearity of risk and the promotion of environmentally sustainable transport. Accid. Anal. Prev. 41, 849–855.
Emond, C.R., Tang, W., Handy, S.L., 2009. Explaining gender difference in bicycling behavior. 88th Annual Meeting of the Transportation Research Board. Transportation Research Board, Washington, DC.
Evenson, K.R., Herring, A.H., Huston, S.L., 2005. Evaluating change in physical activity with the building of a multi-use trail. Am. J. Prev. Med. 28, 177–185.
Federal Highway Administration, 1994. A compendium of available bicycle and pedestrian trip generation data in the United States. US Department of Transportation, Washington, DC.
Fietsberaad, 2006. Continuous and integral: The cycling policies of Groningen and other European cycling cities. Amsterdam: Fietsberaad. Accessible at: http://www.fietsberaad.nl/library/repository/bestanden/Publication%207%20Continuous%20and%20integral.pdf.
Garder, P., Leden, L., Pulkkinen, U., 1998. Measuring the safety effect of raised bicycle crossings using a new research methodology. Transp. Res. Rec. 1636, 64–70.
Garrard, J., Rose, G., Lo, S.K., 2008. Promoting transportation cycling for women: The role of bicycle infrastructure. Prev. Med. 46, 55–59.
Gatersleben, B., Appleton, K.M., 2007. Contemplating cycling to work: Attitudes and perceptions in different stages of change. Transp. Res. Part A 41, 302–312.
Godbold, T., 2005. Exploring the self reported impacts of participation in the 2004 Great Victorian Bike Ride. School of Health and Social Development, Deakin University, Melbourne, Australia.
Godlee, F., 1992. On your bikes: Doctors should be setting an example. Br. Med. J. 304, 588.
Gomez, L., Sarmiento, O., Lucimi, D., Espinosa, G., Forero, R., Bauman, A., 2005. Prevalence and factors associated with walking and bicycling for transport among young adults in two low-income localities of Bogotá, Colombia. J. Phys. Act. Health 2, 445–449.
Gordon-Larsen, P., Boone-Heinonen, J., Sidney, S., Sternfeld, B., Jacobs, D., Lewis, C., 2009. Active commuting and cardiovascular disease risk: the CARDIA study. Arch. Intern. Med. 169 (13), 1216–1223.
Greig, R., 2001. Cycling promotion in Western Australia. Health Promot. J. Austr. 12, 250–253.
Gutzmer, B., 2006. Integrierte Stadt- und Verkehrsplanung in Freiburg im Breisgau. PowerPoint presentation, City of Freiburg, Germany.
Hagelin, C., 2005. A return on investment of Bikes on Bus Programs. National Center for Transit Research, Tampa, FL.
Hamer, M., Chida, Y., 2008. Active commuting and cardiovascular risk: A meta-analytic review. Prev. Med. 46 (1), 9–13.
Harden, B., 2008. For bicyclists, a widening patchwork world. Washington Post, August 31, 2008, pp. A01+. Accessible at: http://www.washingtonpost.com/wp-dyn/content/article/2008/08/30/AR2008083000632.html.

Harkey, D.L., Stewart, J.R., 1998. Evaluation of shared-use facilities for bicycles and motor vehicles. Transp. Res. Rec. 1578, 111–118.

Harvey, F., Krizek, K.J., Collins, R., 2008. Using GPS data to assess bicycle commuter route choice. 87th Annual Meeting of the Transportation Research Board. Transportation Research Board, Washington, DC.

Hegger, R., 2007. Public transport and cycling: Living apart or together? Public Transport International 56 (2), 38–41.

Herrstedt, L., 1992. Traffic calming design—A speed management method. Accid. Anal. Prev. 24 (1), 3–16.

Hillman, M., 1993. Cycling and the promotion of health. Policy Studies 14, 49–58.

Holtzman, D., 2008. Share a bike. Planning 74 (5), 20–23.

Horton, D., Salkeld, A., 2006. Bike film festivals: Taking a cultural approach to cycling promotion in the UK. World Transport Policy and Planning 12, 36–44.

Howard, C., Burns, E.K., 2001. Cycling to work in Phoenix: Route choice, travel behavior, and commuter characteristics. Transp. Res. Rec. 1773, 39–46.

Hunt, J.D., Abraham, J.E., 2007. Influences on bicycle use. Transportation 34, 453–470.

Hunter, W.W., 1998. An evaluation of Red Shoulders as a bicycle and pedestrian facility. Florida Department of Transportation, Tallahassee, FL.

Hunter, W.W., 2000. Evaluation of innovative bike-box application in Eugene, Oregon. Transp. Res. Rec. 1705, 99–106.

Hunter, W.W., Stewart, J.R., Stutts, J.C., Huang, H.H., Pein, W.E., 1999. A comparative analysis of bicycle lanes versus wide curb lanes: Final report. Office of Safety and Traffic Operations Research & Development, FHWA, US Department of Transportation, McLean, VA.

Hunter, W.W., Harkey, D.L., Stewart, J.R., Birk, M.L., 2000. Evaluation of blue bike-lane treatment in Portland, OR. Transp. Res. Rec. 1705, 107–115.

Huy, C., Becker, S., Gomolinsky, U., Klein, T., Thiel, A., 2008. Health, medical risk factors, and bicycle use in everyday life in the over-50 population. J. Aging. Phys. Act. 16 (4), 454–464.

IDRD, 2004. Ciclovía Recreovía. Instituto Distrital para la Recreación y el Deporte (IDRD), City of Bogota, Colombia. Available at: http://www.idrd.gov.co/www/section-27.jsp.

IDU, 2009. CicloRutas. Instituto de Desarrollo Urbano (IDU), City of Bogota, Colombia. Available at: http://www.idu.gov.co/web/guest/espacio_ciclorutas.

Institute of Transportation Engineers (ITE), 1999. Traffic calming: State of the practice. Available at: http://www.ite.org/traffic/tcstate.asp#tcsop. Accessed 3/2/09.

Jackson, M.E., Ruehr, E.O., 1998. Let the people be heard: San Diego County bicycle use and attitude survey. Transp. Res. Rec. 1636, 8–12.

Jacobsen, P., 2003. Safety in numbers: more walkers and bicyclists, safer walking and bicycling. Inj. Prev. 9, 205–209.

Jensen, S.U., 2007. Pedestrian and bicycle level of service on roadway segments. 86th Annual Meeting of the Transportation Research Board. Transportation Research Board, Washington, DC.

Jensen, S.U., 2008a. Bicycle tracks and lanes: A before-after study. 87th Annual Meeting of the Transportation Research Board. Transportation Research Board, Washington, DC.

Jensen, S.U., 2008b. Safety effects of blue cycle crossings: A before-after study. Accid. Anal. Prev. 40, 742–750.

Kessler, L., 2008. LEED leads the way: Bicycles in green buildings. Momemtum 36, 18–20.

Konig, S., 2006. Evaluation of the effects of rebuilt bicycle paths at intersections on arterial streets in Lund - A case study. Department of Technology and Society. Lund University, Lund Institute of Technology, Lund, Sweden, p. 136.

Korve, M.J., Niemeier, D.A., 2002. Benefit-cost analysis of added bicycle phase at existing signalized intersection. Journal of Transportation Engineering-ASCE 128, 40–48.

Krizek, K.J., 2006. Two approaches to valuing dome of bicycle facilities' presumed benefits. J. Am. Plann. Assoc. 72, 309–320.

Krizek, K.J., Johnson, P.J., 2006. Proximity to trails and retail: Effects on urban cycling and walking. J. Am. Plann. Assoc. 72, 33–42.

Krizek, K.J., El-Geneidy, A., Thompson, K., 2007. A detailed analysis of how an urban trail system affects cyclists' travel. Transportation 34, 611–624.

Krizek, K.J., Handy, S., Forsyth, A., 2009. Explaining changes in walking and bicycling behavior: challenges for transportation research. Environ. Plann. B. 36, 725–740.

LAB, 2008. Bike to Work events in selected US Cities. League of American Bicyclists. Washington, DC.

Landis, B.W., Vattijuti, V.R., Brannick, M.T., 1998. Real-time human perceptions: Toward a bicycle level of service. Transp. Res. Rec. 1578, 119–126.

LeClerc, M., 2002. Bicycle planning in the City of Portland: Evaluation of the City's Bicycle Master Plan and statistical analysis of the relationship between the City's bicycle network and bicycle commute. School of Urban Studies and Planning. Portland State University, Portland, OR.

Litman, T., 2009. Bicycle parking, storage, and changing facilities. Accessible at: http://www.vtpi.org/tdm/tdm85.htm.

Lockwood, I.M., 1997. ITE traffic calming definition. ITE Journal 67, 22–24.

Madera, J., 2009. Bicycling, bicyclists, and area type: Findings from the 2005 Philadelphia Metropolitan Bicycle Travel Survey. 88th Annual Meeting of the Transportation Research Board. Transportation Research Board, Washington, DC.

Martens, K., 2004. The bicycle as a feedering mode: Experiences from three European countries. Transp. Res. Part D 9, 281–294.

Martens, K., 2007. Promoting Bike and Ride: The Dutch experience. Transp. Res. Part A 41, 326–338.

Matthews, C., Jurj, A., Shu, X., et al., 2007. Influence of exercise, walking, cycling, and overall nonexercise physical activity on mortality in Chinese women. Am. J. Epidemiol. 165 (12), 1343–1350.

McClintock, H., Morris, D., 2003. Integration of cycling and light rail transit. World Transp. Policy Pract. 9 (3), 9–14.

Merom, D., Bauman, A., Vita, P., Close, G., 2003. An environmental intervention to promote walking and cycling—the impact of a newly constructed rail trail in Western Sydney. Prev. Med. 36, 235–242.

Montezuma, R., 2005. The transformation of Bogota, Colombia, 1995–2000: Investing in citizenship and urban mobility. Global Urban Dev. 1 (1), 1–10.

Mutrie, N., Carney, C., Blamey, A., Crawford, F., Aitchison, T., Whitelaw, A., 2002. Walk in to work out: A randomised controlled trial of a cognitive behavioural intervention aimed at increasing active commuting in a workplace setting. J. Epidemiol. Community Health 56, 407–412.

Nabti, J.M., Ridgway, M.D., 2002. Innovative bicycle treatments: An informational report. Institute of Transportation Engineers (ITE), Washington, DC.

Nadal, L., 2007. Bike sharing sweeps Paris off its feet. Sustainable Transport 19, 8–12.

National Center for Safe Routes to School, 2008. Winter 2008 SRTS Program Tracking Brief. Accessible at: http://www.saferoutesinfo.org/resources/collateral/status_report/TrackBriefOct-Dec08Revised.pdf.

Nelson, A.C., Allen, D., 1997. If you build them, commuters will use them. Transp. Res. Rec. 1578, 79–83.

Netherlands Ministry of Transport, 2009. Cycling in the Netherlands. Ministerie van Verkeer en Waterstaat, The Hague. Accessible at: http://www.fietsberaad.nl/library/repository/bestanden/CyclingintheNetherlands2009.pdf.

Newman, A., 2002. The marking of advanced cycle lanes and advanced stop boxes at signalised intersections. City Streets Unit, Christchurch City Council, Christchurch, New Zealand.

Noland, R.B., Ishaque, M.M., 2006. Smart bicycles in an urban area: Evaluation of a pilot scheme in London. J. Public Transp. 9 (5), 71–95.

Noland, R., Kunreuther, H., 1995. Short-run and long-run policies for increasing bicycle transportation for daily commuter trips. Transp. Policy 2 (1), 67–79.

NRC, 2007. Modal shift in the Boulder Valley: 1990 to 2006. Prepared for the City of Boulder. National Research Center, Inc., Boulder, CO.

OECD, 2004. National policies to promote cycling. Organisation for Economic Cooperation and Development, European Conference of the Ministers of Transport, Paris, France.

Ogilvie, D., Egan, M., Hamilton, V., Petticrew, M., 2004. Promoting walking and cycling as an alternative to using cars: systematic review. Br. Med. J. 329, 763. doi:10.1136/bmj.38216.714560.55.

Orenstein, M.R., Gutierrez, N., Rice, T.M., Cooper, J.F., Ragland, D.R., 2007. Safe Routes to School safety and mobility analysis. Traffic Safety Center, Univ. of California at Berkeley.

Overgaard-Madsen, J.C., Lohmann-Hansen, A., Lahrmann, H., in press. BikeBus'ters - From Car to Bike and Buses in Aarhus. Report from the Transport Research Group, Aalborg University, Denmark.

Parkin, J., Wardman, M., Page, M., 2007. Models of perceived cycling risk and route acceptability. Accid. Anal. Prev. 39, 364–371.

Parkin, J., Wardman, M., Page, M., 2008. Estimation of the determinants of bicycle mode share for the journey to work using census data. Transportation 35, 93–109.

Parra, D., Gomez, L., Pratt, M., Sarmiento, O., Mosquera, J., Triche, E., 2007. Policy and built environment changes in Bogota and their importance in health promotion. Indoor Built Environ. 16 (4), 344–348.

Pein, W.E., Hunter, W.W., Stewart, J.R., 1999. Evaluation of the Shared-Use ARROW. Report prepared for Florida Department of Transportation.

Portland Office of Transportation, 2007. SmartTrips Southeast Final Report. City of Portland, Portland, OR.

Pucher, J., 1997. Bicycling boom in Germany: A revival engineered by public policy. Transp. Q. 51 (4), 31–46.

Pucher, J., 2008. Bike parking. Momentum 36, 30–33.

Pucher, J., Buehler, R., 2005. Cycling trends and policies in Canadian cities. World Transp. Policy Pract. 11, 43–61.

Pucher, J., Buehler, R., 2007. At the frontiers of cycling: Policy innovations in the Netherlands, Denmark, and Germany. World Transp. Policy Pract. 13 (3), 8–57.

Pucher, J., Buehler, R., 2008. Making cycling irresistible: Lessons from the Netherlands, Denmark, and Germany. Transport Reviews 28 (4), 495–528.

Pucher, J., Buehler, R., 2009, in press. Integration of bicycling with public transport. J. Public Transp. 12 (3).

Pucher, J., Clorer, S., 1992. Taming the automobile in Germany. Transportation Quarterly 46 (3), 383–395.

Pucher, J., Dijkstra, L., 2003. Promoting safe walking and cycling to improve public health: Lessons from the Netherlands and Germany. Am. J. Public Health 93 (9), 1509–1516.

Pucher, J., Komanoff, C., Schimek, P., 1999. Bicycling renaissance in North America? Recent trends and alternative policies to promote bicycling. Transportation Research Part A 33, 625–654.

Ratzel, M., 2008. Boulder Bike Program. City of Boulder, CO.

Reid, S., Guthrie, N., 2004. Report 610: Cycling in bus lanes. Transport Research Laboratory, London.

Reutter, O., 2004. The 'You-move-nrw' campaign—New partnerships for youth-oriented and environmentally friendly mobility management. World Transp. Policy Pract. 10 (4), 15–21.

Rietveld, P., 2000. The accessibility of railway stations: the role of the bicycle in the Netherlands. Transp. Res. Part D 5, 71–75.

Rietveld, P., Daniel, V., 2004. Determinants of bicycle use: do municipal policies matter? Transp. Res. Part A 38, 531–550.

Roberts, I., Owen, H., Lumb, P., MacDougall, C., 1996. Pedaling health: Health benefits of a modal transport shift. University of Adelaide, Adelaide, Australia.

Robinson, D., 2005. Safety in numbers in Australia: More walkers and bicyclists, safer walking and cycling. Health Promot. J. Austr. 16, 47–51.

Robinson, D.L., 2006. No clear evidence from countries that have enforced the wearing of helmets. BMJ 332, 722–725. doi:10.1136/bmj.332.7543.722-a.
Rodgers, A., 2005. A23 & A202 ASL Before and After Study. Transport for London, London. Accessible at: http://www.tfl.gov.uk/assets/downloads/businessandpartners/A23-and-A202.pdf.
Romero, C., 2008. Spicycles in Barcelona. PowerPoint Presentation by City of Barcelona at the Spicycles Conference, Bucharest, Romania, December 2008. Accessible at: http://spicycles.velo.info/Portals/0/FinalReports/Barcelona_Final_Report.ppt.
Rose, G., 2007. Combining intercept surveys and self-completion questionnaire to understand cyclist use of off-road paths. 86th Annual Meeting of the Transportation Research Board. Transportation Research Board, Washington, DC.
Rose, G., Marfurt, H., 2007. Travel behaviour change impacts of a major ride to work day event. Transp. Res. Part A 41, 351–364.
Roskowski, M., Ratzel, M., 2008. How to be like Boulder. The Bike/Ped Professional Newsletter of the Association of Pedestrian and Bicycle Professionals 2, 4–5 Accessible at: http://www.apbp.org/resource/resmgr/newsletter/2008_issue_2.pdf.
Rye, T., 2002. Travel plans: Do they work? Transport Policy 9 (4), 287–298.
Ryley, T.J., 2006. Estimating cycling demand for the journey to work or study in West Edinburgh, Scotland. Transp. Res. Rec. 1982, 187–193.
Ryley, T.J., Davies, D.G., 1998. Further developments in the design of contra-flow cycling schemes. Report 358. Transport Research Laboratory, London, England.
Sadek, A.W., Dickason, A., Kaplan, J., 2007. Effectiveness of a green, high-visibility bike lane and crossing treatment. 86th Annual Meeting of the Transportation Research Board. Transportation Research Board, Washington, DC.
Sallaberry, M., 2000. Valencia street bicycle lanes: A one year evaluation. City of San Francisco Department of Parking and Traffic, San Francisco, CA. Accessible at: http://www.sfmta.com/cms/uploadedfiles/dpt/bike/Valencia_Street_Report.pdf.
Sammer, G., 1997. A general 30 km/H speed limit in the city: A model project in Graz, Austria. In: Tolley, R. (Ed.), The greening of urban transport: Planning for walking and cycling in western cities. John Wiley & Sons Ltd., Chichester, U.K., pp. 385–390.
San Francisco Department of Parking and Traffic, 2001. Polk Street lane removal/bike lane trial evaluation. City and County of San Francisco, San Francisco, CA. Accessible at: http://www.sfmta.com/cms/uploadedfiles/dpt/bike/Polk_Street_report.pdf.
Sarmiento, O., Torres, A., Jacoby, E., Pratt, M., Schmid, T., Stierling, G., 2010, in press. The Ciclovía-Recreativa: A mass recreational program with looming public health potential. J. Phys. Act. Health.
Schmidt, S., Buehler, R., 2007. The planning process in the US and Germany: A comparative analysis. Int. Plan. Stud. 12, 55–75.
Sener, I.N., Eluru, N., Bhat, C.R., 2009a. An analysis of bicyclists and bicycling characteristics: Who, why, and how much are they bicycling? 88th Annual Meeting of the Transportation Research Board, Washington, DC.
Sener, I.N., Eluru, N., Bhat, C.R., 2009b. An analysis of bicycle route choice preferences in Texas. Transportation 36, 511–539.
Shafizadeh, K., Niemeier, D., 1997. Bicycle journey-to-work: Travel behavior characteristics and spatial analysis. Transp. Res. Rec. 1578, 84–90.
Shephard, R., 2008. Is active commuting the answer to population health? Sports Med. 39 (9), 751–758.
Shoup, D., 1997. Evaluating the effects of cashing out employer-paid parking: Eight case studies. Transp. Policy 4 (4), 201–216.
Sisson, S.B., Lee, S.M., Burns, E.K., Tudor-Locke, C., 2006. Suitability of commuting by bicycle to Arizona elementary schools. Am. J. Health Promot. 20, 210–213.
Socialdata America, 2005. Portland interstate large-scale individualized marketing - TravelSmart Project. City of Portland Transportation Options, Portland, OR.
Staunton, C.E., Hubsmith, D., Kallins, W., 2003. Promoting safe walking and biking to school: The Marin County success story. Am. J. Public Health 93, 1431–1434.
Stinson, M., Bhat, C., 2003. Commuter bicyclist route choice: Analysis using a stated preference survey. Transp. Res. Rec. 1828, 107–115.
Tal, G., Handy, S., 2008. Children's biking for non-school purposes: Getting to soccer games in Davis, CA. Transp. Res. Rec. 2074, 40–45.
Taylor, D., Mahmassani, H., 1996. Analysis of state preferences for intermodal bicycle-transit interfaces. Transp. Res. Rec. 1556, 86–95.
Telfer, B., Rissel, C., Bindon, J., Bosch, T., 2006. Encouraging cycling through a pilot cycling proficiency training program among adults in central Sidney. J. Sci. Med. Sport 9, 151–156.
Thunderhead Alliance, 2007. Bicycling and walking in the U.S. Benchmarking Report 2007. Thunderhead Alliance, Washington, DC. Accessible at: http://thunderheadalliance.org/pdf/benchmarking2007.pdf.
Tilahun, N.Y., Levinson, D.M., Krizek, K.J., 2007. Trails, lanes, or traffic: Valuing bicycle facilities with an adaptive stated preference survey. Transp. Res. Part A-Policy and Practice 41, 287–301.
Titze, S., Stronegger, W.J., Janschitz, S., Oja, P., 2008. Association of built-environment, social-environment and personal factors with bicycling as a mode of transportation among Austrian city dwellers. Prev. Med. 47, 252–259.
Topp, H., Pharoah, T., 1994. Car-free city centers. Transportation 21, 231–247.
Touwen, M., 1997. Stimulating bicycle use by companies in the Netherlands. In: Tolley, R. (Ed.), The greening of urban transport: Planning for walking and cycling in western cities. John Wiley & Sons Ltd., Chichester, U.K., pp. 415–422.
Transport for London, 2004a. Business case for cycling in London (Draft). Transport for London Street Management, London. Accessible at: http://www.tfl.gov.uk/assets/downloads/businessandpartners/business-case-for-cycling.pdf.
Transport for London, 2004b. The London Cycling Action Plan. Transport for London, London, UK. Accessible at: http://www.tfl.gov.uk/assets/downloads/businessandpartners/cycling-action-plan.pdf.
Transport for London, 2005. Review of procedures associated with the development and delivery of measures designed to improved safety and convenience for cyclists. Transport for London, London. Accessible at: http://www.tfl.gov.uk/assets/downloads/businessandpartners/cycling-review.pdf.
Transport for London, 2008a. Cycling in London: Final report. Transport for London, London. Accessible at: http://www.tfl.gov.uk/assets/downloads/businessandpartners/cycling-in-london-final-october-2008.pdf.
Transport for London, 2008b. Central London congestion charging: Impacts monitoring, Sixth Annual Report. Transport for London, London. Accessible at: http://www.tfl.gov.uk/assets/downloads/sixth-annual-impacts-monitoring-report-2008–07.pdf.
TRB, 2005. Integration of bicycles and transit. TCRP Synthesis Report 62. Transportation Research Board, National Research Council, Washington, DC.
US Census Bureau, 2009. American FactFinder. Available at http://factfinder.census.gov. Accessed 3/1/09.
US Green Building Council, 2005. LEED for new construction rating system, Version 2.2. Washington, DC.
USDHHS, 1996. Physical activity and health: A Report of the Surgeon General. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Atlanta, GA.
USDHHS, 2008. Physical activity guidelines for Americans. U.S. Department of Health and Human Services, Washington, DC.
USDOT, 1994. National Bicycling and Walking Study: Transportation choices for a changing America. Federal Highway Administration, Washington, DC.
USDOT, 1998. Bicycles and transit: A partnership that works. U.S. Department of Transportation, Federal Transit Administration, Washington, DC.
USDOT, 2004. National Bicycling and Walking Study: Ten Year Status Report. U.S. Department of Transportation, Federal Highway Administration, Washington, DC.
USDOT, 2007. Bicycle parking and storage. U.S. Department of Transportation, Federal Highway Administration, Washington, DC. Accessible at: http://www.tfhrc.gov/safety/pedbike/pubs/05085/chapt17.htm.
Van Houton, R., Seiderman, C., 2005. How pavement markings influence bicycle and motor vehicle positioning. Transp. Res. Rec. 1939, 3–14.
Velo'v, 2009. Velo'v information website. Accessible at: http://www.velov.grandlyon.com/Archives-Velo-V.63.0.html.
Vernez-Moudon, A.V., Lee, C., Cheadle, A.D., et al., 2005. Cycling and the built environment, a US perspective. Transp. Res. Part D 10, 245–261.
Wall, G., Davies, D., Crabtree, M., 2003. Capacity implications of Advanced Stop Lines for cyclists. Transportation Research Laboratory, London.
Wardman, M., Tight, M., Page, M., 2007. Factors influencing the propensity to cycle to work. Transp. Res. Part A 41, 339–350.
Watkins, K.F., 2000. Cambridge's traffic calming program – Pedestrians are the focus. ITE 2000 Annual Meeting and Exhibit. Nashville, Tennessee, August 2000.
Watson, M., Dannenberg, A.L., 2008. Investment in Safe Routes to School projects: public health benefits for the larger community. Prev. Chronic. Dis. 5 (3) http://www.cdc.gov/pcd/issues/2008/jul/07_0087.htm. Accessed 7/05/09.
Webster, D., Tilly, A., Wheeler, A., Nicolls, D., Buttress, S., 2006. Pilot home zone schemes: Summary of the schemes. TRL report TRL654. Prepared for Traffic Management Division, Department for Transport, London, UK.
WHO, 2002a. World health report 2002: Reducing risk, promoting health life. World Health Organization, Geneva.
WHO, 2002b. Physical activity through transport as part of daily activities. WHO Regional Office for Europe, Copenhagen.
Xing, Y., Handy, S, 2009. Factors associated with proportions and miles of bicycle rides for transportation and recreation in 6 small US cities. 88th Annual Meeting of the Transportation Research Board. Transportation Research Board, Washington, DC.

- Home
- Contact Us
- Home
- What's COOL 2012?
  - Background on food scraps
  - Background on paper
  - Pesticide and fertilizer use
  - The soil-climate connection
  - Soil health
  - Background on yard trimmings
  - American Clean Energy And Security Act of 2009
- Is Your Community COOL?
  - Collection practices for organics
  - Policies for source separated organics
  - End markets for compost products
  - Source reduction practices
  - What's not COOL
- COOL Tools
  - Composting methods & technologies
  - Navigating composting regulations
  - More Resources & Links
  - Forging partnerships
- Who is COOL?
- COOL Workshops
- Keep COOL with us

PROBLEM: Landfilling food and paper is heating the planet.

As communities work to decrease greenhouse gas emissions, the first place to look is in the garbage can.

Every day, communities across the U.S. send tens of thousands of trucks to bury biodegradable materials such as paper products, food scraps and yard trimmings. These materials amount to half of our discarded resources. When buried in a landfill, those lettuce heads, grass clippings and paper boxes don't just break down as they would in nature or in a compost pile. They decompose anaerobically, without oxygen, and in the process become the number one source of human-caused methane and a major player in climate change.

There's no time to lose in cutting methane.

We're facing a rapidly closing window of opportunity before greenhouse gas emissions reach a tipping point and the effects of global climate change severely alter life on earth. Carbon dioxide (CO_2) emissions from vehicles and utilities have been identified as major culprits. However, the emerging story in the fight against global warming is the tremendous and previously underestimated impact that methane has as well. Methane is now understood to be 72 times more potent than CO_2 over a 20-year period. This means our landfills emit the greenhouse gas equivalent of 20 percent of U.S. coal-fired power plants every year!

Meanwhile, back on the farm…

Intensive farming and shortsighted land use management have been spewing greenhouse gases into the atmosphere for more than 100 years. This contributes to one-third of the increase in atmospheric CO_2, while stripping our soils of carbon and other essential nutrients. Rather than applying organic material to replenish the soil, modern industrial agriculture relies upon huge quantities of polluting petroleum-based, energy-intensive, greenhouse gas-generating fertilizers to produce crops on declining lands. Soils hold twice the carbon stocks of plants. Releasing this carbon through tilling means the soil now contributes to, rather than protects against, global warming. It also compromises the ability of soil to grow our food. We're wasting the very carbon and nutrients our soils so desperately need to sustain our society.

SOLUTION: Get COOL.
The quickest and cheapest way to immediately reduce your community's greenhouse gas emissions

COOL 2012 Campaign: While we work toward longer-term, challenging solutions like shutting down coal-fired power plants and taking cars off the road, the easiest, first step that can produce significant climate results RIGHT NOW is to STOP landfill-produced methane. Simply by getting COOL — Compostable Organics Out of Landfills — by 2012, we can prevent potent methane emissions AND build healthier soils. Taking the COOL step replenishes carbon stocks and supports sustainable agriculture, yielding healthier foods for our population. The technology exists, the need is certain and the time to act is NOW.

It's easy to be COOL by 2012.

Seize the Paper: Commit to recycling a minimum of 75% of all paper and composting the rest by 2012. Paper is the largest share of biodegradable materials in a landfill, so recycling and composting paper products will take the largest bite out of your community's methane emissions. The infrastructure to recycle and market the paper already exists; the key is to make it happen.

Source Separate: Require source separation of residential and business waste into three streams: compostables, recyclables and residuals. Source separation is pivotal to maximizing the environmental and economic potential of these resources.

Feed Local Soils: Support local farmers and sustainable food production with community composting infrastructure. The benefits of amending soils with composted organics are well-proven to increase long-term soil productivity, reduce irrigation needs and use of petroleum-based synthetic fertilizers, and increase water infiltration from today's frequent and intense storm events.

Stop Creating Methane Now: No matter how the waste industry "greenwashes" its "new and improved landfills," there is only one proven method to truly prevent methane emissions — keep compostable organics out of landfills. Public policy needs to first support the elimination of methane by requiring source separation of compostables and recyclables, then mitigate methane from existing sources where organics have already been buried.

- Home
- Contact Us
- Home
- What's COOL 2012?
  - Background on food scraps
  - Background on paper
  - Pesticide and fertilizer use
  - The soil-climate connection
  - Soil health
  - Background on yard trimmings
  - American Clean Energy And Security Act of 2009
- Is Your Community COOL?
  - Collection practices for organics
  - Policies for source separated organics
  - End markets for compost products
  - Source reduction practices
  - What's not COOL
- COOL Tools
  - Composting methods & technologies
  - Navigating composting regulations
  - More Resources & Links
  - Forging partnerships
- Who is COOL?
- COOL Workshops
- Keep COOL with us

Who is COOL?

Project Founders

GrassRoots Recycling Network (GRRN)
GRRN has a vision of the world where waste is not waste – it is a resource. We are the voice of all those who recycle and want to waste less and do more. GRRN is the leading voice calling for Zero Waste (ZW) in the United States by promoting the message that we must go "beyond recycling" and go upstream to the headwaters of the waste stream which is the industrial designer's desk. ZW means not only 100% recovery of society's discards, but also a redesign of the products and packaging of our lives such that everything produced for our consumer economy is non-toxic and designed to be recovered for re-use, recycling or composting.

GRRN is a national network of waste reduction activists and recycling professionals. We set ambitious standards for Zero Waste goals and policies. We provide opportunities for on-going meaningful participation in campaigns and build coalitions to achieve zero waste policies, businesses and communities. We have a valuable website and an active listserv of over 900 knowledgeable experts in both downstream recovery and upstream clean production issues.

> For more information contact:
> GRRN | PO Box 282 | Cotati, CA 94931 | www.grrn.org

Founding Steering Committee

Richard Anthony, Richard Anthony Associates

Linda Christopher, GRRN

Rich Flammer, Hidden Resources

Nora Goldstein, BioCycle

Eric Lombardi, Eco-Cycle

BioCycle
Published since 1960, BioCycle is America's foremost magazine on composting and organics recycling. BioCycle shows you how to turn organic residuals —yard trimmings, source separated municipal solid waste (MSW), food residuals, woody materials, biosolids, manure and other feedstocks into value-added products.

Every issue introduces you to the management teams behind state-of-the-art composting, recycling and anaerobic digestion facilities.

Articles are filled with details on starting, operating and maintaining facilities designed to manage organic wastes that traditionally have been disposed of in landfills. Plus, you'll get the latest recycling and compost statistics from BioCycle's "State of Garbage in America" report, as well as annual composting facility surveys. And you'll learn about systems that sort trash into recyclables, compostables and residuals … New waste management solutions for cities, industries, institutions and farms … Equipment recommended for most efficient operations … Utilization of compost and other processed organics to build healthy soils … Odor control techniques and so much more. Readers rely on BioCycle to connect them to the people … the companies … the facilities … the research findings that comprise the boundless world of composting, renewable energy, soil and water management, bioremediation, erosion control and more. Join your colleagues today as a subscriber to BioCycle.

For more information contact:
The JG Press, Inc. | 419 State Avenue | Emmaus PA, 18049 | www.jgpress.com/biocycle.htm

Eco-Cycle
Founded in 1976, Eco-Cycle is one of the largest non-profit recyclers in the USA and has an international reputation as a pioneer and innovator in resource conservation. We believe in individual and community action to transform society's throw-away ethic into environmentally-friendly stewardship. Our mission is to provide publicly-accountable recycling, conservation and education services, and to identify, explore and demonstrate the emerging frontiers of sustainable resource management.

For more information contact:
Eco-Cycle | P.O. Box 19006 | Boulder, CO 80308 | www.ecocycle.org

---

Super COOL Sponsors

[WhiteWave Foods]()
A dynamic subsidiary of Dean Foods Company, WhiteWave Foods Company specializes in dairy and dairy alternatives in the grocery and natural foods channels. Headquartered in Broomfield, Colorado, WhiteWave Foods is a leader in corporate citizenship — manufacturing innovative, authentic and nutritious branded food products through socially and environmentally responsible practices.

[Eco-Products]()
Our mission is to provide you the greatest variety of environmentally-friendly, non-toxic and sustainable products at the best possible prices. The recycle emblem of three concentric arrows signifies, 1) material collection, 2) re-manufacturing, and 3) remarketing. It is in the remarket niche that Eco-Products seeks to make a difference, helping to "close-the-loop" by marketing recycled and other environmental products.

[California Resource Recovery Association]()
California Resource Recovery Association (CRRA) is a non-profit organization dedicated to promoting waste reduction, reuse, recycling, pollution prevention, and composting. The CRRA works to expand markets for recycled materials, promotes sustainable materials policies and is a clearinghouse for information, innovation, and industry and governmental initiatives. Non-profits, waste haulers, recyclers, state, federal and local government, recycled product manufacturers and many others come together under the CRRA umbrella.

- Our Campaign in 2 Pages

- [ ] Search

- Thanks to Our Sponsors

Policies for source separated organics

Source separation is pivotal to maximizing the environmental and economic potential of organic materials. Numerous U.S. communities require residential and commercial sectors to separate for recycling or composting a variety of materials, including yard trimmings, food scraps and paper products. Find examples of state and local legislation below.

- Yard trimmings
- Food scraps
- Soiled paper

Yard trimmings

Between 1990 and 2000, the amount of yard waste disposed in landfills or incinerators fell dramatically as nearly half of U.S. states enacted legislation to keep these materials out of the landfill. While only 12% of yard waste was diverted in 1990, more than 50% was diverted by 2000, and the rate now stands above 60%. View a list of states with yard waste bans.

A 2004 study for the State of Delaware on the effects of a yard waste ban concluded the following on the reach and effectiveness of yard waste restrictions: First, the definition of yard waste varies from state to state. Some states include only grass and leaves while other states include land-clearing debris, shrubbery and tree stumps. Second, the scope and enforcement of the landfill ban also varies by state. Some states permit only minimal qualities of yard waste in mixed loads while others are more lenient and ban loads containing only yard waste. Despite the differences, states with yard waste bans received significantly less yard waste per capita than states without bans. The report also estimated that a ban on yard waste disposal would increase the amount of yard trimmings treated onsite through grassmulching or onsite mulching and composting operations. Estimates for the state of Delaware show yard waste disposal would decrease from 234 pounds per capita to 76 pounds per capita, a 68% decrease, with about 30% of this material treated onsite.

Legislative Examples

The State of Massachusetts prohibits the disposal of leaves and yard waste, including grass clippings, weeds, garden materials, shrub trimmings, and brush 1″ or less in diameter. The state offers guidance on how waste facilities can comply with the restrictions, including load inspections, ongoing monitoring, sample letters and recommended signage.

The State of Oregon sets tiered materials recovery and waste reduction goals, including 50% recovery and no annual increase in waste generation by 2009. The state goals also require the city, county or metropolitan service district to create the opportunity to recycle, including the establishment of "An effective residential yard debris collection and composting program that includes the promotion of home composting of yard debris, and that also includes either: (A) Monthly or more frequent on-route collection of yard debris from residences for production of compost or other marketable products; or (B) A system of yard debris collection depots conveniently located and open to the public at least once a week…'Yard debris' includes grass clippings, leaves, hedge trimmings and similar vegetative waste generated from residential property or landscaping activities, but does not include stumps or similar bulky wood materials."

Local jurisdictions, including county and municipal governments, and individual landfills also ban yard waste from disposal or require recycling. For example, Sonoma County, CA prohibits yard debris and woody debris from disposal, along with scrap metal, major appliances, corrugated cardboard, and tires. While the state of Maryland bans separately collected loads of yard waste from disposal, Montgomery County, MD requires the recycling of yard waste along with commingled containers, mixed paper, and scrap metal.

In recent years, yard waste bans have been under attack by the waste industry in an effort to promote the use of bioreactor landfill and to push landfill gas capture over resource conservation. In 2003, the state of Iowa considered a repeal of its yard waste ban but the governor vetoed the bill, stating "This action will be a major step backwards for integrated solid waste management creating a need for communities to expand existing facilities or find new property for landfills. Yard waste is best managed at a composting facility and is one of the keys in improving Iowa's water quality. Collecting methane from landfills is still relatively inefficient. As urged by numerous recycling groups who support integrated solid waste management, pollution is best prevented by not disposing of yard waste at a landfill." Keeping yard debris out of landfills is the only practice to fully prevent methane emissions and to capture the valuable nutrients in these materials and to return them to our depleted soils. Learn more about the fight to repeal yard waste bans.

Food scraps

The U.S. generated 31.3 million tons of food waste in 2006, but only 680,000 tons were diverted from the landfill-that's only a 2.2% recovery rate! This makes food waste the second largest material by weight headed to our landfills and a huge source of methane emissions. Momentum for change is picking up across the country as communities initiate programs to collect source separated food scraps from residents and businesses.

Stockton, CA
In the city of Stockton, "recyclable material, green waste and food waste shall be separated from other solid waste for collection…'Food Waste' means all source-separated vegetable waste, fruit waste, grain waste, and dairy waste, meat waste, fish waste, food-contaminated paper and other compostable paper (such as pizza boxes, take-out containers, napkins and paper towels), and untreated and unpainted wall board co-collected with green waste…'Green Waste' means biodegradable materials such as leaves, grass, weeds, and wood materials from trees and shrubs."

Nova Scotia
In 1995, Nova Scotia rewrote its resource management goals to meet 50% by 2000 and has since become an international leader in organics recovery and Zero Waste. The province implemented disposal bans on organic waste including food scraps, yard waste, and soiled paper, as well as beverage containers, glass containers, and metal cans; cardboard and newsprint; tires, car batteries, and antifreeze; #2 plastic containers and polyethylene bags and packaging; and used paint. Ninety percent of residents in Nova Scotia have access to curbside composting and recycling collection.

Paper

Through a combination of voluntary and mandatory approaches, the U.S. has reached 50% paper recovery. However, in order to recover more than 75% of paper through recycling and composting, we really need to step up our efforts. Mandatory source separation and paper recycling ordinances help to ensure everyone in the community is doing their part. Below is a sampling of communities requiring source separation and/or paper recycling:

City and County Level

Montgomery County, MD
Commercial generators, residents and multi-family dwellers must recycle mixed paper including office paper, corrugated cardboard, newspaper, boxboard, magazines/catalogs, telephone books and paperback books. Recycling of commingled containers, scrap metal and yard trimmings are also required.

New York City, NY
Businesses must source separate corrugated cardboard, office paper, newspapers, magazines/catalogs, phone books. Food or beverage establishments must recycle corrugated cardboard along with containers.

San Diego, CA
The city of San Diego launched mandatory recycling for residents in 2008 and will phase in the program at businesses and multi-family units over the next two years. Occupants must participate in the recycling program provided by the city or the franchise hauler,

and that recycling program must collect paper, newspaper, and cardboard. Metal containers, plastic bottles and jars, and glass containers are also included. Business regulations may also apply to materials such as wood pallets, scrap metal and food waste, if markets exist and as determined by the Director of the Environmental Service Department.

Portland, OR
All businesses shall recycle designated materials and all MFUs must establish recycling systems. Recyclables include, but are not limited to newspaper, scrap paper, ferrous and non-ferrous scrap metal, used motor oil, corrugated cardboard and kraft paper, container glass, aluminum, tin cans, magazines, aseptic packaging, coated paper milk cartons, steel aerosol cans, plastic bottles, office paper, cooking grease, wood, rubble and other materials as may be designated by the city. Residents receive recycling service through franchised haulers.

Seattle, WA
Commercial establishments must separate paper, cardboard, and yard waste for recycling while residents in both single family and multi-family dwellings shall separate for recycling paper, cardboard, glass and plastic bottles, and aluminum and tin cans.

State Level

Maine
Businesses with 15 or more employees at one location must recycle office paper and corrugated cardboard.

New Jersey
The state requires each county to develop and adopt a recycling plan that includes the recycling of grass clippings and at least three other recyclable materials. View the list of materials required by counties in both the residential and commercial sector.

Connecticut
The Mandatory Recycling Regulations designate nine items that must be recycled in the state: glass food containers, metal food containers, old newspaper, corrugated cardboard, scrap metal, leaves, waste oil, lead acid batteries and high-grade white office paper.

Pennsylvania
Municipalities with populations of at least 10,000, and municipalities with populations between 5,000 and 10,000 and more than 300 persons per square mile, must implement curbside programs. All disposal facilities provide recycling drop-off centers. Mandated municipalities collect at least 3 of the following materials: clear glass; colored glass; plastics; aluminum; steel and bimetallic cans; high grade office paper; corrugated paper and newsprint. Commercial, municipal and institutional establishments within a mandated municipality are required to recycle aluminum, high-grade office paper and corrugated paper in addition to other materials chosen by the municipality.

Disposal Ban

Wisconsin
Wisconsin banned the disposal of several materials between 1991 and 1995. In 1993, the state banned the disposal of yard waste. In 1995, Wisconsin added aluminum containers, corrugated paper, plastics #1-#7 (if a market develops for the more difficult to recycle plastics), foam PS packaging (provided market development), glass containers, magazines, newspaper, office paper, steel containers, bi-metal containers, and waste tires.

Massachusetts
The state of Massachusetts bans leaves and yard waste; lead-acid batteries; whole tires at landfills; white goods (e.g., large appliances); paper and cardboard; metal, glass, and plastic containers; and cathode-ray tubes (e.g., from televisions and computer screens) from disposal.

- ## Our Campaign in 2 Pages

- Search

- ## Thanks to Our Sponsors

TSD
oe Truckee Sierra Disposal

/www.waste101.com)

SERVICES PRODUCTS (HTTP://WWW.WASTE101.COM/PRODUCTS/) RECYCLING

OCATION (HTTP://WWW.WASTE101.COM/HOURS-LOCATION/) RATES (HTTP://WWW.WASTE101.COM/RATES/)

TTP://WWW.WASTE101.COM/EVENTS/) JOBS (HTTP://WWW.WASTE101.COM/DOCS/TTSDJOBS.PDF)

Green Waste

Green Waste

Living in the Sierras comes with the responsibility of creating and maintaining Defensible Space for wildfire protection. Please see below for green waste programs provided in your area.

El Dorado County

Placer County

Truckee

Three convenient options are available to residents seeking to create and maintain Defensible Space for wildfire protection. The Drop-it-Off and/or Discounted Dumpster options should be used for initial, primary clean-up. After the property is raked, the branches trimmed, and the brush cleared, use the Green Bag program to maintain defensible space into autumn.

Discounted Dumpster. During the months of May, June and July Truckee residents may purchase up to two 6-yard, Yard-Waste only dumpsters at discounted rates. Use of Yard-Waste Dumpsters is restricted to natural loose yard waste material and *must not contain any bagged items*. Dumpsters also accommodate larger woody material such as limbs and branches in addition to pine needles, pine cones, brush and garden waste.

Drop-It-Off. Residents are allowed to drop off up to 6 yards of yard-waste material to the Eastern Regional Landfill (ERL). If material is transported in bags, the bags must be emptied on site by the hauler. To facilitate unloading, position a tarp on the bottom of the truck bed or trailer before loading the material. Don't forget to cover the load for safe hauling. In order to take advantage of the free drop-off, residents are required to bring proof of residency. ERL is located on Cabin Creek Road off HWY 89 three miles south of the Mouse Hole Tunnel. Free drop-off is available May 1 – October 31, Monday – Saturday, 8am – 4pm.

Curbside Green Bags for Maintenance. Residents participating in the curbside program must utilize Special Green Bags purchased from area vendors. Maximum of four bags can be left out weekly on regular garbage service day. Bags must not contain items that may pierce or protrude from the plastic. Bags must be tied and weigh less than 40 pounds each in order to be collected by the hauler. Curbside collection is intended to be a convenient option to dispose of small amounts of yard waste on an on-going basis and should not be used for large scale clean-up. The best way to prepare your home to survive a wildfire is to get the combustible fuel load away from the property altogether. Piling it in bags in front of your house is unsightly and only consolidates the fuel load. No matter how big the pile, collection is limited to 4 bags each week.

Other

The Dump
(Eastern Regional Landfill)
Hwy 89 & Cabin Creek Road
Truckee, CA 96161
530-583-7800

Administrative Office
645 Westlake Blvd, Suite 5
Tahoe City, CA 96145
530-583-7800
530-583-0804 (fax)

Mailing Address
Tahoe Truckee Sierra Disposal
PO Box 6479
Tahoe City, CA 96145

SERVING OUR COMMUNITY

Tahoe Truckee Sierra Disposal is dedicated to providing our community excellent service at a reasonable cost in a family-friendly manner.

PRESERVING OUR ENVIRONMENT

We are committed to keeping our Sierra environment beautiful and sustainable through safe and responsible operations.

SCRAPPY SAYS, "RECYCLE!"

OUR LOCATION

645 West Lake Blvd., #5
PO Box 6479
Tahoe City, CA 96145

Contact
(530) 583-7800

JOBS (HTTP://WWW.WASTE101.COM/DOCS/TTSDJOBS.PDF) MY ACCOUNT (HTTPS://WWW.ONLINE-BILLPAY.COM/DEFAULT.ASPX)
CONTACT US (HTTP://WWW.WASTE101.COM/CONTACT-2/)

Is Truckee's Green Bag Program In Trouble?

More than 50% of Truckee homeowners have participated in the Green Bag Program since its inception. The Town of Truckee did not anticipate the massive response to the program notwithstanding the fact that it was offered as a method to create defensible space. Residents are limited to four bags per week weighing not more than 40 pounds. In spite of that restriction, bags are piling up. Some residents produce as many as 20-50 bags per year.

The Town is looking for ways to make the program more efficient and reduce the cost. One of the options is a free yard waste drop-off program which allows six cubic yards of green waste to be dropped off at the landfill. In a trial run to determine the feasibility of this alternative, only four percent of residents participated. Nichole Dorr, recycling coordinator for the Town of Truckee wrote "Over the next several months the town will evaluate the current program and explore opportunities for possible change."

Bins were originally rejected because of the cost of purchasing extra equipment. Now the town is revisiting that option due to the rising costs of handling the increasing number of bags. If a resident's yard waste cannot fit into four bags, how can a bin be better? In any case, it should be noted that some of the costs are recouped by Tahoe Truckee Sierra Disposal by sending the yard waste to a biomass center to produce electricity. That which is not sent to the biomass center is chipped for resale as groundcover.

It is our understanding that the Green Bag Program was offered as a fire safety measure. In our opinion, the Town of Truckee should remember that fact when considering alternative methods for dealing with yard waste. One of the costs that should be taken into consideration is the cost of fighting wildfires. In 2012 Cal Fire reports 141,154 acres were consumed by fire. The five year average was 198,769 acres. In 2007 the Angora Fire near South Lake Tahoe, burned 3,100 acres, destroyed 242 residences and 67 commercial structures, and cost $11.7 million to fight. Over 3,000 evacuations were ordered and the personal cost in terms of damage was $141 million. We believe these costs should be juxtaposed against the cost of expanding the service of the Green Bag Program. For a detailed article on this subject, visit the Moonshine Ink website. Details of the Angora Fire can be found on Wikipedia.

Posted: July 30, 2013 / Filed Under North Tahoe-Truckee News • Leave a Comment

Comments

Leave a Reply

Name (required)

Email Address (required)

Website

Categories

Information Request

Questions? Send a message now or call (530) 913-6020

Phone

Email *

Comments

Submit

USCC Position Statement:

Keeping Organics Out of Landfills

The US Composting Council is firmly opposed to landfilling yard debris and other source-separated organics when viable alternatives are available. It is an inefficient way to use our organic feedstocks–wasting resources, reducing recycling, and potentially increasing greenhouse gas emissions.

As the world focuses on mitigating and preventing the consequences of global climate change there is a heightened awareness of the significant impact of landfill-generated methane emissions. This recognition is increasing the importance of recovering organics through composting and anaerobic digestion, since it is the organics that are buried in landfills that are the source of this methane. Currently there are 23 states that ban some fashion of organics disposal in landfills, mostly leaves, grass and other yard debris. It is unfortunate and ironic that these easiest-to-recycle materials are now the target of some entities who want to overturn organics landfill bans under the premise that the methane these organics would generate can be used as an energy source. The US Composting Council is firmly opposed to landfilling yard debris and other source-separated organic wastes. From both energy and resource conservation standpoints this is a wasteful use of resources, decreasing recycling and the life of our landfills and potentially increasing greenhouse gas emissions. Yard trimmings should be recycled into mulch and compost that can be used to enhance the health of our soils and plants and protect our water resources.

The USCC is a non-profit 501(c)(6) trade and professional organization promoting composting and compost use. We provide a unified voice for the growing composting industry. The US Composting Council is involved in research, public education, composting and compost standards, expansion of compost markets and the enlistment of public support.

Growth of US Composting

In 2005, an estimated 245.7 million tons of municipal solid wastes were generated in the United States, that's 4.5 pounds per person per day. Organic materials—comprised of yard trimmings, food scraps, wood waste, paper and paperboard products—are the largest component of our trash and make up about two-thirds of the solid waste stream.

According to the US Environmental Protection Agency,

> "Reducing, reusing, recycling, and rebuying—the four "Rs"—is key to diverting organic materials from landfills or incinerators and protecting human health and our land, air, and water. Waste reduction and recycling prevents greenhouse gas (GHG) emissions, reduces pollutants, saves energy, conserves resources, and reduces the need for new disposal facilities…Yard trimmings and food residuals by themselves constitute 24 percent of the U.S. municipal solid waste stream… Composting offers the obvious benefits of resource efficiency and creating a useful product."[1]

As a nation, we have made remarkable strides towards recycling these materials, primarily through the development of effective composting technologies. Whereas in 1990 recovery via composting only diverted 2% of the total solid waste stream, we now recover 20% through composting, including 62% of all yard trimmings (USEPA, 2006a). Unfortunately, confusion over how to deal with global climate change among some members of industry, government, and the general public threatens to undo these gains.

The Climate Change-Organics Connection

Global climate change threatens to cause dramatic ecological change for people, nations and environmental systems worldwide (see USCC factsheet: Composting and Global Climate Change: a Primer for Producers). While too late to completely stop, there is much to be done to reduce and delay the effects. Global climate change is caused by an increase in greenhouse gases in the atmosphere, the result of the burning of fossil fuels and other human activities. Carbon dioxide is the main greenhouse gas (GHG), but methane, nitrous oxide and other gases also make significant and disproportionately large contributions to climate change. When organic materials decompose naturally, the CO_2 they give off, while still a greenhouse gas, is part of the natural (biogenic) short-term carbon cycle[2]. Since this is part of the natural flow of CO_2 between vegetation and the

[1] http://www.epa.gov/epaoswer/non-hw/organics/index.htm
[2] Carbon is constantly removed from the atmosphere by plant photosynthesis, moved among organisms through the foodweb and released by via decomposition.

atmosphere it has little impact on global warming compared to the "mined" CO_2 produced by burning fossil fuel. However, when those same organic materials are placed in a landfill (anaerobic) environment the decomposers will convert and release the carbon as methane and other volatile organic compounds which *DO* contribute to global climate change. Recent waste composition studies estimate that approximately 72% of the municipal waste stream going to landfills is organic (6% wood, 7% textiles/leather, 13% yard debris, 12% food scraps, 34% paper). The US EPA has identified landfills as the single largest source of methane (CH_4), a potent greenhouse gas that is 23 times more efficient at trapping heat than carbon dioxide (CO_2). Landfills contribute approximately 34% of all man-made methane released to the atmosphere in the US (USEPA, 2007).

Landfilling Organics

Over the last quarter-century, state-of-the-art landfill management, known as "dry tomb", has been used to bury wastes in landfills so that they become sealed away from the environment. Entombment is achieved by lining the bottom of landfills with a thick impervious layer of geotextiles and clay, compacting the waste as it is buried, and covering each day's fill with soil or similar material. Once filled, the landfill is "capped" with another impervious layer. The leachate that seeps to the bottom of the landfill is collected and treated. All of these steps, eliminate or lower the overall moisture level in the landfill and as such significantly reduce the overall level of biological activity. Any buried organic materials decompose in this moisture and oxygen-starved environment, some more rapidly than others, generating landfill gas that contains methane and other harmful gaseous by-products.

Landfill gas (LFG) is hazardous and potentially explosive. In 1996, the EPA amended its landfill regulations[3] to require most landfills to have gas collection systems. The EPA also requires most landfills to monitor gas emissions and modify / expand gas collections systems when emissions reach certain thresholds. Collected gas may be burned (flared) to convert it to mostly CO_2 and water, or used as an energy source[4]. Figure 1 shows the change in chemical composition of the gas produced by organic materials in landfills as they decompose, finally stabilizing at a roughly 50-50 mix of methane and CO_2, with trace levels of other gases mixed in. The length of each phase depends on the type of wastes going in the landfill and the management of the landfill. For some materials, it may take several years to reach Phase IV, which may then last for many decades. Landfill owners are required to manage and control methane generation during the operational life of the landfill, and typically for a 30-year post-closure period.

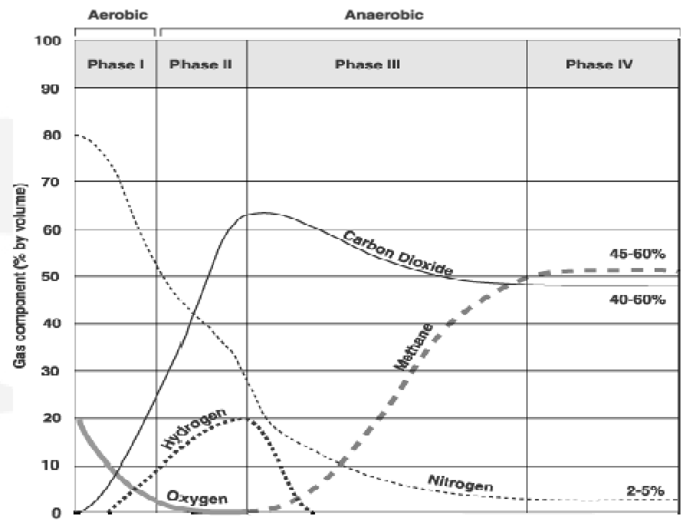


Figure 1. Phases of landfill gas generation over time
Source:www.atsdr.cdc.gov/HAC/landfill/html/ch2.html

Bioreactor Landfills

To accelerate methane production and to shorten the duration of Phase IV, EPA is testing new landfill designs as "bioreactors". The idea is to increase the moisture content in the buried waste to greater than 40 percent, through a combination of leachate recirculation and adding supplemental liquid, to improve the conditions for decomposition and methane generation. At this time, there are 6 federally recognized "bioreactor" projects underway. Since the rate of methane production can be increased, it may be more economical to use as an energy source. The landfill operators could potentially benefit by increasing the usable landfill space and lifetime, and by generating revenues from the sale of energy. However, this technology is still under-development and facilities are not widespread.

The USCC recognizes that the diversion of all organic materials from the waste stream into reuse or recycling is not possible in the near term. We therefore support the development of bioreactor landfills as an improved management practice that reduces the burden placed on future generations by today's waste disposal[5]. We also encourage the retrofitting of existing landfills with methane collection systems in order to capture as much as possible methane before it is emitted directly to the atmosphere. However, while doing a better job at managing, capturing and using errant landfill gas is a worthy goal, it in no way justifies any attempts to increase, or even to maintain, the amount of organics going to landfills. Here's why:

[3] Subtitle D of the Resource Conservation and Recovery Act is the main body of landfill regs. For a complete list go to http://www.epa.gov/epaoswer/non-hw/muncpl/landfill/msw_regs.htm.
[4] Besides controlling its flammability, raw LFG is 23 times more toxic than its combustion products (NRDC, 2003, full report at http://www.nrdc.org/air/energy/lfg/lfg.pdf)

[5] Joint Statement on Composting and Bioreactor Landfills from The Solid Waste Association of North America (SWANA) and The U.S. Composting Council (USCC), http://www.compostingcouncil.org/pdf/SWANA_USCC_position.pdf

Avoiding Methane Generation

Organics wastes do not contain methane. It is only when they are placed in an anaerobic environment that methane is produced. Composting, while not perfectly aerobic, will generate very little, if any, methane. Composters work to maintain an aerobic environment in their piles. The very management parameters that make for good composting, like proper carbon:nitrogen ratio, adequate moisture and good airflow, also minimize methane generation. The US EPA has concluded that the greenhouse gas emissions from composting stem from the energy used to manage the operations, not from the composting process itself (USEPA, 2006b)

Errant Emissions

Methane collection at a landfill often does not begin until the active portion of the landfill ("the cell") where the wastes are buried is "capped' (covered with an impermeable membrane). The timing of actual gas system installation is based on many factors including EPA requirements which require installation of such systems based on the age of in-place waste and a landfill's potential to emit gas. Some landfill operators may begin collecting LFG prior to cell closure; however, since the landfill is not yet capped, a significant amount of gas still escapes to the atmosphere. The delay between when the waste is buried and when the gas collection system is in place does not matter for organics like paper, wood and fiber that decompose slowly. However, the more rapidly decomposing "putrescible" wastes, like grass clippings or food scraps, often start generating methane within a few days or weeks. Much of this methane can be lost to the atmosphere if a gas collection system is not in place. Figure 2 shows how the capture rate may change over the lifetime of a landfill.

The USEPA estimates that over the life of a landfill 25% of the methane generated in a landfill with gas collection will escape. Some advocates of bioreactors put that number as low as 10%, while some critics put it as high as 80%. The overall efficiency of the methane collection will vary depending on many factors, including the waste composition, the climate and the management of the landfill. However, by endeavoring to put more organic wastes in a landfill in order to increase methane production, a bioreactor landfill may be emitting more methane than its conventional counterpart, especially in the near term.

Space Saver?

It is true that one of the benefits of managing a landfill as a bioreactor compared to conventional management is that the accelerated decomposition rate increases the useful space at the landfill, prolonging the life of a landfill and delaying the need to site a new landfill.

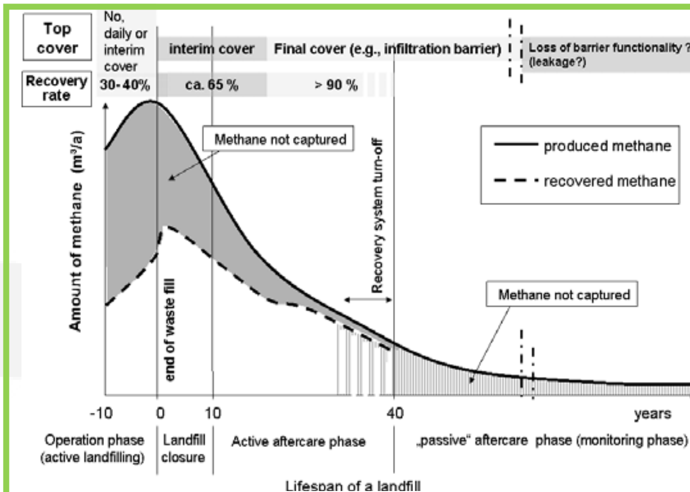


Figure 2. Methane production and recovery over a landfill lifetime (Humer-Huber et al, 2008)
Reprinted with permission, Sage Publication, UK

However, if saving space is the goal, a better solution would be to divert organics from landfills altogether. By sending the organics to reuse or recycling, perhaps with an energy extraction step, space is saved at the landfill, and society gets the most benefit from its materials.

It's not recycling

The USCC's position on putting organics in a landfill, whether a bioreactor or a dry tomb, is that disposal is a last resort. We recognize that the disposal of organics at landfills and the associated release of methane is partially due to the slow development of an alternative infrastructure. Composting is a viable alternative. Composting is recycling when these materials are used in the manufacture of something new and valuable. Whether it's converting wood pallets to landscape mulch or transforming leaves and grass to humus-rich compost, recycling of organic "wastes" makes sense and creates products of real value.

The products of composting and mulch production have many environmental benefits: Compost is widely used as a soil amendment in residential and commercial landscape and garden beds for its ability to improve the physical, chemical and biological properties of the soil, leading to healthier plants. Compost and mulch are gaining wide acceptance in the development and construction fields for their role in erosion control and stormwater management. Compost is increasingly used in agriculture for its ability to improve soil health and fertility. The list of applications and the understanding of the uses and benefits of recycled organic materials continues to grow.

More than just "Green Energy"

Is landfill gas "green" energy? On one hand, the EPA says yes, and on that strength LFG qualifies as a renewable fuel in nearly all of the states that have adopted some form of renewable energy portfolio standard (standards requiring power generators to provide a specified percentage of electricity from renewable fuels). (Weeks, 2005). On the other hand, several environmental groups, like the National Resources Defense Council and Grass Roots Recycling Network, do not agree, because of the potential to reduce recycling rates and uncertainty about emissions, both gaseous and liquid.

However, a more important question than the "greenness" of the energy produced is how to extract the maximum energetic value from organic residuals? Composts contain large amounts of organic carbon, rich in "biological energy", which can fuel critical ecosystem functions, such as soil building and nutrient cycling. The opportunity to utilize this biological energy is lost for those organic materials that are buried in landfills – the use of landfill gas to produce renewable energy only partially recovers some of this value.

In any case leaves and branches are not good sources of methane. Eleazar et al (1997) showed that high amounts of lignin interfere with methane production. Only 28% of leaf mass and 29% of branches decomposed in a landfill environment, as compared to 94% of grass and 84% of food.

The USCC believes it makes more sense, from both energetic and greenhouse gas perspectives, to send organic feedstocks to either dedicated energy-extraction processes such as anaerobic digestion or to composting than to dispose of those feedstocks in landfills. In dedicated energy-extraction facilities the quality of the gas produced is much higher, and the errant emission rate is near zero. After digestion the solids can still be used as a soil amendment or a composting feedstock to provide essential ecosystem services.

Towards a Sustainable Future

Despite the well-recognized value of compost for improving the environmental sustainability of our gardens, yards, parks, cropland and forests, the economics of composting may not always be favorable as we transition away from common waste management practices. Composting operations can incur significant development and operating costs. Economic viability of compost operations is essential if they are to be sustainable. These facilities must be properly designed, operated, and monitored if diversion is truly going to be a success. It will require regulatory and public support to discourage unnecessary landfilling and promote the use of composting. Those supports come in two basic forms: 1) financial: those that increase the cost of alternatives or reduce the cost of organics collection or processing, and 2) directive: those that guide feedstocks towards composting. Of the latter, direct bans on landfilling some or all yard trimmings have been most effective, followed by stating recycling goals that can only be realistically met by composting yard trimmings. More recently, innovative market-based incentives, such as "carbon credits", have been proposed to stimulate the recycling of organic residuals without the need for additional mandates.

While some form of composting has been practiced since ancient times, as a modern industry it is barely 30 years old. As the market for compost products matures and differentiates, the demand for compost will grow. At that point the regulatory support may become unnecessary. For now though, we need to keep the bans and other policies in place and not allow yard trimmings to end up in landfills, bioreactor or otherwise. The path to a sustainable society may be long and difficult, but composting organics is clearly a step in the right direction.

REFERENCES:

Agency for Toxic Substances and Disease Registry, 2001, Landfill Gas Primer: An Overview for Environmental Health Professionals, US Department of Health and Human Services, Washington, DC.

Chen, C. and Green, N., 2003, Is Landfill Gas Green Energy, Natural Resources Defense Council, New York, NY

Eleazer, W.E., O. Williams, W. Yu-Sheng, M. Borlaz, 1997, Biodegradability Of Municipal Waste Components in Laboratory-Scale Landfills, Env. Sci and Tech, Vol 31, No 3:911-917

Huber-Humer M., J. Gebert and H.Hilger, 2008, Biotic systems to mitigate landfill methane emissions, Waste Management Research 26:33-46

USEPA, 2006a, Municipal Solid Waste in the United States: 2005 Facts and Figures. US Environmental Protection Agency, Washington, DC

USEPA, 2006b, Solid waste Management and Greenhouse Gases, US Environmental Protection Agency, Washington, DC

USEPA, 2007, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005, USEPA #430-R-07-002, US Environmental Protection Agency, Washington, DC

Weeks, J, 2005, Landfills Expand Energy Output, BioCycle August 2005, Vol. 46, No. 8, p. 48

US Composting Council
1 Comac Loop, Suite 14B1
Ronkonkoma, NY 11779
phone: 631-737-4931
fax: 631-737-4939
email: uscc@compostingcouncil.org
www.compostingcouncil.org

CLIMATE PROTECTION PLAN

December 3, 2007

Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level*.[1]

*IPCC, 2007: Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Table of Contents

Executive Summary

Overview
Global warming is nearly universally recognized by scientists, and much of the public, as one of the most important threats facing human civilization, and political stability. This rise in temperatures has major implications for transboundary migration, economic prosperity, and the future of human development. Locally, the effects of climate change are likely to reduce the availability of hydro generated electricity, increase the incidence of forest fires, and lead to a rise in the level of San Francisco Bay that would impact Palo Alto's shoreline.

The Climate Protection Plan (CPP) continues a process, of which the Green Ribbon Task Force (GRTF) recommendations were an earlier step, through which the City government and the community are working together to reduce significantly greenhouse gas (GHG) emissions. A cross reference between the GRTF recommendations and those of the CPP are summarized at the end of each chapter and presented in-full in Appendix I.

The goal of the CPP is to present a comprehensive inventory of municipal (City government-generated) and community-generated emissions, propose reduction targets, and propose practical steps to reach those targets.

Setting Emission Reduction Goals
The CPP sets out goals for the reduction of CO_2 emissions from the City and the Community. These goals are:

> ***Short Term Goal****:* By 2009 the City will reduce emissions by 5% from 2005 emission levels for a total reduction of 3,266 metric tons of CO_2.
>
> ***Medium Term Goal****:* By 2012 the <u>City and Community</u> will reduce emissions by 5% from 2005 emissions levels for a total reduction of 39,702 metric tons of CO_2.
>
> ***Long Term Goal:*** By 2020, the <u>City and Community</u> will reduce emissions by 15% of 2005 levels, equal to 119,140 metric tons of CO_2, and bring the community in line with State reduction goals.

Cost Benefit Analysis and Budget Implications
The CPP begins the process of estimating the costs of potential actions, some of which would be borne by the City, and others of which would be borne by the end user or community.

The cost benefit analyses here should be considered as preliminary only. Additional, more detailed financial analyses should be carried out before many of the actions listed here are implemented. Furthermore, additional funding is required for many of the actions recommended in this report. Any actions deemed by Council worth expending City funds would be integrated into the 2008-10 budget process in spring 2008.

The table at the end of this Executive Summary lists all of the proposed actions in this report, broken out by those requiring no additional funding, and those requiring additional funding and/or additional analysis of funding needs.

Structure of the Report

This report contains eight chapters:

- Chapter 1 is the Introduction.
- Chapter 2 discusses the baseline inventory of City and community-wide greenhouse gas (GHG) emissions, and proposes an overall goal of reducing communitywide emissions by 15% below 2005 levels by 2020.
- Chapter 3 covers the wide array of emission-reducing Utility programs.
- Chapter 4 describes the Sustainable Purchasing portion of the Plan.
- Chapter 5 discusses Transportation and Sustainable Land Use.
- Chapter 6 covers Green Building.
- Chapter 7 discusses Zero Waste, and
- Chapter 8 on Education proposes strategies for enlisting City employees and the Palo Alto community in carbon-reduction efforts.

In each chapter, the subject area is introduced, baseline emissions quantified where possible, and then goals and actions laid out for Short-Term (2008), Medium-Term (2009-2011), and Long-Term (2012-2020) time frames. At the end of each chapter, the GRTF recommendations for that section are laid out in table format, side-by-side with the recommendations contained in that chapter, with comments regarding differences between the two sets of recommendations. Appendix 1 lists the entire 250 recommendations of the GRTF and correlates them where possible with the proposed actions of the CPP.

This document primarily assumes a forward-looking vantage point. While several activities throughout the City are already underway to achieve Council policy goals that overlap with climate protection issues, this report attempts to identify the costs and benefits of those activities as they apply to greenhouse gases. It also focuses on the continuation of those activities as well as the introduction of new activities for reducing GHG emissions.

Key Findings

Emissions within Palo Alto are estimated at 814,254 metric tons per year. The CPP presents a number of possible actions to consider implementing to meet the City's emission reduction goals. The three primary sources of emissions from Palo Alto are as follows:

> **Transportation Fuels:** Commute emissions, plus other non-commute driving and Air Travel accounts for 333,400 metric tons of CO_2e or 40% of total emissions.

Energy: Natural Gas and Electricity use accounts for 155,016 metric tons of CO_2e or 19% of total emissions

Solid Waste: Emissions from Solid Waste account for 100,304 metric tons of CO_2e or 14% of total emissions.

A variety of possible actions to reduce these emissions are presented in this report. These actions fall into three categories:

Short Term Actions. These are actions that the City should undertake as soon as possible, for completion by July 2009. Generally these actions cost little or no additional funds, are part of existing programs, or can be accomplished with relatively modest effort on the part of staff. For the most part, these actions do not achieve significant declines in emission levels.

Medium Term Actions. These are actions that the City should aim to complete by 2011. With a few exceptions these actions entail moderate marginal cost. Some actions may require a new program for implementation, and most may be accomplished with a modicum of additional staff, resources and/or community effort.

Long Term Actions. These are actions that will require substantial additional resources, considerable staff effort, and substantive community involvement to be effective.

A complete list of proposed actions, and their costs and benefits where known, is included in Appendix II.

Chapter 1: Introduction

Global warming is nearly universally recognized by scientists, and much of the public, as one of the most important threats facing human civilization, and political and military stability. This rise in temperatures has major implications for transboundary migration, economic prosperity, and the future of human development. Locally, the forecasted changes in precipitation accompanying climate change could dramatically reduce the availability of hydro generated electricity, increase the incidence of forest fires, and lead to a rise in the level of San Francisco Bay that will impact Palo Alto's shoreline.

The residents and businesses of Palo Alto clearly recognize the challenges, and appear willing to be part of the solution. In a survey conducted of residents on behalf of the City's utilities, a full 81% of respondents believe that global warming is worse now than a few years ago.[1]

City staff members have also recognized the importance of climate change, and have taken many steps to reduce the emissions of greenhouse gases. For example, the Electric Utility has implemented an innovative and nationally recognized green power program and provided incentives for energy efficiency, among other programs. The Planning Department has implemented incentives for environmental considerations in development, while the Public Works Department is working to decrease the energy demands in public buildings, reduce energy use in the Regional Water Quality Treatment Plant, and reduce the amount of waste that is deposited in the landfill.

Palo Altans can take pride in the efforts of the City and community in reducing greenhouse gas emissions. For example, since 1990, the City government has reduced its energy use by roughly 20% by purchasing and installing energy efficient lighting and LED street lighting, and by implementing energy management systems that optimize state-of-the-art HVAC systems. Also since 1990, emissions from the community from electricity and gas use have declined 13% due in part to more efficient use of energy as well as a decline in economic activity.

Nevertheless, local government, by itself, cannot fully address all of the challenges posed by climate change. Government must act in coordination with, and provide incentives to, the public to fully mitigate the risks posed, and to promote programs and individual behaviors that reduce greenhouse gas emissions. Recognizing the need for coordinated action, former Mayor Kleinberg established in 2006 a Green Ribbon Task Force (GRTF), spearheaded by residents and supported by City staff, to develop a comprehensive list of recommendations to the City and the Community, on ways to reduce greenhouse gas

[1] RKS Research and Consulting, 2006

emissions. The report of the GRTF (CMR: 211:07) delivered in December, 2006 represents far-reaching thinking about new and innovative approaches to solving the climate challenge. Staff has ensured that recommendations of the GRTF are integrated into this Climate Protection Plan.

The first step in implementing a climate protection plan for the City government of Palo Alto and the community it serves is to develop a comprehensive baseline assessment of current emissions. Over the last year, City staff and community members have studied the sources and amounts of greenhouse gas (GHG) emissions from within City limits. This work has included assessments of emissions from energy and fuel use in municipal operations, electricity and natural gas use by the community, road travel within and through Palo Alto, air travel, and commuting to and from Palo Alto. These efforts have been summarized in recent Council reports (CMR 211:07 and *Green Ribbon Task Force Report*).

Council has made Climate Protection a top priority for 2007, and has committed to address climate protection in numerous arenas including:

1. U.S. Mayor's Climate Protection Agreement (CMR 426:06)
2. Sustainability Policy (CMR 260:07)
3. International Council of Local Environmental Initiatives (ICLEI) Cities for Climate Protection Campaign (CMR 426:06)
4. California Municipal Utility Association GHG Reduction Principles (CMR 211:07)
5. Long-Term Electric Acquisition Plan (CMR 158:07)
6. Membership in Sustainable Silicon Valley and Joint Venture Silicon Valley's Climate Protection Taskforce (CMR 266:07)
7. California Climate Action Registry (CMR 169:06)

The goal of this CPP is to present a comprehensive inventory of municipal (City government-generated) and community-generated emissions, identify reduction targets, and propose practical steps to reach those targets. More specifically, the CPP is intended to achieve the following:

1. Analyze the available data on emissions from both municipal and community activities, to present a more comprehensive inventory of emissions from (a) City government operations and (b) community-wide activities
2. Present this inventory as a baseline against which to measure progress towards reducing GHG emissions
3. Develop a set of emission reduction goals for municipal operations over the next year (short term), from years 2-4 (medium term) and from year 5 and beyond (long term) timeframes.
4. Present cost-effective actions for each City department for achieving municipal emissions reduction goals.
5. Present cost-effective actions the City may undertake to help reduce emissions from the Community.

The Climate Protection Plan (CPP) is the next step in a process, continuing on from the GRTF recommendations, by which the City government and the community develop and implement GHG emission reductions and provide leadership in the climate crisis. While the City and the community have much to accomplish, we are not starting from scratch. Municipal staff and the community have already implemented many programs to reduce emissions. Palo Alto is known nationally and internationally as a community of intellectual capital and innovative technology, developing new approaches to solving problems. As a community, Palo Alto has the opportunity to continue its leadership role in finding solutions to the challenges posed by the climate issue.

Cost Benefit Analysis and Budget Implications

The costs of actions to reduce greenhouse gas emissions are a key component of prioritizing which actions to take, in implementing a Climate Protection Plan. This CPP begins the process of estimating the costs of various actions. Some of these costs would be borne by the City, while other costs, either directly or indirectly, could potentially fall on the end user, or the community.

The process of estimating costs of specific CO_2 reductions requires making some assumptions. The assumptions used in this report are described in each chapter's cost benefit section. In some instances, the assumptions use information taken from manufacturers' or other non-peer-reviewed materials and websites, and could not for this study be independently verified. This being the case, the cost benefit analyses should be considered as preliminary only. Additional, more detailed financial and budgetary analyses should be carried out before many of the actions listed here are implemented.

Despite the preliminary nature of these estimates, the analysis does strongly suggest that the City specifically, and the community as a whole, may embark on some significant actions to reduce greenhouse gas emissions at little or no cost. These low-cost actions can be initiated within the next twelve months. Other actions, requiring either greater financial commitment or policy decisions, should be evaluated in the upcoming months by staff which can then make recommendations for expenditures in concert with the FY 2008-2009 budget process. A third group of potential actions represent long term investment and policy changes and require additional study and consideration.

In many cases the changes required to significantly reduce emissions bear significant costs. Many of the actions listed in Appendix II listed here have relatively low cost, but also low benefit. A few, such as reducing the carbon intensity of electricity, have a major impact and can be implemented quickly while maintaining relatively low cost to the City. However, overall, significant investments will be required, especially surrounding waste diversion and the zero waste goals, to achieve significant reductions in emissions.

In many instances, however, the benefits of actions extend beyond the climate change issue. For example, while achieving Zero Waste goals will significantly reduce carbon emissions, it will have other benefits in terms of reduce requirements for landfill space and cleaner air. In another example, adopting green building principals will lower emissions from energy use, but also reduce water demand, improve indoor air quality, and enhance overall standards of living. Including these "auxiliary" benefits into the cost benefit analyses was beyond the scope of this project.

How the Climate Protection Plan fits into other environmental and sustainable efforts

The Climate Protection Plan intersects with and influences many other environmental programs and initiatives. For example, the Zero Waste plan calls for an increase of the diversion rate of several categories of solid waste which will significantly reduce GHG emissions from the community. Another example is the Urban Forest Master Plan. An interdepartmental team has been working to prepare a master plan that addresses the management and expansion of Palo Alto's urban forest. The goal of the Plan is to identify and set forth a comprehensive strategy for management and expansion of both the private and public urban forest, including a preliminary inventory of the publicly-owned urban forest and its carbon trapping capacity. The plan will be completed by summer 2008.

Goal Setting

In each of the following chapters, staff evaluates actions for reducing emissions from several of the sectors comprising City and community GHG sources. To the extent possible, each recommendation is analyzed on a cost-benefit basis.

Staff recommends adopting the following overall goals across City and community operations. These goals are listed below, and correspond with many of the recommendations listed in the Green Ribbon Task Force Report:

1. Set greenhouse gas emissions reduction targets as follows:
    - A 5% reduction from 2005 City emissions levels by July 2009. This would equal a reduction of 3,266 metric tons CO_2e.
    - A 5% reduction in City and Community emissions by July 2012. This would equal a reduction of 39,702 metric tons of CO_2e.
    - A community-wide target of a 15% decrease from 2005 levels by 2020, equal to a reduction of 119,107 metric tons. Achieving this goal would enable Palo Alto to match the State of California’s goal of 1990 emission levels by the year 2020 (statewide it is estimated that 2005 emissions were 15% higher than 1990 emissions).

2. Incorporate carbon reduction into the City’s Comprehensive Plan goals to ensure continuity with other City priorities, continued action, and a long-term perspective.

3. Explore and evaluate a policy whereby all of the Palo Alto Utilities would become climate neutral and enable customers to choose climate neutrality through various voluntary mechanisms.

4. Use this Climate Protection Plan as a springboard for determining GHG-reducing actions to take over the next few years. It should be revisited and action steps reformulated at least biennially.

5. Maintain and report GHG inventories on a regular basis including:

- Conducting regular community-wide GHG emission estimates using methodological advances to improve the estimates presented here.
- Conduct annual municipal operations GHG emissions inventory.
- Continue to certify electric utility emissions with California Climate Action Registry (CCAR) or with a suitable reporting system recognized by the State of California.

6. Promote participation by Palo Alto businesses in inventory efforts: CCAR, SSV (Sustainable Silicon Valley), JVSVN (Joint Venture Silicon Valley Network), SVLG (Silicon Valley Leadership Group) or other organization). This includes participation by vendors and joint action agencies with which Palo Alto interacts (Northern California Power Agency, Transmission Agency of Northern California, Palo Alto Solid Waste Collection and Hauling agreements, etc.). These efforts should include:

    - Participating in regional efforts to promote consistent, science-based, reasonable, and transparent GHG inventory accounting.

    - Working with ICLEI, California Climate Action Registry, California Air Resources Board, US EPA and other broad based organizations who are working on developing new approaches to estimating emissions from refuse (landfills, recycling, composting) activities, water treatment, natural gas distribution systems, and other pertinent and applicable municipal operations.

    - Helping to refine science for estimating unmeasured sources; fugitive methane from landfills and gas distribution, sequestration and sinks, regional transportation, air travel, embodied emissions in purchased products, etc.

    - Developing methodology using SAP or other tools/systems for tracking and for regulatory compliance and tracking municipal purchases for emissions modeling.

    - Preparing systems for completing municipal inventories of non-CO_2 emissions.

    - Identifying and tracking long-term methodology and metrics for measuring progress (e.g. total, net, per-square-foot, per capita, per unit GDP, etc.).

Monitoring

The City will measure its overall progress in reducing GHG emissions by:

- Completing the California Climate Action Registry inventory, or similar inventory, every two years.
- Updating International Consortium of Local Environmental Initiatives inventory for community-wide emissions every two years.
- Monitoring the effectiveness of actions undertaken on an annual basis.

Table 1.1 Baseline Green Ribbon Task Force Recommendations in comparison with Baseline Palo Alto Climate Protection Plan Actions

GRTF Baseline Recommendations	CPP Baseline Actions
Knowing the starting point helps identify and prioritize opportunities	This CPP analysis presents more detailed analysis of cost effective actions and prioritizes opportunities for the city and the community.
No uniform accepted baseline methodology for cities.	CPP used best practice analysis to emissions estimating Methodology for Palo Alto, borrowing approaches from CCAR, ICLEI and the US EPA.
Would be improved with more frequently updated Palo Alto-specific data	CPP does not specifically address issue of Palo Alto-specific data.
Apply targets to government, corporations, or even individuals	CPP provides a comprehensive analysis of emissions from more sources than are commonly used in performing inventories. Additionally, CPP provides recommendations and cost effective measures on how to reduce emissions for Palo Alto government, corporations and individuals.
Measuring changes instead of totals often easier with greater accuracy	CPP provides data for the community and municipal government to compare progress overtime by providing details on methodology used to complete assessment.

Chapter 2: Greenhouse Gas Emissions Estimates

Overview

According to the US Environmental Protection Agency, the average American emits 23 metric tons of carbon dioxide into the environment every year; 10 metric tons related directly to driving, home activities, and air travel, and 13 metric tons related to the purchase of products and services. Overall, each person emits 140 pounds of carbon dioxide per day.

Per capita CO_2 emissions in California are estimated by the California Energy Commission to be approximately 11 metric tons per year. In California, GHG emissions are dominated by carbon dioxide, mostly from combustion of fossil fuels, followed by nitrous oxide, then methane, and then the remaining "high global warming potential" gases, chlorofluorinated refrigerants and sulfur hexafluoride. California GHG emissions by GHG and by end-use sector are illustrated in Figure 2.1 and Figure 2.2.

The greenhouse gas of key concern is carbon dioxide (CO_2). GHGs other than CO_2 can be converted to "CO_2 equivalent" (CO_2e) by multiplying the mass of that gas by the "global warming potential" (GWP), which indicates the equivalent greenhouse effect of a pound of the gas as compared to a pound of CO_2. Throughout this report, references to greenhouse gas (GHG) emission quantities follow the international convention of using metric tons (2205 pounds) of CO_2 or "CO_2 equivalent" when referring to non-CO_2 greenhouse gases. Sometimes pounds are used when those units are more illustrative. The key GHGs of interest are listed below in Table 2.1 along with their respective global warming potentials.

Table 2.1. Key Greenhouse Gas Global Warming Potentials

Gas	Symbol	Global Warming Potential (IPCC Second Assessment Report)
Carbon Dioxide	CO_2	1
Methane	CH_4	21
Nitrous Oxide	N_2O	310
Hydrofluorcarbons	HFCs	140-12,100
Perfluorocarbons	PFCs	6,500-9,200
Sulfur Hexaflouride	SF_6	23,900

Per capita Palo Alto emissions (not including municipal operations-generated emissions) are estimated at 14 metric tons, or 26% above the statewide average. This higher level of emissions is not necessarily an indication that an average Palo Altan actually emits more greenhouse gases than the average Californian. Rather, it indicates that this inventory includes emissions, both direct and indirect, which may not be included in some other inventory approaches.

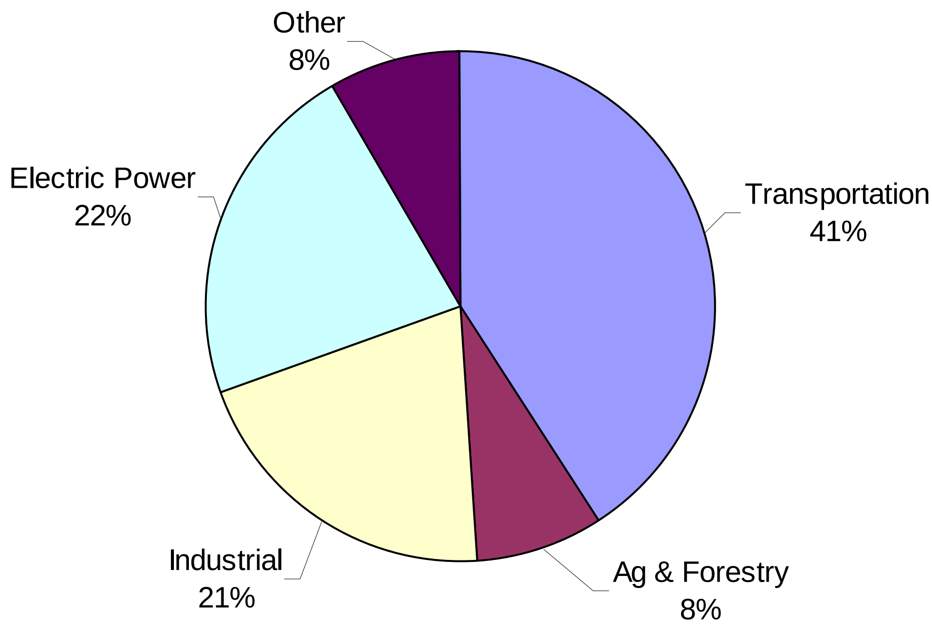


Figure 2.1. Sources of California's 2004 GHG Emissions by Sector
Source: California Energy Commission

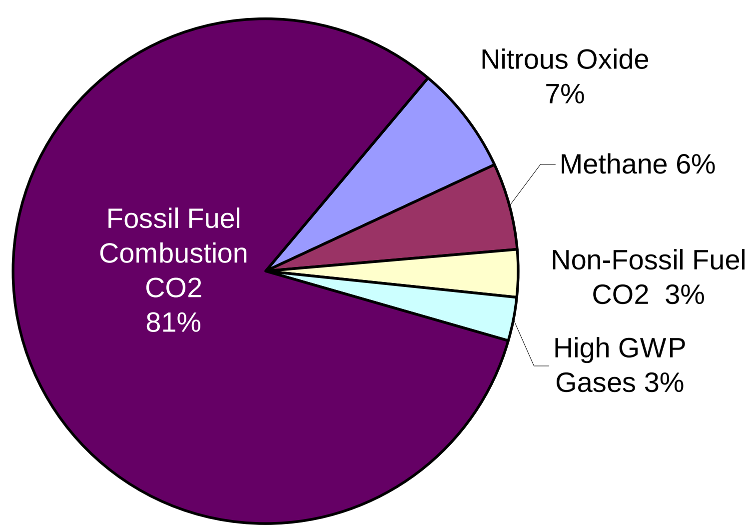


Figure 2.2. California GHG Gas Composition in 2004
Source: California Energy Commission

Approach to Assessing Emissions

In this report, staff has attempted to complete a more comprehensive assessment of emissions from both City operations (municipal) and the Palo Alto community as a whole than most other cities have attempted. This assessment includes some sources of emissions not included in other inventories, such as emissions generated outside Palo Alto and even outside the United States, as part of "upstream" emissions from the manufacture of products used but not produced in Palo Alto. By including these sources, we have attempted to account for emissions that are a result of our actions, behaviors and purchasing decisions which we can indeed influence. In a global perspective, we "own" those emissions no matter where they are generated. We as a community **should** account for them, even if current emissions reporting protocols do not extend to this level.

Municipal Emissions Profile. City operations contribute to greenhouse gas emissions through three primary avenues:

1. Energy
   a. The use of electricity and natural gas to power and heat City buildings and facilities.
   b. The use of gasoline, compressed natural gas, diesel fuel and other fossil-based fuels to power vehicles, equipment, compressors and other machinery. This includes the emissions of vehicles from the Palo Alto Landfill and Regional Water Quality Plant.
   c. Emissions associated with losses in the electric and gas transmission and distribution systems (which serve the entire community).
2. Materials & Services
   a. Emissions associated with the manufacture, use, and disposal of a wide variety of products such as paper, electronics, toner cartridges, and equipment.
   b. Outsourced services that use fossil fuels from City fueling stations.
3. Community Refuse and Wastewater Services
   a. Emissions from the Palo Alto landfill (which serves the entire community) but not including the use of vehicles which are included in 1b above.
   b. Emissions from wastewater treatment at the Palo Alto Regional Water Quality Plant (which serves several communities) but not including the use of vehicles which are included in 1b above.

Palo Alto has CO_2 "sinks," as well, such as City-owned trees, which can absorb CO_2. Given the framework of this Plan, these sinks are not included. The City is working actively to manage its forest resources in open spaces and is currently working on a revised Urban Forestry Master Plan. Staff recommends that future reports and updates include the impact of municipal and community actions to increase biotic sinks and sequestration impacts and coordinate the Climate Protection Plan actions with those of the Urban Forestry Master Plan.

Community Emissions Profile. The Palo Alto community - businesses, residents and workers produce greenhouse gas emissions in a wide variety of ways. These include:

1. General economic and domestic activity which consumes electricity and natural gas to power and heat homes and businesses.
2. Non-commute travel, including errands, business, vacations, shipping, and air travel.
3. Commuting by residents to their job within and outside of City limits, and by non-residents commuting into the City for work. In this way, the "community" of Palo Alto includes workers who come to the City for employment, but do not reside within city limits.
4. Production of waste material which, when landfilled, decomposes and in the process produces methane, a potent greenhouse gas.
5. Production of new materials and disposal of materials that could be recycled.

Calendar year 2005 has been selected as the "baseline" reference year, as it is the first year for which certified estimates have been completed.

A key element in this analysis is the inclusion of "upstream" emissions as well as "downstream" emissions. Understanding the differences between these emissions types is critical in understanding both the methodology of this report, as well as the results and conclusions drawn. Downstream emissions are those which are released as the result of a particular activity. For example, downstream emissions include the discarding of materials into a landfill which in the process of decomposing creates CO_2, methane, or other greenhouse gases, or the leakage of refrigerants into the atmosphere from old appliances. The ICLEI model focuses on downstream emissions.

Upstream emissions are those generated by the manufacture and transportation of products to Palo Alto. In this report, upstream emissions are included for items which are discarded into the waste stream but which are recyclable. The upstream emissions represent the <u>difference</u> between the additional emissions which are generated by the making of a new item compared to the emissions generated by recycling the item. For example, 15.7 tons of CO_2 emissions are produced in the production of one ton of new aluminum cans, as opposed to 2.2 tons CO_2 emitted in recycling a ton of aluminum cans (EPA 2006). The difference, 13.5 tons, is included in the emissions inventory for non-recycled aluminum cans as an upstream emission.

The analysis presented below is based on three primary approaches to measuring emissions.

1. California Climate Action Registry. For the municipal baseline estimates associated with energy use, staff used the protocols from California Climate Action Registry (CCAR). This State recognized registry provides municipalities and organizations a methodology for measuring emissions primarily associated with energy use. The data used in this report were those reported to CCAR as the City's 2005 baseline emissions inventory.

2. ICLEI. For much of the other non-energy sources of emissions from the City, staff used the protocols designed by ICLEI, the International Council for Local Environmental Initiatives. These protocols are embodies in ICLEI's Clean Air and Climate Protection (CACP) Software, which was used in this analysis. The ICLEI climate protection protocol is being used by over 800 cities and local governments around the world, including over 20 in the Bay Area. The ICLEI approach has the advantage of comparability between cities, allowing municipal staff and residents to compare emissions profiles of similar communities. However the ICLEI approach does have some limitations and does not consider many types of emissions from the community which are critical to obtaining a complete community-wide emissions profile. These omissions include emissions from municipal purchases of office supplies, as well as emissions associated with the manufacturing of materials which are discarded by the community instead of being recycled.

3. US EPA. Because of the ICLEI limitations, staff used the US Environmental Protection Agency's Life Cycle Assessment of Emissions and Sinks for emissions factors when the ICLEI Model did not include those elements.

Table 2.2 presents the details of the emissions inventory, identifying for each emissions source whether the ICLEI or the EPA model was used, as well as the data source and conversion factor used.

In addition to the CCAR, ICLEI, and EPA protocols, staff has employed the following additional resources in developing a baseline of Palo Alto emissions:

1. Transportation estimates are based on the Mayor's Green Ribbon Task Force assessment of transportation vehicle-mile, vehicle mix, fuel sales, and commute data from the U.S. Census Bureau, Bay Area Air Quality Management District, Metropolitan Transportation Commission, California Department of Motor Vehicles, and State Board of Equalization.
2. Estimates related to materials and solid waste are based on landfill emissions factors from the California Air Resources Board (CARB), direct source-testing measurements at the Palo Alto Landfill, the US Environmental Protection Agency's *Solid Waste Management and Greenhouse Gases Report Edition 3*, and use of ICLEI's "Clean Air and Climate Protection Software".
3. Assessment of the component emission factors associated with purchases by the City were carried out using data from the US EPA WARM model, as well as anecdotal data from the Pew Center on Climate Change, "The Green Guide" of the National Geographic Society, Silicon Valley Toxics Coalition, Indiana Recycling Coalition, and Green Office Products Program of United Kingdom[2].

---

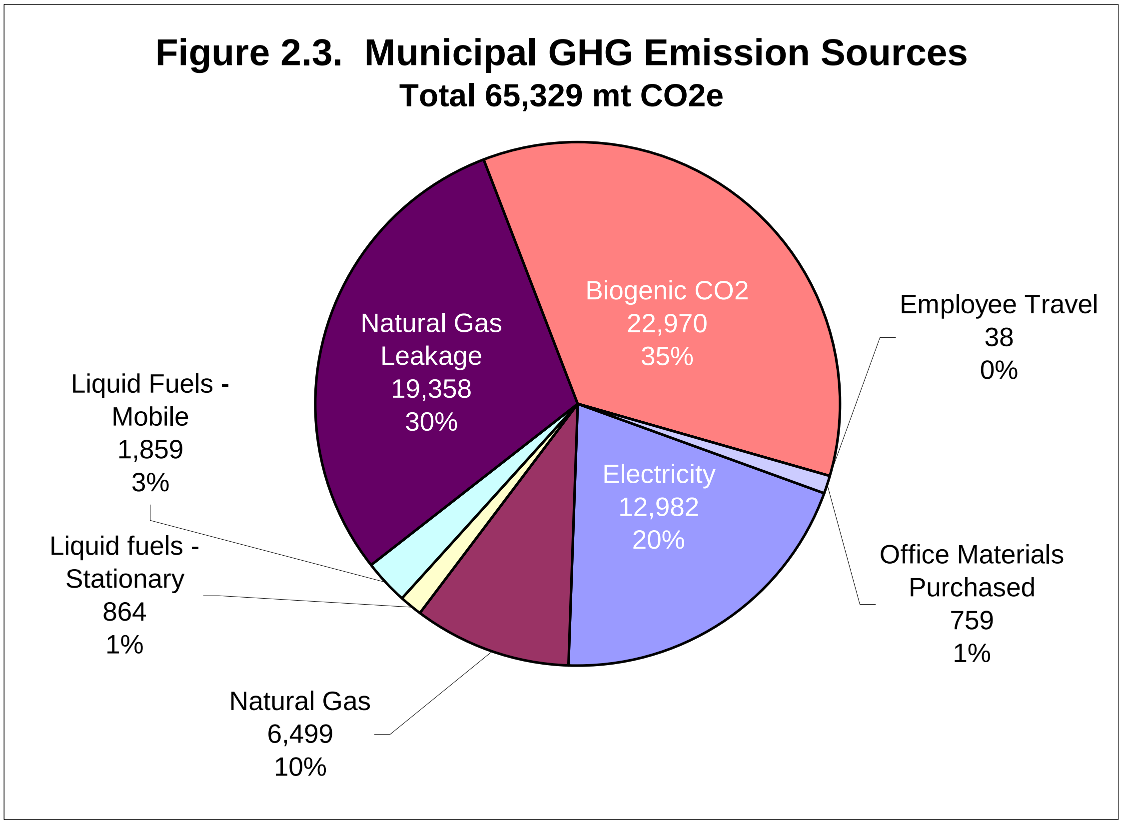
[2] Other sources include: *Eco-Efficiency in Industry and Science series from Kluwer Publications: Computers and the Environment, edited by Ruediger Kuehr and Eric Williams. Research conducted at the United Nations University, and Organization for Economic and Cooperative Development. Working Party on Pollution Prevention and Control. Extended Producer Responsibility: A Guidance Manual for Governments. October 2000.*

Baseline Emissions Estimates

Municipal and community-wide emissions estimates are listed in Table 2.2. The results indicate that total baseline emissions for the municipal and community combined is 794,049 metric tons of CO_2e, or approximately 14 tons per resident. Of that total, municipal emissions contributed 65,329 metric tons of CO_2e which include emissions from energy use, biogenic sources, fugitive sources, employee travel, fuel use, and some office purchases. Community emissions are approximately 728,720 metric tons of CO_2e per year, which include emissions from electricity and natural gas use, transmission and distribution losses, commuting into and out of Palo Alto, non-commute ground travel, air travel, landfill emissions, and upstream emissions from recyclable materials left in the waste stream. One emissions source, leakage of methane from the Palo Alto Landfill, is subject to considerable debate, and different methodologies show a high degree of variability. Currently, an external consultant has been retained to carry out a detailed study. The results from that study are not yet released.

Emissions of greenhouse gases from City operations and City-managed facilities are presented in Figure 2.3. Municipal use of electricity, natural gas, and liquid fuels emit about 22,242 tons of CO_2e per year. Flaring collected landfill gas and incinerating wastewater sludge account for another 43,185 tons of biogenic CO_2 (not reported under IPCC protocols). City purchases account for at least 759 tons of CO_2e. One major suspected source of "fugitive" methane emissions is included which involve leaks in the utilities' natural gas distribution system. The amount of emissions from such leaks is very difficult to estimate accurate. The total of 65,329 metric tons of CO_2e includes taking a conservative approach to the variability of fugitive emissions.

Continued refinement on the methodology for determining fugitive emissions is clearly worthwhile. Nitrous oxide and high GWP gases have not yet been estimated. In addition, sequestration such as trees have not yet been incorporated.



CCAR does not include emissions associated with manufacture and disposal of supplies and materials, but there are tools that can help in illuminating what those emissions may be. These indirect emissions arise from both the energy it takes to make something and the downstream effects when it is disposed of, whether landfilled, or reused or recycled. Municipal purchases of paper, toner and electronics are estimated to contribute approximately 739 metric tons of CO_2e to overall municipal emissions. The actual impact of all City purchases is likely to be much greater than that stated here. Of the products tracked, the City's purchases of electronics (computers, monitors and copiers) contribute around 550 metric tons of CO_2e each year. The use of paper by the City is the second largest contributor at 210 metric tons of CO_2e. Other tracked municipal purchases as well as staff travel contribute small amounts to the City's total.

The community's emissions (Figure 2.4) far outstrip those of City government, totaling nearly 730,000 metric tons CO_2e. The largest contributors to community GHG's are the non-commute use of vehicles, and natural gas and electricity use. Other primary contributors include landfilling of recyclable and compostable materials, air travel, and commuting.

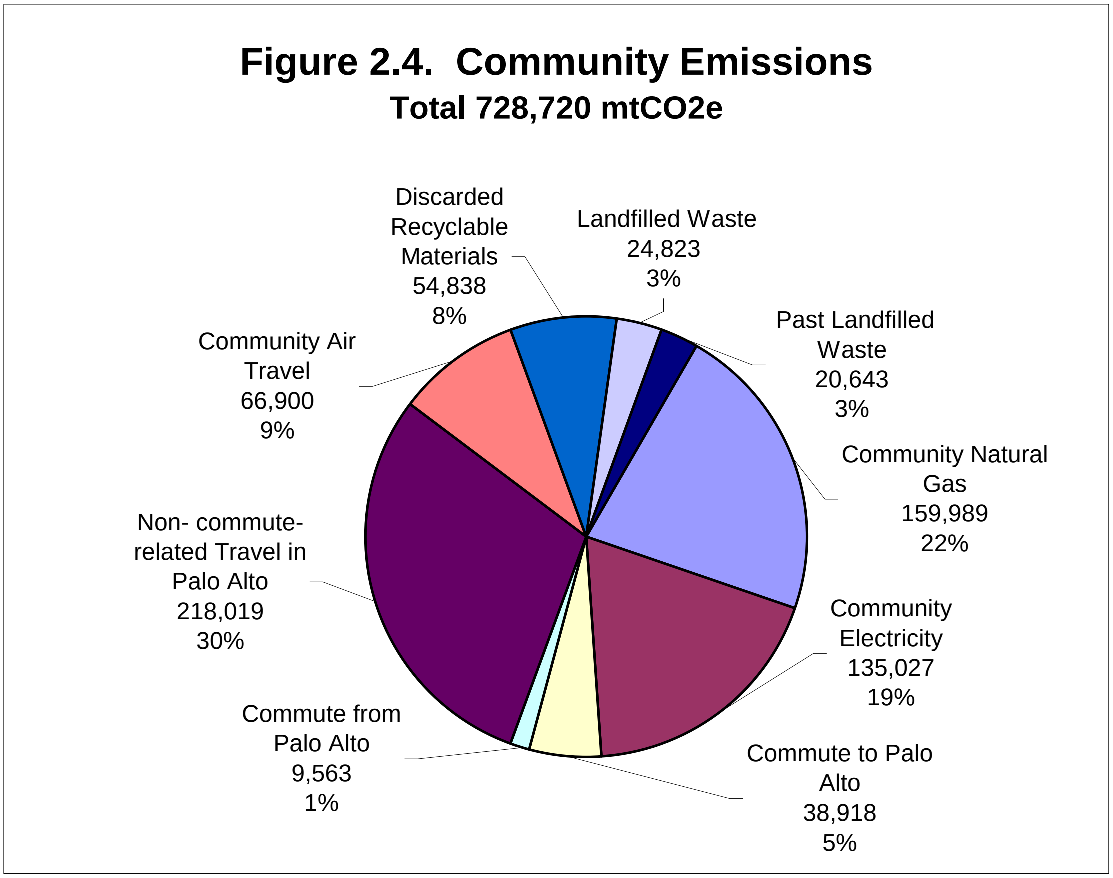


Figure 2.5 presents the upstream emissions factors associated with those discarded items. Interestingly, paper is the single largest contributor at 9,955 tons of waste, or at over 31,000 metric tons of CO_2e and nearly 60% of total community emissions from disposal of recyclable or compostable materials in the landfill. Eliminating all recyclable materials from the waste stream would reduce total emissions from the community by nearly 8%, and would be equivalent to taking nearly 10,060 cars off the road each year.

Figure 2.5. Upstream Emissions from Unrecycled Items Disposed of into the Waste Stream ($54,838$ metric tons CO_2e)