



Should State DOTs Prefer Bicycle Lanes or Wide Curb Lanes?

Final Report 598

Prepared by:

A. L. Dennison
PO Box 2664
Tempe AZ, 85280-2664

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16. Abstract This report investigates collisions between bicycles and motor vehicles to ascertain their relationship (if any) to a Bicycle Lane or Wide Curb Lane for the purpose of informing State Departments of Transportation. A literature review describes progress of Federal legislation supporting bicycle travel and implementation of bicycle facilities, their application in various jurisdictions, agency liability, and the debate between advocates of Wide Curb Lanes and Bicycle Lanes. A survey of DOT officials nationwide reveals the importance of available space and input from municipalities in designing bicycle facilities. An examination of fatal bicyclist/motorist collisions in Arizona suggests strong relationships to human error and "failure to yield" infractions, and negligible relationships to road conditions or mechanical failure. Based on the evidence, this report cannot determine that a relationship exists between collisions, Bicycle Lanes, or Wide Curb Lanes. Further investigation of this topic is recommended.			
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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS					APPROXIMATE CONVERSIONS FROM SI UNITS				
Symbol	When You Know	Multiply By	To Find	Symbol	Symbol	When You Know	Multiply By	To Find	Symbol
<u>LENGTH</u>					<u>LENGTH</u>				
in	inches	25.4	millimeters	mm	mm	millimeters	0.039	inches	in
ft	feet	0.305	meters	m	m	meters	3.28	feet	ft
yd	yards	0.914	meters	m	m	meters	1.09	yards	yd
mi	miles	1.61	kilometers	km	km	kilometers	0.621	miles	mi
<u>AREA</u>					<u>AREA</u>				
in ²	Square inches	645.2	square millimeters	mm ²	mm ²	square millimeters	0.0016	square inches	in ²
ft ²	square feet	0.093	square meters	m ²	m ²	square meters	10.764	square feet	ft ²
yd ²	square yards	0.836	square meters	m ²	m ²	square meters	1.195	square yards	yd ²
ac	acres	0.405	hectares	ha	ha	hectares	2.47	acres	ac
mi ²	square miles	2.59	square kilometers	km ²	km ²	square kilometers	0.386	square miles	mi ²
<u>VOLUME</u>					<u>VOLUME</u>				
fl oz	fluid ounces	29.57	milliliters	mL	mL	milliliters	0.034	fluid ounces	fl oz
gal	gallons	3.785	liters	L	L	liters	0.264	gallons	gal
ft ³	cubic feet	0.028	cubic meters	m ³	m ³	cubic meters	35.315	cubic feet	ft ³
yd ³	Cubic yards	0.765	cubic meters	m ³	m ³	cubic meters	1.308	cubic yards	yd ³
NOTE: Volumes greater than 1000L shall be shown in m ³ .									
<u>MASS</u>					<u>MASS</u>				
oz	ounces	28.35	grams	g	g	grams	0.035	ounces	oz
lb	pounds	0.454	kilograms	kg	kg	kilograms	2.205	pounds	lb
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<u>ILLUMINATION</u>					<u>ILLUMINATION</u>				
fc	foot-candles	10.76	lux	lx	lx	lux	0.0929	foot-candles	fc
fl	foot-Lamberts	3.426	candela/m ²	cd/m ²	cd/m ²	candela/m ²	0.2919	foot-Lamberts	fl
<u>FORCE AND PRESSURE OR STRESS</u>					<u>FORCE AND PRESSURE OR STRESS</u>				
lbf	poundforce	4.45	newtons	N	N	newtons	0.225	poundforce	lbf
lbf/in ²	poundforce per square inch	6.89	kilopascals	kPa	kPa	kilopascals	0.145	poundforce per square inch	lbf/in ²

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GLOSSARY OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
AI	Artificial Intelligence
AzDOT	Arizona Department of Transportation
BL	Bicycle Lane
Caltrans	California Department of Transportation
CSS	Context Sensitive Solutions
DOT	Department of Transportation
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
ISTEA	Intermodal Surface Transportation Efficiency Act
LED	Light emitting diode
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
TEA-21	Transportation Equity Act for the 21 st Century
TRB	Transportation Research Board
WCL	Wide Curb Lane
WOL	Wide Outside Lane

EXECUTIVE SUMMARY

Bicycle facility advocates have long debated the respective merits of bicycle lanes (BLs) and wide curb lanes (WCLs); this report investigates their claims. A BL, defined by a 6-inch stripe located 5 feet from the curb face, is reserved primarily for bicycle traffic. A WCL (also known as a wide outside lane), alternatively, is at least 14 feet wide; bikes and automobiles share this lane, and can overtake each other without changing lanes. The report provides input from various departments of transportation (DOT) officials on how WCLs or BLs are chosen in their states. The report examines police files of bicycle/motor vehicle collisions in the State of Arizona.

The report has three sections. First, a literature review summarizes the evolution of bicycle facilities legislation, official definitions of BLs and WCLs, their use in various jurisdictions, agency liability, and the ongoing debate between bicycle facility experts. Second, the report gives survey results from bicycle facility professionals at other state DOTs. The third section reviews fatal bicyclist/motorist collision reports from police agencies in Arizona and submits conclusions.

Literature Review

- The United States Congress responded to the call for bicycle facilities with: the Intermodal Surface Transportation Efficiency Act (ISTEA), passed in 1991; the Transportation Equity Act for the 21st Century (TEA-21) in 1998; the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005. The legislation supported bicycle advocacy in metropolitan and state government, and promulgated bicycling as an efficient travel mode in the nation's transportation system.
- The American Association of State Highway and Transportation Officials (AASHTO) has pioneered bicycle facilities design. Its most significant contribution, *Guide for the Development of Bicycle Facilities* (1999), reaffirmed the bicyclist's legitimate status on America's roads. This review outlines AASHTO's specifications for WCLs and BLs.
- Applications of BLs and/or WCLs in various jurisdictions are reviewed.
- Agency liability is discussed.
- WCLs and BLs: Experts debate their merits; the review examines the arguments of both sides.

Survey

- Thirty-three DOTs responded (63% of 52 DOTs contacted). This unscientific sample revealed no overall bias for or against BLs or WCLs.
- Several officials reported that municipalities are responsible for planning bicycle facilities.
- Respondents called for all stakeholders to help plan bike facilities early enough to embed their proposals in the planning process.
- Respondents said space constraints guided selection of bicycle facilities.

- According to one respondent, limited space designated WCLs the only choice; another official stated that city authorities viewed BLs as “traffic calming” despite narrow roads.

Crash Analysis

- We searched 85 bicyclist/motorist fatal collision reports filed by Arizona police agencies in 2003 – 2006 for any relationship between crashes and bicycle facilities design.
- We believe that none of these fatal collisions was attributable to a WCL or BL, based on the evidence.
- Apparently, no crash resulted from road conditions or road design, with three possible exceptions: 1) A tricyclist traveling in “what appeared to be a small lane 2 to 3 feet wide;” the lane’s width would not have met AASHTO guidelines for a BL (Appendix B, case #14). 2) A dedicated right turn lane was closed for construction; a motorist turned right from the number two lane, colliding with a bicyclist who may have expected the motor vehicle to proceed straight (Appendix B, case #45). 3) Ice on the road may have contributed to a bicyclist’s loss of control when colliding with a motor vehicle (Appendix B, case #73).
- Crashes apparently followed human error, chiefly “failure to yield.”

Conclusion

This study found no apparent relationship between fatal bicycle/motor vehicle collisions and type of bike facility. Consequently, there are no hard engineering data to support a recommendation on the type of facility that ought to be preferred.

A significant handicap to any analysis of bicycle travel or safety is the paucity of reliable data. For roadway travel there are continuing and consistent efforts to count and classify the traffic. There are no similar programs for measuring or estimating the volume of bicycle travel. If we are to get serious about this mode of travel, steps to improve data collection are necessary if we are to make informed decisions on how cost-effectively to accommodate bicycle travel.

Implementation Recommendation

Given the null finding regarding the comparison of BLs and WCLs, we cannot resolve the issue of which design is safer. Therefore, we cannot recommend any specific implementation action on design of bicycle facilities. We do urge that consideration be given to methods for acquiring more comprehensive data on bicycle travel.

1.0 INTRODUCTION

This report explores the possibility that a relationship exists between bicyclist/motorist collisions and type of bicycle facility (BL or WCL). Our research question is: Does one type of bike facility endanger motorists and bicyclists more than the other?

In Chapter 2, a literature review describes Congressional efforts to enhance the status and safety of bicycle travel, AASHTO's bicycle facilities guidelines and their implementation in various jurisdictions, agency liability, and the debate between supporters of WCLs and BLs.

Chapter 3 shows results of a survey, in which DOT officials from other states explain how they choose a BL or WCL and their suggestions for improving bike facilities design procedures.

In Chapter 4, we analyze 85 police reports of fatal collisions between bicyclists and motorists in Arizona during 2003 – 2006.

Chapter 5 has the report's conclusions.

2.0 LITERATURE REVIEW

2.1 INTRODUCTION

This section describes applications of Bicycle Lanes (BL) and Wide Curb Lanes (WCL) in various jurisdictions and summarizes the features supporting each mode. The debate between proponents of WCL and BL has overshadowed development of bicycle facilities for many years. In 1999, for example, Paul Schimek realized the difficulty of making valid safety inferences because determining whether a BL is safer than another roadway configuration “depends on the [crash] risk of a bicycle lane relative to not having that lane, all else being equal.”¹ “Improperly designed bicycle facilities,” Schimek warned, “can be dangerous, and in some cases worsen bicycling conditions.”² Moreover, the literature shows that creation of appropriate bicycle facilities is not just a planning and engineering issue; it poses a political challenge as well, tantamount to satisfaction of a civil right. Bicycle advocate Steven Goodridge, for instance, asserts that “accommodation of cyclists and pedestrians must be provided via safe, lawful and courteous behavior by other road users and by appropriate engineering of roadways ... anyone who has spent much time bicycling or walking in America knows how it feels to be treated as a trespasser on our streets.”³ While bicycle lobbyists may disagree in many respects, their common determination to prevent marginalization of non-motorized transport constitutes formidable political thrust. “Every street is a bicycle facility,”⁴ declares the North Carolina Coalition for Bicycle Driving, an organization that seeks recognition of this principle in public policymaking, “a bicycle driver is not afraid of traffic; a bicycle driver *is* traffic.”⁵

2.2 LEGISLATION

The United States Congress has responded to the political exigencies of bicycle transportation with a series of legislation:

In 1991, the Intermodal Surface Transportation Efficiency Act (ISTEA) amended Section 217 of title 23, United States Code, to designate funding from the Congestion Mitigation Program and National Highway System for bicycle transportation.⁶ In addition, the Act authorized funding for State bicycle coordinators responsible for “promoting and facilitating the increased use of non-motorized modes of transportation, including

¹ Paul Schimek, “The Dilemmas of Bicycle Planning,” 7.2, Massbike.org, 2 March 1999. <<http://www.massbike.org/info/dilemma.htm>>. (Accessed 28 April 2007)

² *Ibid.*, 7.

³ Steven G. Goodridge, “The Right to Travel by Human Power,” *Bicycling Life*. 2001. <http://www.bicyclinglife.com/EffectiveAdvocacy/TheRightToTravel.htm> (Accessed 28 April 2007.)

⁴ North Carolina Coalition for Bicycle Driving, *Home*, <<http://www.humantransport.org/bicycledriving/index.html>>.

⁵ North Carolina Coalition for Bicycle Driving., *The Science and Politics of Bicycle Driving*, <<http://www.humantransport.org/bicycledriving/sciencepolitics1/page6.html>>.

⁶ Intermodal Surface Transportation Efficiency Act of 1991, Pub. L. No. 102-240, SEC. 1033 (a)(b), 18 December 1991. <<http://ntl.bts.gov/DOCS/istea.html>>. (Accessed 21 May 2007.)

developing facilities for the use of pedestrians and bicyclists and public education, promotional, and safety programs for using such facilities.”⁷

In 1998, the Transportation Equity Act for the 21st Century (TEA-21) declared that provision of bicycle facilities⁸ “shall be given due consideration in the comprehensive transportation plans developed by each metropolitan planning organization and State...”⁹ The Act protected bikes and small motorcycles from projects that would eliminate “an existing major route” without providing an acceptable alternative,¹⁰ and delegated to State authorities responsibility for taking bicycle safety “into account” during project implementation.¹¹

In 2005, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) supplanted TEA-21. The Act mandates provision of bicycle facilities “that will function as an intermodal transportation system for the State and an integral part of an intermodal transportation system for the United States.”¹² Further, the Act encourages collaboration between public and private organizations in “longer-term, higher-risk research with potentially dramatic breakthroughs for improving the durability, efficiency, environmental impact, productivity, and safety (including bicycle and pedestrian safety).”¹³ The Act also authorizes creation of an “Intermodal Transportation Database” to track “the volumes and patterns of movement of people, including local, interregional, and international movements, by all modes of transportation (including bicycle and pedestrian modes).”¹⁴

Since 1981, The American Association of State Highway and Transportation Officials (AASHTO), has issued guidelines for bicycle facilities design. AASHTO’s 1999 iteration, the *Guide for the Development of Bicycle Facilities*, addresses the importance of safe bicycle facilities in promoting ridership. The *Guide* states that “bicyclists can be expected to ride on almost all roadways, as well as separated shared use paths and even sidewalks, where permitted to meet special conditions.”¹⁵ The *Guide* provides “suggested minimum guidelines” for designers to follow when planning diverse bicycle facilities.¹⁶

⁷ ISTEA, SEC. 1033 (d).

⁸ Transportation Equity Act for the 21st Century, Pub. L. No. 105-178, 9 June 1998. <<http://www.fhwa.dot.gov/tea21/h2400enr.htm>>. (Accessed 17 March 2007) Bicycle Facilities: TEA-21 uses the term ‘bicycle transportation facility’ to define “a new or improved lane, path, or shoulder for use by bicyclists and a traffic control device, shelter, or parking facility for bicycles,” page 112, Stat. 169 (j)(1).

⁹ *Ibid.*, Sec. 1202 (g)(1).

¹⁰ *Ibid.*, p. 112, Stat. 170 (n).

¹¹ *Ibid.*, p. 112, Stat. 170 (j).

¹² Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, Pub. L. No. 109-59, §5304. Statewide transportation planning (a)(2), 10 August 2005. (Accessed 28 April 2007)

<http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_public_laws&docid=f:publ059.109.pdf>.

¹³ *Ibid.*, 119 STAT. 1783 (g)(e)(1).

¹⁴ *Ibid.*, 119 STAT. 1836 (e)(3)(B).

¹⁵ American Association of State Highway and Transportation Officials, *Guide for the Development of Bicycle Facilities 1999* (Washington, DC: American Association of State Highway and Transportation Officials, 2001) 1-2. “For a variety of reasons,” however, the *Guide* views sidewalks as “unsatisfactory” for bicycles. For example, a pedestrian’s walking pace and sudden change in direction may confound a bicyclist traveling much faster (58). The *Guide* states that “sidewalk bikeways should be considered only under

2.3 BICYCLE LANES

2.31 Definition

AASHTO

AASHTO's *Guide* defines a BL as "a portion of a roadway which has been designated by striping, signing and pavement markings for the preferential or exclusive use of bicyclists."¹⁷ The *Guide* recommends a one-way BL that follows vehicular traffic, marked by a 6-inch solid white stripe 5 feet from the curb face.¹⁸ Road obstacles, such as gratings and utility covers, may require extending BL width so that bicyclists can maneuver without entering traffic lanes. Similarly, traffic volume, speed, and composition may necessitate a wider BL, for instance, "where substantial truck traffic is present, or where motor vehicle speeds exceed" 50 mph. When adjacent to parked vehicles, a BL needs a 4-inch outer stripe to separate bicyclists from the parking lane and "encourage" motorists to park nearer the curb.¹⁹ BL striping should stop at pedestrian crossings and intersections (except at "particularly complex intersections" where a broken stripe is recommended instead).²⁰ The *Guide* warns that:

Bike lanes sometimes complicate bicycle and motor vehicle turning movements at intersections. Because they encourage bicyclists to keep to the right and motorists to keep to the left, both operators are somewhat discouraged from merging in advance of turns. Thus, some bicyclists may begin left turns from the right-side bike lane and some motorists may begin right turns from the left side of the bike lane. Both maneuvers are contrary to established rules of the road and may result in conflicts; however, these can be lessened by signing and striping.²¹

Near intersections, striping should encourage motor vehicles and bikes to merge gradually, enabling users to position themselves in the appropriate travel lane depending on destination and permitting automobiles a safer right turn than abrupt merges would allow. Bicyclists turning left, however, may enter traffic lanes to execute a "vehicular style" turn, or "pedestrian style" turn by continuing across the intersection, then proceeding left to cross the intersection again.²²

certain limited circumstances," for instance: "To provide continuity along high speed or heavily traveled roadways having inadequate space for bicyclists, and uninterrupted by driveways and intersections for long distances" (20).

¹⁶ *Ibid.*, 2.

¹⁷ *Ibid.*

¹⁸ *Ibid.*, 23.

¹⁹ *Ibid.*

²⁰ *Ibid.*, 25.

²¹ *Ibid.*, 25, 27.

²² *Ibid.*, 27. Ken Cooper, PE, RLS, Road Standards Engineer, Arizona Department of Transportation, warns that some jurisdictions may require bicyclists to dismount if using the crosswalk during "pedestrian style" turns, even when following traffic flow (personal interview, 3 May 2007).

2.32 Applications

Various applications of bicycle facilities design are summarized below:

City of Chicago

Chicago's narrow, congested streets presented special challenges for city planners tasked with meeting AASHTO standards and bicyclists' demand for BLs. Charlie Zegeer²³ writes that Chicago's guidelines give "an excellent example of how facilities can be retrofitted into an existing street system ... with the constraints of a 44-foot cross section."²⁴ In summer of 1999, Chicago's experimental striping of two streets with peak hourly traffic of 150 bicycles "proved popular with cyclists, there was a reduction in overall crash severity, and there was no degradation in motor vehicle level of service at intersections."²⁵ Emboldened by this result, Chicago now has a 107-mile network of BL.²⁶ The City's aggressive goal for 2015 to create 150 miles of BL foresees "a 500-mile bikeway network in Chicago that is the equal of the best in the world."²⁷

City of Davis, California

In 1966, Davis City Council authorized an experimental network of BLs which soon "proved immensely popular."²⁸ By October, 2005 Davis had achieved platinum level status from the League of American Bicyclists for its "bicycle friendly" system comprising 50 miles of BL and 52 miles of bike paths.²⁹ In its 2006 *Plan* the City's Ad Hoc Bicycle Task Force identified an "overriding theme" wherein bicycles and automobiles would share an "equal level of importance" in transportation planning.³⁰ City planners follow specifications in the California Department of Transportation's Highway Design Manual³¹ to construct bike paths and BLs, although City policy prohibits Class III bike routes.³² The *Plan* claims "bike lanes provide a significant benefit to safe and efficient bicycle circulation. Conflicts between bikes and autos are dramatically reduced when on-street

²³ "Chicago Bike Lane Design Manual," Pedestrian and Bicycle Information Center 2002: Foreword, Charlie Zegeer, Director, Pedestrian and Bicycle Information Center (PBIC), 12 March 2007 <<http://www.bicyclinginfo.org>>.

²⁴ *Ibid.*

²⁵ *Ibid.*, 3

²⁶ "Existing Bike Lanes," Chicago Department of Transportation, January 2006, City of Chicago. (Accessed 23 March 2007) <<http://www.chicagobikes.org/existingbikelanes.html>>.

²⁷ "Bike 2015 Plan," January 2006, City of Chicago. (Accessed 23 March 2007) <<http://www.bike2015plan.org>>.

²⁸ "City of Davis Comprehensive Bicycle Plan (2006)," 2. City of Davis Public Works Department and City of Davis Bicycle Advisory Commission October 2006: City of Davis. (Accessed 23 March 2007) <http://www.city.davis.ca.us/pw/pdfs/2006_BikePlan_withMaps.pdf>.

²⁹ *Ibid.*

³⁰ *Ibid.*, Appendix 3, 23.

³¹ "Highway Design Manual Chapter 1000: Bikeway Planning and Design, Topic 1003 - Design Criteria" California Department of Transportation, 1 September 2006. (Accessed 24 March 2007) <<http://www.dot.ca.gov/hq/oppd/hdm/pdf/english/chp1000.pdf>>.

³² City of Davis, 29.

lanes are installed.”³³ At intersections, for example, the *Plan* offers BL designs that “provide a weaving section of sufficient length” to permit bikes the option of turning left or proceeding straight.³⁴ Width guidelines for BLs are 8 feet from the curb in parking zones, and 7 feet when adjacent to parked cars (providing a total of 15 feet from the bike lane stripe to the curb.³⁵) The *Plan* considers width guidelines sufficient for bicyclists negotiating obstacles, such as yard debris, and assesses low risk of collision when a motorist or bicyclist crosses into each other’s lane. BLs may pose risks for less skilled bicyclists, however, “when traffic volumes are heavy and/or vehicle speeds are high.”³⁶

City of Orlando, Florida

In contrast with Chicago and Davis, Orlando’s transportation planners are grappling with ongoing, rapid lateral growth. Indeed, evidence of the city’s explosive sprawl is visible from outer space in its “conurbation of congested freeways and parking lots.”³⁷ Orlando’s 2010 Bicycle Plan seeks to reduce automobile dependency “by implementing a system of safe, economical and efficient bikeway facilities and by supporting bicycle-related programs.”³⁸ *The Downtown Orlando Transportation Plan: Final Report* asserts that “on-street bicycle lanes provide the safest form of travel for bicyclists in urban areas because they allow separation from traffic lanes, and in clear view of traffic.”³⁹ Based on research by Landis, *et al.*,⁴⁰ (examined later in this section) the *Plan* concludes that “a designated striped bicycle lane” which separates bikes from motorized traffic, significantly increases bicyclists’ “level of comfort.”⁴¹ Narrow roadways in downtown Orlando, however, reduce “opportunities to stripe exclusive bicycle lanes.”⁴² The *Plan* reasons that downtown’s slow motor traffic—where bicycle traffic flows at similar speeds—may eliminate the need for BLs and permit bicyclists to “take the lane ... [which] is also practical in urban settings when travel lanes are too narrow for a bicyclist and motorist to share.”⁴³

³³ *Ibid.*, 20. See also David Takemoto-Weerts, “Evolution of a Cyclist-Friendly Community: The Davis Model.” A Paper Presented at Pro Bike/Pro Walk, Santa Barbara, California, September, 1998. (Accessed 29 April 2007) <<http://www.taps.ucdavis.edu/bicycle/davis/community.html>>.

³⁴ *Ibid.*, 19; Figure 3, 22b; Figure 4, 22c.

³⁵ *Ibid.*

³⁶ *Ibid.*

³⁷ T. D. Allman and David Burnett, “The Theme-Parking, Megachurching, Franchising, Exurbing, McMansioning of America,” *National Geographic* March 2007: 99.

³⁸ “Transportation Planning: Bicycle Plan: Plan Goal,” 2005, City of Orlando. (Accessed 31 March 2007) <<http://www.cityoforlando.net/planning/Transportation/bikeways/BPlan.htm>>.

³⁹ “The Downtown Orlando Transportation Plan: Final Report, Bicycle Facility Plan,” 4-13. November 2006, City of Orlando Public Works Department. (Accessed 31 March 2007) <<http://www.cityoforlando.net/planning/Transportation/documents/DTPDOCS/DTP1106.pdf>>.

⁴⁰ Bruce W. Landis, Venkat R. Vattikuti, and Michael T. Brannick, “Real-Time Human Perceptions: Toward a Bicycle Level of Service.” 1997, *Transportation Research Record 1578*. (Accessed 31 March 2007) <<http://www.dot.state.fl.us/Planning/systems/sm/los/pdfs/BLOSTRB.pdf>>.

⁴¹ Downtown Orlando, 4-10, 4-13.

⁴² *Ibid.*, 4-20.

⁴³ *Ibid.*

2.4 WIDE CURB LANES

2.41 Definition

AASHTO

A WCL is a traffic lane at least 14 feet wide, shared by bikes and automobiles, in which bicyclists and motorists can overtake each other without changing lanes. AASHTO's *Guide for the Development of Bicycle Facilities 1999* states that WCLs are "usually preferred where shoulders are not provided."⁴⁴ Typically, motorists need not change lanes to overtake bicyclists when sharing a WCL wider than 12 feet. Moreover, WCLs provide extra turning space for motorists approaching from driveways or for those with restricted lines of sight.⁴⁵ The *Guide* recommends a WCL with 14 feet of "usable lane," measured from the road's edge stripe to lane stripe (excluding the gutter pan, which is not considered usable).⁴⁶ Additional width is necessary for bicyclists negotiating steep inclines and obstacles, such as gratings, parked cars, and road reflectors.⁴⁷ The *Guide* cautions that continuous stretches of WCL wider than 14 feet may encourage formation of two motor vehicle streams within the WCL; here, planners should consider striping a BL or installing a shoulder.⁴⁸ Restriping existing roadways to create a WCL is another possibility, once the consequences of narrower inside lanes on traffic flow have been thoroughly assessed.⁴⁹

2.42 Applications

City of Austin, Texas

Austin's *Bicycle Plan, Part 1*⁵⁰ observes guidelines from AASHTO and a Federal Highway Administration (FHWA) report prepared by Wilkinson, *et al.*, (1994).⁵¹ The *Plan* focuses on FHWA's recommendations to inspire bicycle facilities design; for example, Wilkinson, *et al.*, define three types of bicyclists, each of whom may optimize a particular design:

⁴⁴ AASHTO *Guide*, 17. According to the *Guide*, shoulders must have minimum width of 4 feet to support bicycles. Wider shoulders are necessary when traffic exceeds 50 mph or traffic composition includes many wide vehicles (16).

⁴⁵ *Ibid.*, 17.

⁴⁶ *Ibid.*

⁴⁷ *Ibid.*

⁴⁸ *Ibid.*

⁴⁹ *Ibid.*

⁵⁰ "Austin Bicycle Plan, Part 1," April 1996, City of Austin. (Accessed 2 April 2007) <<http://www.ci.austin.tx.us/bicycle/plan1.htm>>.

⁵¹ W. C. Wilkinson, A. Clarke, B. Epperson, and R. Knoblauch, "The Design Bicyclist," in Selecting Roadway Design Treatments to Accommodate Bicycles. FHWA-RD-92-073. Washington, DC: United States Department of Transportation, Federal Highway Administration, January 1994. (Accessed 2 April 2007) <http://safety.fhwa.dot.gov/ped_bike/docs/select.pdf>.

Group A — Advanced Bicyclists: Experienced riders who can operate under most traffic conditions, they comprise the majority of the current users of collector and arterial streets and are best served by the following:

- Direct access to destinations usually via the existing street and roadway system.
- The opportunity to operate at maximum speed with minimum delays.

Group B — Basic Bicyclists: These are casual or new adult and teenage riders who are less confident of their ability to operate in traffic without special provisions for bicycles. Some will develop greater skills and progress to the advanced level, but there will always be many millions of basic bicyclists. They prefer:

- Comfortable access to destinations, preferably by a direct route; either low-speed, low traffic-volume streets, or designated bicycle facilities.
- Well-defined separation of bicycles and motor vehicles on arterial and collector streets (bike lanes and shoulders), or on separate paths.

Group C — Children: Pre-teen riders whose roadway use is initially monitored by parents, eventually they are accorded independent access to the system. They and their parents prefer the following:

- Access to key destinations surrounding residential areas, including schools, recreation facilities, shopping, or other residential areas.
- Residential streets with low motor vehicle speed limits and volumes.
- Well-defined separation of bicycles and motor vehicles on arterial and collector streets, or on separate bicycle paths.⁵²

Accordingly, Austin’s *Plan* offers a two-tiered approach to bicycle facilities design. For Wilkinson, *et al.*’s Group A bicyclists, it envisions a “bikeway system on arterial streets to facilitate continuous and efficient bicycle transportation.”⁵³ For Groups B and C, the *Plan* suggests a “bikeway system on collectors, with bike lane or separated path connections, or on arterials or local and neighborhood streets where no alternative routes exist.”⁵⁴ The *Plan* perceives various benefits of WCLs, such as fewer “operating conflicts” between bicyclists and motorists; the “least amount of additional maintenance” compared with other bike facilities; and the capacity to serve a greater overall number of motorists and bicyclists.⁵⁵ The *Plan* reasons that Group A bicyclists, usually less concerned by high traffic volume and relative velocity than less-experienced riders, require no bike routes or

⁵² The Design Bicyclist, FHWA-RD-92-073, Introduction, 1-2, quoted in *Austin Bicycle Plan*, chapter 5, 32-33.

⁵³ *Austin Bicycle Plan*, 34.

⁵⁴ *Ibid.*

⁵⁵ *Ibid.*, 35.

exclusive space. For Groups B and C, alternatively, a BL or shoulder may provide the greater “degree of comfort and safety” necessary to encourage ridership.⁵⁶

Broward County, Florida

Broward County’s *2030 Long Range Transportation Plan Update* includes two types of WCL:

- Wide Curb Lane—A vehicular lane that is wider than the adjacent travel lanes to provide more room for the motorist to pass a bicyclist.
- Wide Curb Lanes with lane stripe—Some roads in this category will have a lane stripe similar to a bike lane, but will not have a diamond symbol or bike lane signs. These lanes will be at least 3 feet wide.⁵⁷

The Florida Department of Transportation (FDOT), in its *Florida Bicycle Facilities Planning and Design Handbook*, recognizes that a WCL may in some circumstances provide the only “practicable option” and permits local authorities discretion to install WCLs.⁵⁸ However, the *Handbook* states that WCLs “no longer meet FDOT requirements” and that “only 5% of bicyclists feel comfortable using these facilities.”^{59, 60} Dwight Kingsbury, Assistant State Pedestrian and Bicycle Coordinator at FDOT’s Safety Office, unable to locate the source of the *Handbook*’s “only 5% of bicyclists...” claim, states that “it was supposed to be removed” from the PDF version of the April 2000 *Handbook* posted online. “In revised editions [of the *Handbook*] in 1999 and 2000,” according to Mr. Kingsbury, “the passage was supposed to be amended to read, ‘...many cyclists are not comfortable using these facilities.’”⁶¹

⁵⁶ *Ibid.*, 36. A similar approach, for example, is taken by the Minnesota Department of Transportation. The “Minnesota Bicycle Transportation Planning and Design Guidelines,” June 2006, state that “[g]iven these two types of design bicyclists, a two-tiered approach to meeting their needs is possible. *However, because the goal is to increase safety and use by Average Bicyclists, the development of a bicycle network for bicycle traffic should take priority.*” (1-8.0 Design Approach; emphasis in original).

⁵⁷ “2030 Long Range Transportation Plan Update,” 5-13. March 2005, Broward County, Florida. (Accessed 5 April 2007) <<http://www.co.broward.fl.us/transportationplanning/5needsassessment.pdf>>.

⁵⁸ “*Florida Bicycle Facilities Planning and Design Handbook: Chapter 4: On Road Design*,” 4-14. April 2000, Florida Department of Transportation. (Accessed 8 April 2007) <http://www.dot.state.fl.us/safety/ped_bike/handbooks_and_research/bhchpt4.pdf>.

⁵⁹ *Ibid.* Florida’s design manual asserts that only 5% of bicyclists feel comfortable using WCL facilities. By itself, this statistic would tend to weigh fairly heavily against the WCL option. However, it is unclear how Florida arrived at this 5% figure. Their manual provides no citation for its source. Without a verification of how the 5% figure was determined its utility as a guide to design or policy is undermined. An example of a FDOT bike facilities survey may be viewed at <http://www.dot.state.fl.us/safety/ped_bike/handbooks_and_research/bhchpt4.pdf>: FDOT Safety Office *Statewide Survey on Bicycle and Pedestrian Facilities: Key Bicycle Findings (v), and Bicycle Facilities Satisfaction (19-28)*.

⁶⁰ Jeffrey A. Hiles provides more information on the basis of FDOT’s support for BLs in *Listening to Bike Lanes: Moving Beyond the Feud*, 1996, Chapter 7: 8-9. (Accessed 20 May 2007) <<http://www.wright.edu/~jeffrey.hiles/essays/listening/>>.

⁶¹ Dwight Kingsbury, FDOT, personal communication, 22-23 May 2007.

According to Wilkinson, *et al.*:

Wide curb lanes can serve existing, confident cyclists—those comfortable riding with traffic—quite well. However, for the novice cyclist wide curb lanes do not always provide the degree of comfort or feeling of safety required to persuade them to ride on a busy highway.

The Florida DOT has recently altered its policy of providing wide curb lanes on all new highways in favor of providing designated bike lanes. Accommodation of the group B/C rider was a key determinant in this decision.⁶²

City of Seattle, Washington

The City of Seattle's *Bicycle Master Plan*⁶³ finds WCLs on arterial streets "generally acceptable for experienced cyclists."⁶⁴ In concurrence with Wilkinson, *et al.*'s standards (reproduced above), however, the *Plan* asserts "less-experienced"⁶⁵ bicyclists may not feel comfortable on this type facility."⁶⁶ The City's objections relate to the absence of striping that bicyclists "with all levels of riding experience" reportedly find desirable; and furthermore, the lack of "markings" that would guide bicyclists through "an intersection with a right turn lane."⁶⁷

2.5 BICYCLE FACILITIES AND AGENCY LIABILITY

AASHTO warns us that bicyclists can be expected on most roadways, not just in bicycle facilities. In this regard, John W. English⁶⁸ provides an assessment of agency liability:

... Designation of bikeways will not affect the government entity's potential liability because the liability already exists with respect to bicyclists on the highways. Careful attention by the highway agency to compliance with applicable laws, guidelines, and recommended procedures relating to the design, construction, operation, and maintenance of bikeways will greatly curtail the risk of liability. The most important step which any government entity can take to reduce potential liability is to reduce accidents on its bikeways.⁶⁹

⁶² W. C. Wilkinson, A. Clarke, B. Epperson, and R. Knoblauch, The Effects of Bicycle Accommodations on Bicycle/Motor Vehicle Safety and Traffic Operations, 14. FHWA-RD-92-069. (Washington, DC: United States Department of Transportation, Federal Highway Administration, July 1994) 14.

⁶³ "Bicycle Master Plan," updated September, 2007. City of Seattle. (Accessed 4 November 2007) <<http://www.seattle.gov/transportation/bikemaster.htm>>. Among other innovations, the *Plan* recommends "Climbing Lanes," a "hybrid" facility that provides a 5-foot bicycle lane for bicyclists traveling uphill, and a "shared lane pavement marking" downhill. Slower bicyclists traveling uphill, the *Plan* reasons, will benefit from an exclusive lane that permits motorists to overtake more easily; faster downhill bicyclists, however, may require the shared "travel lane" to avoid parked cars (98).

⁶⁴ *Ibid.*, 99.

⁶⁵ *I.e.*, Wilkinson, *et al.*'s Groups B and C bicyclists.

⁶⁶ Bicycle Master Plan, 99.

⁶⁷ *Ibid.*

⁶⁸ John W. English, Liability Aspects of Bikeway Designation (Washington, DC: National Center for Bicycling and Walking, 1986).

⁶⁹ *Ibid.*, Summary: 1.

Agency liability can exist, according to English, even for roads barred to bicyclists. If, say, “there is significant bicycle traffic on the roadway in spite of the prohibition, the standard of care owed by the highway agency might well be the same as it would be without the prohibition. The violation by the bicyclist might (or might not) be considered contributory negligence, but the duty of the highway agency would be unaffected by the violation.”⁷⁰ Potential liability also exists when agencies fail in their “continuing duty to review a [highway] design in light of actual operation and changed circumstances, and if it appears that the design has become hazardous.”⁷¹ Context Sensitive Solutions (CSS) can help ensure that design of a bike facility (or highway) satisfies evolving standards.

Highway maintenance, English claims, “is the area which is most likely to produce liability.”⁷² For example, once an agency “*becomes aware*” of a dangerous road condition, it “has a duty” to “take reasonable action” to correct it. Remedies could include provision of a warning sign or protective measure if fixing the dangerous condition is infeasible.⁷³ English gives examples in which sewer gratings and railroad crossings trapped bicyclist’s front wheels, injuring the riders. The courts ruled that negligence existed in not providing “barriers or warning devices ... a simple maintenance matter not protected by immunity.”⁷⁴ However, the courts determined that eliminating the dangerous conditions—replacing grates and modifying the railroad crossings—was “a function within the protection of governmental immunity.”⁷⁵ These crashes illustrate the “greater susceptibility”⁷⁶ of bikes to road hazards than other vehicles, and “... may contribute, in a particular case, to defining the appropriate standard of conduct which the highway agency owed the bicyclist.”⁷⁷

A bicyclist’s apprehension of safety—discussed in the next section—is an important element in calculating agency liability. English cautions that an “agency should carefully avoid making statements that a designated bikeway is ‘safe’ or that it is ‘safer’ than some non-designated route.”⁷⁸ English posits “there may be a pre-existing public perception that bikeways are safer than other routes, and that this perception may increase potential liability. That perception should not be augmented by additional safety claims.”⁷⁹

⁷⁰ *Ibid.*, 20.

⁷¹ *Ibid.*, 8-9.

⁷² *Ibid.*, 13-16.

⁷³ *Ibid.*, 14 (emphasis added).

⁷⁴ *Ibid.*, 14-15

⁷⁵ *Ibid.*

⁷⁶ *Ibid.*, 19

⁷⁷ *Ibid.*, 20

⁷⁸ *Ibid.*, 27.

⁷⁹ *Ibid.*

2.6 THE DEBATE: WCL v. BL

This section summarizes the debate between proponents of WCLs and BLs.

All bicycle advocates, despite their differences, energize a longstanding popular cause: the right of bicyclists to enjoy safe bike facilities. As John Auerbach, Executive Director, Bicycle Institute of America, Inc., expressed the situation in 1974,

The bikeway movement has grown so big and so fast that it is no longer possible to say who is leading it. It no longer matters, if, indeed, it ever did. *The movement has created a momentum of its own.* With the passage this past year of the Federal Highway Act of 1973, bikeway supporters in and out of government brought about their greatest single accomplishment. Passage of the Highway Act means more than just the appropriation of funds; *it means national recognition of the fact that bikes belong on the roads and streets of America. It means that cyclists, more than 90 million of them, have a right to share in America's road building programs and highway facilities. It was the first time Congress appropriated Highway Trust funds for anything but automobiles.* ... This singular achievement must not be regarded as the end of the battle, but rather as the beginning.⁸⁰

As outlined above, support for “the movement” is firmly grounded in federal and local legislation and investment. Rising concern about climate change and urban congestion also militate in favor of bicycling. Mayor Bloomberg of New York recently proposed a congestion tax on automobiles similar to the one imposed on motorists in central London, and, according to the *Wall Street Journal*, an “increase [in] the number of bicycle paths in the city. [The Mayor's proposal] would also require commercial buildings to have indoor parking facilities for bikes.”⁸¹

Nonetheless, as John Auerbach warned in 1974, the movement's gains merely signaled the early stages of an ongoing battle. More than thirty years after Auerbach's prediction, the *Journal* reports “strong opposition” from “some small businesses, car owners and parking-garage owners to any proposals to remove parking, shrink driving lanes or reduce speed limits. Some argue that limiting car usage would hurt business.”⁸²

Early disagreement among bicycle facilities designers occurred when bicycle safety expert John Forester, in a 1974 speech, declared himself a “soldier” in a “war” against facilities which, he claimed, generate confusion—and collisions—between cars and bikes. The “channelization of cyclists into bike lanes,” said Forester, exposed left-turning bicyclists to danger from motorists in the adjacent motor vehicle lane; and for bicyclists proceeding

⁸⁰ Speech given by John Auerbach, Executive Director, Bicycle Institute of America, Inc., “Public and Legislative Support for Bikeways,” in *Proc. of the Seminar on Bicycle/Pedestrian Planning and Design*, December 12-14, 1974, Walt Disney World, Florida (New York, American Society of Civil Engineers) 25. Emphasis in original. Auerbach defined a “bikeway” as “a shared bike route, a Class III Bikeway” (22).

⁸¹ Nancy Keats, “Building a Better Bike Lane,” *The Wall Street Journal* 4 May 2007, western ed.: W10.

⁸² *Ibid.*

straight ahead, danger from motorists attempting right turns across the BL.⁸³ Forester believed that channelization overlooked a practicality of bicycling—that the “proper place to ride apparently changes with traffic state.”⁸⁴

Developing his case for WCLs in *Bicycle Transportation* (1983), Forester wrote that “cyclists should act and should be treated as drivers of vehicles” or vehicular bicyclists:⁸⁵

Both motorists and cyclists are happier and more comfortable with each other on roads with wide outside lanes. Wide outside lanes reduce the emotional tension between the parties. Cyclists know there is sufficient room for motorists to overtake even if opposing traffic appears.⁸⁶

Wayne Pein, representing the North Carolina Coalition for Bicycle Driving, supports the view that “space” comforts bicyclists and enables motorists to pass conveniently:

BLs are often touted as increasing bicyclist safety. Surprisingly, neither BLs nor WOLs [wide outside lanes] have been shown to actually increase safety as defined by reducing collisions. Both simply provide space, make passing easier for motorists and affording comfort to bicyclists. Similarly, neither has been shown to be more safe than the other. However, proving safety or lack thereof through collision studies is quite difficult.⁸⁷

For Pein, “BLs give the illusion of safety, typically reported as bicyclist comfort, presumably due to a perceived effect from the stripe.”⁸⁸ Landis *et al.*, (1997) concur: their comparison of two road segments, identical except that one was striped, indicated that bicyclists favored the striped segment, “even though the striped lane had nearly double the traffic volume of the other.”⁸⁹

Alan Wachtel, in his article, “About bike lanes,” writes that BL striping serves a common purpose with other traffic lane stripes: “to delineate travel paths that could otherwise be ambiguous, providing for more predictable movement. Many cyclists, for instance, might find it intimidating to share an undivided 16-foot lane with 60-mi/hr traffic.”⁹⁰

⁸³ John Forester, “Planning for Cyclists as They See Themselves Instead of as Motorists See Them,” in Proc. of the Seminar on Bicycle/Pedestrian Planning and Design, December 12-14, 1974, Walt Disney World, Florida (New York, American Society of Civil Engineers) 315, 318.

⁸⁴ *Ibid.*, 323.

⁸⁵ John Forester, Bicycle Transportation (Cambridge, MA: MIT P, 1983) 3.

⁸⁶ *Ibid.*, 254.

⁸⁷ Wayne Pein, “Wide Outside Lanes Are Superior to Bicycle Lanes,” 1. North Carolina Coalition for Bicycle Driving, 6 March 2007 <<http://www.humantransport.org/bicycledriving/engineering/wols.htm>>.

⁸⁸ *Ibid.*

⁸⁹ Landis, *et al.*, 124.

⁹⁰ Alan Wachtel, “About bike lanes” in John S. Allen’s Bicycle Facilities, Laws and Programs Pages <<http://www.bikexpert.com/bikepol/facil/lanes/wachlane.htm>>.

Robert Gray, a professor of applied psychology at Arizona State University, supports striping, given that “people evaluate a vehicle’s distance but not the speed.”⁹¹ Dr Gray believes that some motorists, particularly inexperienced ones, misjudge the clearance between their vehicles and bicycles without a road stripe.⁹² Gray also claims that motorists have difficulty gauging their speed in relation to bicycles and motorbikes. As an experienced researcher in human/machine interaction, Gray predicts that, eventually, a virtual on-board assistant will alert the motorist to impending hazards. Machine intelligence may also relieve motorists of the responsibility to make judgments vis-à-vis their proximity to smaller, slower vehicles such as bikes and motorbikes. In this situation, Gray states that he would feel equally safe (as a bicyclist) in a WCL as he would riding in a marked BL.⁹³

Jeffrey Hiles reasons that since “shy space”—the minimum distance from an object at which one feels comfortable—varies according to the relative speed between vehicles; bicyclists and motorists traveling at greater speeds “have less time to identify and respond to [approaching] obstacles.” BL channelizations therefore “work best” when motorists have less reaction time on higher speed roads, or where curves and hills reduce sight distances.^{94,95}

Bicycles lose stability at lower speeds than automobiles and motorbikes, yet “scant attention has been paid to the design speed of BLs,” according to Wayne Pein.⁹⁶ Pein quotes from this passage in the California Department of Transportation’s Highway Design Manual:

Bike lanes are not advisable on long, steep downgrades, where bicycle speeds greater than 30 miles per hour are expected. As grades increase, downhill bicycle speeds will increase, which increases the problem of riding near the edge of the roadway. In such situations, bicycle speeds can approach those of motor vehicles, and experienced bicyclists will generally move into the motor vehicle lanes to increase sight distance and maneuverability. If bike lanes are to be marked, additional width should be provided to accommodate higher bicycle speeds.⁹⁷

Moreover, novice bicyclists gain high speeds coasting on downgrades as quickly as experienced riders, writes Pein. BLs, “said to be installed for the explicit purpose of

⁹¹ Christian Richardson, “East Valley faces deadly traffic trend,” *East Valley Tribune* 18 February 2007: 2.

⁹² Minnesota’s *Bicycle Planning and Transportation Planning and Design Guidelines* supports the view that “[b]icycle lane stripes can increase bicyclists’ confidence that motorists will not stray into their path of travel if they remain in the bicycle lane.” (Chapter Four: On-Road Designs 4-2.01 Bicycle Lanes).

⁹³ Robert Gray, Ph.D., personal interview, 1 March 2007.

⁹⁴ Jeffrey A. Hiles, *Listening to Bike Lanes*, Chapter 8: 1-2.

⁹⁵ Hiles argues that channelization reduces “Problem Type 13” fatalities (Cross, 1978) in which motorists strike a bicyclist from behind. K. D. Cross, *Bicycle Safety Education: Facts and Issues* (Falls Church, VA: AAA Foundation for Traffic Safety, 1978) rpt. in Hiles, *Listening to Bike Lanes* Chapter 8: 2.

⁹⁶ Pein, *Wide Outside Lanes Are Superior to Bicycle Lanes* 2.

⁹⁷ California Department of Transportation *Highway Design Manual*, Chapter 1000, Bikeway Planning and Design, Topic 1003 - Design Criteria, 1000-16.

accommodating novices,” endanger novices—indeed, all bicyclists—by limiting their maneuverability to a lane 4 to 5 feet wide.⁹⁸

Narrow lanes, according to Steven Goodridge, provide insufficient passing space for bicycles and motor vehicles. Such roads “often carry substantial bicycle traffic; drivers of wide vehicles cannot pass these cyclists at safe and lawful distance without moving into the next lane.” With traffic in adjacent lanes, however, motorists may pass the bicyclist within the narrow lane at an “unlawfully close and unsafe distance.”⁹⁹ Alternatively, lanes providing at least 16 feet width provide bicyclists “greater operating comfort” and protection against the destabilizing effects of wind blast from heavy motor vehicles.¹⁰⁰ “A widened outside lane,” states the North Carolina Department of Transportation, “is an effective way to accommodate bicyclists riding in the same lane with motor vehicles. With a wide outside lane, motorists do not have to change lanes to pass a bicyclist.”¹⁰¹

“Dooring” results from the negligent opening of a stationary motor vehicle’s door into the path of an approaching bicyclist. Critics of BL design claim that insufficient space between parked vehicles and the adjacent BL forces bicyclists to travel in the hazardous “door zone,” risking injury or death “as the result of the sudden opening of doors,” according to Steven Goodridge.¹⁰² Goodridge claims that “some traffic engineering departments have attempted to facilitate convenient automobile-overtaking of cyclists by directing cyclists to ride within the door zone by marking bike lane stripes and stencils in the door zone.” This technique, used in Chicago’s narrow streets, has received criticism from safety analyst John S. Allen, who asserts that Chicago overlooks the “issue of a driver’s side door’s opening into the bike lane, though ‘doorings’ constitute a very substantial percentage of serious crashes for bicyclists on streets with parallel parking.”¹⁰³ In addition to the hazard of door zones, Pein raises the issue of equity as well:

People using bicycles should expect an obstacle free travel way, as do motor vehicle operators. Bike Lanes which invite and constrain users to ride in the Door Zone create an unacceptable hazard with a potentially suddenly appearing fixed object. Marking BLs within the Door Zone is either a breach of safety by the unaware, or a negligent act by those who are mindful of the hazard. Educational interventions and engineering practice must be targeted in concert to result in bicyclists operating outside of the Door Zone.¹⁰⁴

⁹⁸ Pein, Wide Outside Lanes Are Superior to Bicycle Lanes 3.

⁹⁹ Steven G. Goodridge, “Wide Outside Through Lanes: Effective Design of Integrated Passing Facilities,” 2. 6 March 2007 <<http://www.humantransport.org/bicycledriving/library/passing/>>.

¹⁰⁰ *Ibid.*, 7.

¹⁰¹ “*Bicycle Facilities Guide: Types of Bicycle Accommodations—Wide Outside Lanes—When to Consider This Type of Facility*,” 17 April 2003, North Carolina Department of Transportation. (Accessed 11 February 2007) <http://www.campo-nc.us/BPSG/docs/NCDOT_on_Wide_Outside_Lanes.pdf>.

¹⁰² Steven G. Goodridge, Wide Outside Through Lanes 10.

¹⁰³ John S. Allen, “The Bike Lane Design Guide—‘Honey, they shrunk the cars!’” 1. 14 May 2007 <<http://www.truewheelers.org/comments/laneguide/index.htm>>.

¹⁰⁴ Wayne Pein, “Bicycling and On-Street Parallel Parking,” 3. January 2003 (revised December 2003). (Accessed 14 May 2007) <http://www.humantransport.org/bicycledriving/library/door_zone.pdf>.

Apparently, scarce crash data exist to show conclusively that BLs or WCLs reduce collisions. However, as Pein acknowledges, using “collision studies [to determine the superiority of either mode] is quite difficult”¹⁰⁵—Hiles, for one, discovered “that what passes for hard fact is often conjecture and exaggeration, including assertions about car-bike crashes.”¹⁰⁶ The next section will help meet this shortfall, nonetheless.

¹⁰⁵ Quoted previously on p. 15.

¹⁰⁶ Hiles, Listening to Bike Lanes, Abstract: 1.

3.0 SURVEY

3.1 INTRODUCTION

The survey's objective was to enhance knowledge of bicycle facilities design policy at state transportation agencies. Our open-ended questionnaire format also sought candid (non-attributable) opinions on how state decision makers might improve current practices in bike facilities planning.

The survey instrument (Attachment One) was emailed to 52 state agencies; 33 answered—a response rate of 63%. Of these respondents, 17 returned completed questionnaires, 12 granted telephone interviews after follow-up by an AzDOT researcher, who completed survey questionnaires based on verbal answers, two directed us to Web sites for information about their bicycle facilities, and two sent brief email messages explaining their bicycle facilities policy.

The survey results do not provide a representative sample. Rather, it is hoped that readers will benefit from knowledge of how various DOTs design bicycle facilities and respondents' suggestions about how to improve methods by which WCLs or BLs are chosen for a bike facility.

Highlights of respondents' answers are given below; full transcripts are provided in Appendix A. The source of answers is confidential.¹⁰⁷

3.2 QUESTION ONE

“What key factors does your agency consider in determining whether Bike Lanes or Wide Curb Lanes will be used on a given facility?”

Thirteen state agencies indicated that, to some degree, local authorities decide. A typical response suggested that local involvement in bike facilities design is paramount. One official said: “We do not make those decisions; we stripe Wide [Curb] Lanes or shoulders everywhere there's room for pedestrians and bikes. Designated Bike Lanes are planned by municipalities.” Another agency, responsible for highways on which “traffic levels are so low,” stated WCLs are “ordinarily used” and “work fine;” usually uninvolved in “bike level of service,” this agency identified local “knowledge [and] discretion,” as factors in facilities design. Respondents also cited local initiative, “traffic counts and public feedback,” “requests from bike groups,” “public demand,” or “community opinion,” or “community support” as precursors to state involvement. Context Sensitive Solutions (CSS), for instance, offer a “collaborative interdisciplinary approach to developing transportation projects,” whereby a state agency encourages “dialogue with local governments, road commissions, industry groups, land use advocates, residents and state agencies early in a project's planning phase. A cooperative spirit and an awareness of community interests help achieve the ultimate goal—projects that fit their surroundings while effectively serving transportation needs.” A second state referred to CSS,

¹⁰⁷ In order to preserve anonymity, we have made a few minor alterations to the transcripts.

implemented “by the Governor’s executive order ... to include non-motorized facilities consistent with federal guidelines.”

Another agency, “whenever possible” provides a 16-foot traffic lane, “5 feet for bikes,” although “policy on whether to designate the 5-foot space as a Bike Lane or a Wide Curb Lane is evolving.”

For some respondents, the setting—rural or urban—guides bicycle facility design. Two western states, for example, prefer shoulders rather than BLs on rural highways. In urban areas, however, one state “stripes Bike Lanes” but does not “typically” install WCLs, whereas for another state “Wide Curb Lanes are preferred to accommodate bicycle transportation on state highways in urban areas and incorporated communities. Striped Bicycle Lanes may be considered in special cases.”

Respondents cite space and right-of-way constraints. Indeed, one official from an urban district told our researcher that “available space” was the key factor. Another respondent mentioned “opposition to BLs by homeowners who don’t want to lose space to more paving. A lot has to do with the project engineer’s discretion—we often use striped shoulders—or WCLs; BLs are a last resort unless requested by local authorities.” Over 200 miles of BL exist statewide however, and BLs receive “very little opposition”; moreover, “our two lane highways are 36 feet curb to curb—enough to qualify them as WCLs.”

Authorities may install BLs—despite insufficient space—as a traffic control device. According to one state official, “there are some local advocates who don’t want bike lanes but wide curb lanes are a rare choice [in this state]. Even the local committee in [the city] has put funds into striping a roadway shoulder with insufficient width and continuity for [a] bike lane as a desirable traffic calming measure to benefit cyclists.”

An official whose state apparently has fewer space constraints wrote that “we only do a wide curb lane if there is not enough room for a bike lane, but this has happened rarely.” The state “will include a bike lane (in urban areas/curb & gutter sections) in a road widening or reconstruction project if that road is planned for a bike facility in a state, regional/MPO, or local transportation plan. Currently we have about 1,000 widening/reconstruction projects in the pipeline that include bike lanes. If a project is in a rural area, it automatically gets a 6.5’ shoulder (sometimes reduced to 4’ if right-of-way costs are excessive).”

Respondents named traffic speed and volume¹⁰⁸ as other key factors in facilities design. For example, shared roadways are used in urban areas where traffic density is high but speed is less than 25 MPH, and on roads where traffic speeds are high but density is less than 1200 AADT.

¹⁰⁸ Calculated as Average Annual Daily Traffic (AADT)

3.3 QUESTION TWO

“How are these factors measured or verified?”

Eight respondents named local authorities. Essentially, these state agencies react to proposals from local jurisdictions. Five respondents were guided primarily by available space. For example, “if the pavement is wide enough to accommodate a wide lane or bicycle lane, it is deemed feasible. If there is not sufficient pavement, then a cost/benefit study is conducted.” In urban districts where space would allow “either BLs or WCLs,” wrote another respondent, “there has been little expressed interest in WCLs as an alternative.” Three respondents cited traffic volume. One respondent named “aerial photography /GIS” and “field visits—tape measure and measuring wheel.” One respondent said the agency reports annually to the governor on miles of BL and bike trail added, but not WCL.

One respondent described a new bike map that shows which highways have bikeways, and their type of design. Miles of BL are given in an “attainment report” submitted to the state legislature. One respondent reported “trying to change our policy to one of routine accommodation—considering bike facilities in every project regardless of whether it’s in a plan or not. Right now the inclusion of bike facilities is so reliant on the State Bike/Ped Coordinator, which is not a good idea”

3.4 QUESTION THREE

“If you could improve your agency’s decision-making process for determining whether Bike Lanes or Wide Curb Lanes will be used on a given facility, what would you do?”

This question yielded diverse opinions. A recurring theme, however, was the belief that bike facilities planning should start earlier and include all stakeholders. According to one respondent, for instance, the DOT should “try to incorporate thinking earlier in planning so bike facilities are [a] key part of [the] planning process.” Other respondents wrote that “all bike decision makers [should] evaluate WCLs and BLs,” and that planners should “include all the stakeholders and involve Context Sensitive Solutions.”

Some respondents called for better access to local stakeholders, such as “making local plans available via database accessible statewide,” and permitting “more flexibility based on opinion and local input, rather than strictly by the numbers.”

Statewide training of DOT staff was proposed as a means to “raise the awareness of accommodations” for bicyclists and pedestrians. Other respondents recommended creating “guidelines to determine appropriate use of BLs and WCLs,” and a “protocol with a set of standards.” One respondent proposed eliminating BLs as a performance measure or giving “equal weight” to both BLs and WCLs. One respondent said that limited space often presents WCLs as “the only option.”

3.5 RESPONDENTS' COMMENTS

Some respondents wrote us their comments in preference to completing the survey. One official, for example, citing local opposition to BLs, said that, nonetheless, the state seldom installs WCLs. City authorities view BLs as a “traffic calming measure to benefit cyclists,” despite insufficient road width.

Another respondent provided state directives and standards, which designate paved shoulders as “the primary method” of “making a state highway bicycle friendly.”¹⁰⁹ Design criteria in Louisiana’s *Statewide Bicycle and Pedestrian Master Plan*¹¹⁰ incorporate a selection of “best practices from around the world” in addition to FHWA and AASHTO guidelines.¹¹¹

¹⁰⁹ “Engineering Directives and Standards,” 1(e) Policy Statement. Louisiana Department of Transportation and Development, Office of Highways
<[http://webmail.dotd.louisiana.gov/ppmemos.nsf/0/E40D5BEEAD087BFA86256F1D005A21A4/\\$file/EDS M.htm](http://webmail.dotd.louisiana.gov/ppmemos.nsf/0/E40D5BEEAD087BFA86256F1D005A21A4/$file/EDS M.htm)>

¹¹⁰ “Louisiana Statewide Bicycle and Pedestrian Master Plan (1998) and Updates.” Contact information: Louisiana Department of Transportation and Development, Office of Planning and Programming, Attn: Statewide Plan Update, P.O. Box 94245, Baton Rouge, LA 70804.

¹¹¹ Engineering Directives and Standards, 2(a) Design Criteria and Standards, Policies and Procedures.

4.0 ANALYSIS OF CRASH DATA

4.1 INTRODUCTION

We obtained 85 (97%) of 88¹¹² microfilmed fatal bicyclist/motorist crash reports submitted to AzDOT by police agencies in Arizona between 2003-2006. Excerpts are provided in Appendix B. We omit all dates, and names of crash victims, witnesses, and reporting officials. The data are not representative of bicycle/motor vehicle collisions, but do give diverse examples of how such collisions occur. In all cases, bicyclists were killed, while motorists escaped significant physical injury. Most crashes fit the broad definition ‘failure to yield,’ subcategorized by errors—such as running red lights or stop signs—whose details are summarized below. Other crashes, particularly those committed by hit-and-run motorists without witnesses leave investigators with scant evidence to reconstruct causation. Six collisions occurred in a bicycle facility; however, we cannot conclude from this information that the bicyclist’s presence in a particular type of bicycle facility—WCL or BL—affected the outcome of these crashes.

4.2 DISCUSSION

4.21 Failure to Yield

A bicycle’s nimble characteristics, which allow the rider to maneuver in tight spaces inaccessible to motorists, are no match for a motor vehicle’s far greater speed and mass. In addition, younger bicyclists—Wilkinson’s Group 3 riders—lack mature judgment to assess the risk in “beating the car” across a major roadway. At the intersection of Glendale Avenue and 41st Avenue in Phoenix, for example, a witness relates that “two little boys” crossed in front of her and collided with another car. Another case illustrates a motorist’s failure to anticipate, while allegedly driving under the influence of an intoxicating liquor or a drug (DUI), a child’s sudden movements on a residential sidewalk in Gilbert. According to one witness, the child’s front wheel slipped off the sidewalk and into the motorist’s path. A second witness, however, thought that the child was “pedaling very fast,” trying to beat the car. Most collision victims in our sample, though, were adult bicyclists who crossed the road mid-block, diagonally, or perpendicularly before oncoming traffic—expecting, perhaps, that motorists would obey the posted speed limit. One victim of a speeding driver, apparently DUI, according to the police investigator, “had a duty to stop and yield to oncoming traffic lawfully in the roadway, but may not have expected the oncoming vehicle to be traveling at such a high speed.” The investigator calculated that the crash would not have occurred if the motorist, driving at least 64 MPH, had obeyed the posted speed limit of 45 MPH.

Our sample indicates that a bicyclist’s wrong-way travel often precedes failure-to-yield collisions with automobiles. A daylight incident on Broadway Road and 110th Street, Mesa, for instance, revealed that a bicyclist rode, “on a daily basis,” in a traffic lane against oncoming vehicles. This practice resulted in a fatal collision when a school bus changed

¹¹² Two reports were illegible; one report was unavailable. We discarded a fourth report, involving a multi-vehicle fatal collision, which the bicyclist survived.

lanes suddenly to avoid the bicyclist; a motorist in that lane, forced to slow by the school bus, then moved into the lane just vacated by the school bus, failing to see the bicyclist riding towards him in time to avoid impact. The motorist stated that the bicyclist “was riding in the roadway about 1 foot into the roadway from the fog line.”

In one example, a motorist was driving on a license suspended due to expired insurance coverage; while occupied with some papers, the driver passed through a red light at 45-50 MPH, striking a teenage boy crossing on a light that had turned green “for at least one to two seconds,” according to a witness. A longer delay in receiving the green light might have alerted the boy to the speeding vehicle. Listening, an important skill for alert bicyclists, may often provide additional warning of motorists who show no sign of stopping for a red light.

The “right hook,” in which a bicyclist collides with a motor vehicle turning across his path, may earn the motorist a citation for failure to yield. Yet, as the files show, the motorist’s actions sometimes occur in extenuating circumstances. One dark morning at Buckeye Road and 75th Avenue, without benefit of streetlights, a bicyclist who was traveling without reflectors or lights—required by law—collided with a large truck as it made a right turn ahead of him. In another case, a motorhome driver was stopped for a red traffic signal, preparing to turn right at Ellsworth Road and U.S. 60. Due to construction, the dedicated right turn lane was closed, and a bicyclist alongside, perhaps expecting the driver to proceed straight, was killed as the motorist made his turn.

4.22 Motorist Reversing into Bicyclist’s Path

A single case in our sample involved a motorist backing into a bicyclist. The victim was a 3-year-old tricyclist, riding directly behind as the truck driver engaged reverse gear. The driver, according to the official report, was unable to see the child. Increasingly common in today’s more expensive automobiles are devices (sonar or video) that warn drivers of objects behind, and beside, the vehicle. This incident suggests that all trucks should have such devices, not just to help motorists avoid backing into bicyclists, but to alert them to impending “right hook” situations as well.

4.23 Collisions on Interstate Highways 10 and 17

Bicyclists are prohibited on interstate traffic lanes. Posted speed limits of up to 75 MPH allow motorists, especially truck drivers, little warning of unexpected objects ahead. Three cases involved bicycle/motorist collisions on interstate highways. One case—possibly a hit and run—occurred on westbound I-10, Tucson. Witnesses reported that a commercial truck in the right lane bounced over a large object, possibly a cow. Moments later, the witnesses saw sparks coming from a bicycle part trapped under the vehicle. The vehicle took the next off ramp (M.P. 232). Unfortunately, investigators were unable to determine the impact point, concluding it occurred between the “dirt median road edge and the right emergency shoulder.” Another collision, on southbound I-17, Phoenix, occurred when a bicyclist, “for an unknown reason,” rode from the emergency shoulder into the path of a truck in the number 3 lane.

4.24 Bicycle Facilities

In six cases, motorist/bicyclist crashes occurred in a bicycle facility. One incident, attributable to driver inattention, happened when a motorist inadvertently moved into the BL while traveling 60-65 MPH. The driver reported “reaching to change the radio station”; moreover, glare from sunset was bad, and “I did not see [the victim]. I did not know I drifted over the lane until impact.” The victim’s wife, riding alongside to the right, said “she was not paying any attention to the traffic” that was coming up behind them since they were riding in the bike lane. Wayne Pein and Landis, *et al.*, might claim this statement demonstrates the “illusion of safety” that a striped BL may create.¹¹³ Alternatively, could a narrow rumble strip (instead of, or in addition to, the stripe) have alerted the motorist before he entered the BL?

Another collision occurred while a motorist was driving in the curb lane, behind a tricyclist “traveling in what appeared to be a small lane (about 2 to 3 feet in width), located between the raised concrete curb and the number 2 lane.” The motorist stated that immediately before impact, “he looked away or possibly checked his rear view mirror.” The narrow lane, 2 to 3 feet wide, in which the tricyclist was riding, would not qualify as a BL under AASHTO guidelines. Further, a tricycle’s wide stance would occupy the lane’s width, with the added risk that its left wheel could become exposed to traffic in the number 2 lane.

The third collision occurred when a bicyclist in a bike lane struck a bus at a marked bus stop. The official report states that the bicyclist was not wearing a helmet.

The fourth crash, a hit and run, happened after a motorist apparently drifted into “the marked bike lane in the 1500 block of E 8th Street,” Tempe. The official report states that the motorist “fled the scene without providing information or assistance.” The fifth crash also occurred when a hit-and-run motorist struck a bicyclist from behind.

¹¹³ Pein, *Wide Outside Lanes*, 1; Landis, *et al.*, 124.

The final collision in our sample, another case of driver inattention, resulted when a motorist, traveling at least 72 MPH in a 40 MPH zone, “was changing a CD on the CD player and noticed a bicyclist traveling south on Alma School in the bike lane.” The bicyclist “suddenly veered ... into the motorist’s path.” Although one could accuse the bicyclist of failure to yield, clearly, in this case, the driver’s high rate of speed was grossly excessive.

4.3 CONCLUSION

To reiterate: Our sample does not represent all bicycle/motor vehicle collisions in Arizona. It does represent, nonetheless, *fatal* bicycle/motor vehicle collisions in Arizona reported in 2003-2006. The fatal crash data suggest a common denominator—human error. Aggressive law enforcement can modify human behavior, such as the inclination to drive while intoxicated, to speed, or to run red lights. Widespread implementation of artificial intelligence in the transportation system will reduce its vulnerability to human error, as humans relinquish control to ever smarter and increasingly reliable machines. Tellingly, in this regard, no crash was officially attributed to mechanical failure.

5.0 CONCLUSIONS

The study's objective was to ascertain relationships (if any) between bicyclist/motorist collisions and type of bike facility, BL or WCL. No apparent relationship was found. However, what remained elusive to our study could be discovered in research based on a representative sample of bicyclist/motorist collisions in the United States, or on examination of non-fatal bicycle/motor vehicle collisions in Arizona. Future research may also reveal which type—WCL or BL—is safer overall, or perhaps, that each is better suited in a particular context. Our conclusions for this study are therefore tangential to the merits of bike facilities.

First, despite worthy efforts by the U.S. Congress and local authorities to enhance the legitimacy of bicycling on American roads, bicyclists still experience second-rate status to motorists. For instance, bicyclists cannot attain equality until traffic control devices recognize the presence of bicyclists as well as they detect motorists. Robert M. Shanteau, Ph.D., P.E., in a presentation to Caltrans on October 17, 2007, stated that bicyclists are “still having trouble” with inadequate sensors, despite at least 25 years research.¹¹⁴ Shanteau, citing legislation signed by Governor Schwarzenegger on October 8, 2007, observed that since “bicyclists and motorcyclists are legitimate users of roadways in California ... [legislation] require[s] all new and replaced traffic signals to detect bicycle or motorcycle traffic.”¹¹⁵ Shanteau mentioned ongoing research to develop “advanced methods” of recognizing bikes at traffic signals to allow riders longer green lights. Meantime, loop sensors remain the state of the art; planners should place them under the road “where bicyclists are expected to stop,” or cue the bicyclist with a “Bicycle Detector Symbol.”¹¹⁶

Secondly, traffic surveillance has achieved success in reducing crashes and speeding in Arizona, and could prove effective in targeting common “failure to yield” offenses—such as those in this report's crash data. Privacy advocates may argue that surveillance, and the possibility that intelligent surveillance may extend a virtual police presence, vitiate American values which permit individuals to “be let alone.” Safety advocates, alternatively, may claim that the gruesome crashes caused by human negligence call for sacrifice: driving, indeed, is a privilege, not a right.

Finally, intelligent automobiles are “closer than they may appear.” Given the role of human error in crash causation, driverless cars offer fascinating potential in crash prevention.

¹¹⁴ Robert M. Shanteau, Ph.D., P.E., “Detecting Bicycles and Motor Vehicles Using the Same Loop Detector,” presented to the California Department of Transportation, 16 October 2007.

¹¹⁵ *Ibid.*

¹¹⁶ *Ibid.*

6.0 APPENDIX A

Appendix A contains tables that provide our respondents' contact information and transcripts of their answers.

6.1 LIST OF SURVEY RESPONDENTS

The table below lists the 33 respondents who answered our survey. To preserve the anonymity of respondents, the order in which they appear in this list does not correspond with the order in which each respondent's transcript is presented in the tables that follow.

LIST OF RESPONDENTS			
NAME	AGENCY	EMAIL	TELEPHONE
Ken McGuire	CALIFORNIA DOT	ken.mcguire@dot.ca.gov	916 653 2750
Dwight Kingsbury	FLORIDA DOT	dwight.kingsbury@dot.state.fl.us	850 245 1520
Sharon Briggs	UTAH DOT	sbriggs@utah.gov	801 965 4564
Paul Ahlenius	KANSAS DOT	bikeped@ksdot.org	785 296 7448
Eric Glick	NEVADA DOT	eglick@dot.state.nv.us	775 888 7433
Bill Story	NEVADA DOT	wstory@dot.state.nv.us	775 888 7433
David Bachman	PENNSYLVANIA HWY SFTY/ENG	dbachman@state.pa.us	717 783 8444
Sharon Todd	OHIO DOT	sharon.todd@dot.state.oh.us	614 752 4685
William Riviere	NEW JERSEY DOT	william.riviere@dot.state.nj.us	609 530 4646
Tom Huber	WISCONSIN DOT	thomas.huber@dot.state.wi.us	608 267 7757
Mike Goodno	DC DEPT OF TRANSPORTATION	mike.goodno@dc.gov	202 671 0681
Neal Honma	HAWAII DOT	neal.k.honma@hawaii.gov	808 692 7675
Craig McIntyre	SOUTH DAKOTA	craig.mcintyre@state.sd.us	605 773 4912
Jerry Moore	NEW HAMPSHIRE DOT	jmoore2@dot.state.nh.us	603 271 3320
Caryn Giarratano	MISSOURI DOT	caryn.giarratano@modot.mo.gov	573 522 9297
Josh DeBruyn	MICHIGAN DOT	DeBruyn@michigan.gov	517 335 2918
Paul Douglas	TEXAS DOT	pdouglas@dot.state.tx.us	512 486 5112
Tim Rogers	NEW MEXICO DOT	tim.rogers@state.nm.us	505 827 0050
Sheila Lyons	OREGON DOT	Sheila.a.lyons@odot.state.or.us	503 986 3555
Paul Simms	ARKANSAS HWY & TRANS	paul.simms@arkansashighways.com	501 569 2100
Michael Jackson	MARYLAND DOT	mjackson3@mdot.state.md.us	410 865 1237
Amy Goodwin	GEORGIA DOT	Amy.Goodwin@dot.state.ga.us	404 657 6692
Ron Schlautman	NEBRASKA DOT	ronschlautman@dot.state.ne.us	402 479 4338
Paula Reeves	WASHINGTON DOT	ReevesP@wsdot.wa.gov	360 705 7258
Mary Lou Crenshaw	ALABAMA DOT	crenshaw@dot.state.al.us	334 353 6439
Dan Kline	WYOMING DOT	dan.kline@dot.state.wy.us	307 777 4719
Bill Robinson	WEST VIRGINIA DIV OF HWYS	wrobinson@dot.state.wv.us	304 558 9615
Brian Parsons	LOUISIANA DOT	BrianParsons@dotd.louisiana.gov	225 379 1954
Mark McNeese	IDAHO DOT	mark.mcneese@itd.idaho.gov	208 334 8272
Dan Stewart	MAINE DOT	dan.stewart@maine.gov	207 624 3252
Jim Sebastian	WASHINGTON, D.C., DPW	jim.sebastian@dc.gov	202 671 2331
Steve Church	RHODE ISLAND DOT	schurch@dot.ri.gov	N/A
Tom Norman	NORTH CAROLINA DOT	tnorman@dot.state.nc.us	N/A

6.2 SURVEY INSTRUMENT

ARIZONA DEPARTMENT OF TRANSPORTATION

Survey of Wide Curb Lanes/Bike lanes

The Arizona Department of Transportation (AZDOT) is evaluating the effectiveness of Bike Lanes and Wide Curb Lanes in reducing collisions between bicyclists and motorists. As part of this effort, we are interested in learning how other transportation agencies assess each of these bicycle accommodation options. We would appreciate your response to the following questions. This information will be used to assist AzDOT in improving its current practices.

Person completing this survey: _____ Jurisdiction:

Department and Section:

Telephone: _____ Email:

PLEASE EMAIL, FAX OR MAIL YOUR COMPLETED SURVEY TO JOHN SEMMENS AT ONE OF THE FOLLOWING CONTACTS:

FAX: 602-712-3400 **EMAIL:** jsemmens@azdot.gov **MAILING ADDRESS:** Arizona Transportation Research Center, 206 S. 17 Ave., MD 075R Phoenix, AZ 85007

If you have any questions regarding this survey, please contact Michael Sanders at 602-712-8141 or John Semmens at 602-712-3137

-
1. What key factors does your agency consider in determining whether Bike Lanes or Wide Curb Lanes will be used on a given facility?

 2. How are these factors measured or verified?

3. If you could improve your agency's decision-making process for determining whether Bike Lanes or Wide Curb Lanes will be used on a given facility, what would you do?

4. Has your agency used any reports, studies, memoranda, policies or plans that include information on bicycle traffic and/or safety to help guide decisions on whether to implement Bike Lanes or Wide Curb Lanes? Yes No If yes, how may we obtain a copy? Specify document name and date

5. Is there anyone else you think we should include in this survey? Yes No If yes, please let us know the name and e-mail address so we may invite them to participate.

If you would like a copy of the final report for this project please provide a name and e-mail or postal address for the person who should receive the report.

THANK YOU FOR YOUR ASSISTANCE!

The following three tables provide transcripts of replies to Questions One to Three. The fourth table contains respondents’ comments outside the scope of the questionnaire. Information that could identify respondents is redacted.

6.3 TRANSCRIPT OF REPLIES TO SURVEY QUESTION ONE

Twenty-eight replies to Question One were received from our 33 respondents—

QUESTION ONE	
<i>“What key factors does your agency consider in determining whether Bike Lanes or Wide Curb Lanes will be used on a given facility?”</i>	
1	Don’t put BLs on roads—decided by cities and municipalities. WCLs are used by default, mostly.
2	Decisions made at the local level. Our standards include 8’ shoulders—the most basic level of accommodation—available for breakdowns and bikes.
3	Available space.
4	On a construction project in an urban area, generally endeavors to provide bike lanes, not WCLs. On a resurfacing project involving a state road currently without bike lanes in an urban area, first consideration would ordinarily be given to provision of bike lanes (<i>i.e.</i> , if this could be achieved without moving curbs or other adjustments usually considered beyond the scope of resurfacing), then (if BLs not practical) to WCLs; if BLs of standard dimensions are deemed not practical and WCLs are already present, they would just be kept in most cases. In a few projects with ROW constraints, 11’/3’ lane striping has been used (DOT’s gutters usually provide more than a foot of additional width, so total width from stripe to curb of the undesignated facility is about 4’ or more in such cases).
5	DOT will include a bike lane (in urban areas/curb & gutter sections) in a road widening or reconstruction project if that road is planned for a bike facility in a state, regional/MPO, or local transportation plan. Currently we have about 1,000 widening/reconstruction projects in the pipeline that include bike lanes. If a project is in a rural area, it automatically gets a 6.5’ paved shoulder (sometimes reduced to 4’ if right-of-way costs are excessive). We only do a wide curb lane if there is not enough room for a bike lane, but this has happened rarely. DOT does not “retrofit” roads for bike facilities. We only do it if it’s part of a road construction project or through local government applications for the Transportation Enhancement or CMAQ programs.
6	Don’t build BLs as a rule—province of municipalities.
7	1. Project Type; typically changes would only occur with reconstruction or new construction projects; 2. what does the local agency bike/ped plan show for that facility when it is improved; 3. right-of-way needs.
8	The Department has not developed any factors internally. Since most facilities will be local, local needs and requirements will determine which facilities will be constructed.
9	We do not make those decisions; we stripe Wide [Curb] Lanes or shoulders everywhere there’s room for pedestrians and bikes. Designated Bike Lanes are planned by municipalities.
10	Whenever possible provide 16’ lane (5’ for bikes). Policy on whether to designate 5’ space as BL or WCL is evolving.
11	DOT practices Context Sensitive Solutions (CSS) which is a collaborative interdisciplinary approach to developing transportation projects. Under CSS, DOT solicits dialogue with local governments, road commissions, industry groups, land use advocates, residents and state agencies early in a project’s planning phase. A cooperative spirit and an awareness of community interests help achieve the ultimate goal—projects that fit their surroundings while effectively serving transportation needs. As a result it is often during the public input process it is often brought to the Department’s attention that the route sees heavy bicycle use and wide curb lanes or wide paved shoulders should be provided. The Department rarely actually makes these facilities as designated bike lanes.

QUESTION ONE

“What key factors does your agency consider in determining whether Bike Lanes or Wide Curb Lanes will be used on a given facility?”

12	DOT typically considers wide curb lanes or bike lanes when it is brought up during the public involvement process, requested by the municipality/county or is part of a known bike route. Some factors that are considered include (a) truck traffic, (b) pavement cross section, (c) shoulder width (if any), (d) vehicle speed and (e) traffic volume. In general, we follow the AASHTO <i>Guide for the Development of Bicycle Facilities</i> .
13	Nothing official in writing. Depends on requests from bike groups. WCLs are standard on new highway construction or highway modifications.
14	Usually local planning authority.
15	Traffic counts and public feedback.
16	1) Pavement Width 2) Traffic Volume (AADT) 3) Travel Speed Limit 4) Urban or Rural 5) With or W/O Parking.
17	Only in cities, and they decide.
18	Shared roadways are used on LOW SPEED (<25MPH) roadways in DOWNTOWNS and URBAN CENTERS. And on LOW VOLUME (<1200 +/- ADT) roads of any posted speed.
19	State or local roadway/classification (arterial, collector, etc.) (if local & DOT providing funds, must have local community support, roadway, roadway width, parking lanes, AADT, truck volume, signalization, intersection treatments, trip generators. AASHTO <i>Guide for the Development of Bicycle Facilities</i> .
20	Ordinarily don't do bike level of service—local discretion and knowledge, and cost factor. WCLs ordinarily used. Traffic levels are so low: WCLs work fine.
21	A) Width of available right-of-way B) Presence of a bicycle route plan.
22	By governor's executive order is context sensitive to include non-motorized facilities consistent with federal guidelines.
23	A lot has to do with project engineer's discretion. There is opposition to BLs by homeowners who don't want to lose space to more paving—we often use striped shoulders (then WCLs; BLs are a last resort unless local authorities request them). More than 200 miles of BL in state; very little opposition to BL. Our two lane highways are 36' curb-to-curb (enough to qualify as WCL).
24	Public demand.
25	Highway shoulders are generally considered the most effective means of accommodating bicyclists on rural highways. Wide curb lanes are preferred to accommodate bicycle transportation on state highways in urban areas and incorporated communities. Striped bicycle lanes may be considered in special cases. Guidance comes from DOT Operating Policies and AASHTO.
26	Local plans must designate the route as a bicycle route or the local jurisdiction must provide the required funds.
27	Width of roadway; street classification; vehicle volume and speed; presence or absence of vehicle parking [and] parking turnover; connectivity to existing or proposed bike lanes; bicycle volume, based upon manual counts and/or familiarity; community opinion—we send out notice of intents to advisory neighborhood commissions [and] receive feedback from community organizations—present proposals at community meetings; bicycle advisory council; truck volume; crash data; 2005 Bicycle master plan.
28	Available pavement width; available right-of-way; continuity of bike route.

6.4 TRANSCRIPT OF REPLIES TO SURVEY QUESTION TWO

Twenty-eight replies to Question Two were received from our 33 respondents—

QUESTION TWO <i>“How are these factors measured or verified?”</i>	
1	Not real sure—done at the local level.
2	Whether we have money/space to provide shoulders.
3	With a ruler.
4	Measurements of available width. The public can and occasionally does express differing preferences about bikeways on state roads, but in urban projects in which either BLs or WCLs would be feasible, there has been little expressed interest in WCLs as an alternative.
5	Our bicycle accommodation is a DOT policy is in our Design Policy Manual. Project managers need to get a variance if they do not comply. I have 100+ local, regional and state bike/ped and/or transportation plans on file. Each month when new projects get programmed/authorized and added to DOT’s project database, I check the project location against the plans on file to determine if it needs a bike lane. If it does, there is a field in our project database to indicate that it requires a bike facility. Also, the project managers typically get in touch with me when they begin to develop their concept report (to verify whether or not a bike facility is needed). FYI—I am in the process of trying to change our policy to one of routine accommodation – considering bike facilities in every project regardless of whether it’s in a plan or not. Right now the inclusion of bike facilities is so reliant on the State Bike/Ped Coordinator, which is not a good idea—it could all come apart if I left.
6	If municipality asks, state will assist consistent with AASHTO and federal guidelines.
7	As the department’s Bicycle and Pedestrian Coordinator I am on the department’s project review team and I review every project from concept through final design. Justification for both the type of facility and its inclusion in the project must be discussed in the project’s concept report.
8	Local requirements.
9	There are no factors. We install shoulders based on our paving policy—Bike Lanes are a municipal effort.
10	New bike map shows state highways that have bikeways and type of design. Miles of BL are given in ‘attainment report’ submitted to the legislature.
11	DOT relies on the local units of government, residents, and local DOT staff to verify this information and level of need on these facilities. DOT also works closely with the League of Bicyclists who provides information on the frequency of use of these facilities for organized bicycle tours.
12	Essentially, if the pavement is wide enough to accommodate a wide lane or bicycle lane, it is deemed feasible. If there is not sufficient pavement, then a cost/benefit study is conducted. User safety is always a primary concern. If the percent of truck traffic, the traffic volume and the posted speed limit present no concerns, a wide curb lane or bicycle lane is generally provided. Generally speaking, bicycle lanes are used in more urban areas where one might find on-street parking, smaller lane widths and more frequent turns. Wide curb lanes are most likely used in suburban areas with a lower traffic count than urban areas. In rural areas with four-foot or wider paved shoulders, DOT considers the shoulder an adequate bicycle facility.
13	Verified by construction engineer (WCL); BL installation depends on pressure from bike groups and municipal initiative.
14	Local planning.
15	Follow-up on traffic counts.
16	State databases and/or Field visits.
17	City jurisdiction.
18	Speed and Traffic Volume Data is know [sic], the CONTEXT (downtown or urban center) is verified with our Digital Video Log of all state highways, i.e. visual inspection.
19	Roadways under DOT jurisdiction where bike lanes are proposed—as part of preliminary design contract, roadway factors noted above are measured/evaluated by project design consultant.

QUESTION TWO	
<i>“How are these factors measured or verified?”</i>	
20	Visual inspection, traffic counts (bike traffic not usually counted).
21	A) The width of right-of-way is physically measured B) Local bicycle route plans are looked at in the planning process.
22	Annual report to the governor: Miles of BL and trail added, but not WCL.
23	They really aren't; don't keep track.
24	By meeting with public if a request is received.
25	Via plans review with the state bicycle/pedestrian coordinator.
26	See #1.
27	Aerial photography/GIS; field visits—tape measure and measuring wheel; resurfacing/reconstruction plans; right-of-way database (really just scanned photos of 1950s era 3 by 5 cards); street database; synchro/HCM LOS analysis; transportation studies; vehicle counts—both volume and turning movement counts; computer aided design—Microstation and/or AutoCAD; police crash reports—although reliability and extent of information is limited.
28	As-built plans, field investigations and our bicycle master plan.

6.5 TRANSCRIPT OF REPLIES TO SURVEY QUESTION THREE

Twenty-five replies to Question Three were received from our 33 respondents—

QUESTION THREE	
<i>“If you could improve you agency’s decision-making process for determining whether Bike Lanes or Wide Curb Lanes will be used on a given facility, what would you do?”</i>	
1	Make decisions about putting in any kind of facility.
2	Try to incorporate thinking earlier in planning so bike facilities are key part of planning process.
3	Apply FHA criteria (90% of streets have parked cars).
4	Since the policy is to try to provide BLs, Department has no established decision-making process for making such a choice. If a Shared Lane Marking is adopted in the MUTCD, ¹¹⁷ that might awaken greater interest in possible use of WCLs.
5	Mentioned above – routine accommodation. My current proposal is to include bike lanes in all urban projects, paved shoulders in all rural projects. Should there be significant right of way impacts, or other compelling reasons not to include bike lanes, then 14’ wide curb lanes should be included instead.
6	Recently developed and strengthened implementation of bike safety checklist for planners and engineers working on highway modifications and new construction.
7	Nothing, what we do seems to work. I think everyone involved in the process enjoys some flexibility.
8	The Department hasn’t assessed the matter at this time.
9	We don’t actually make decisions on Bike Lanes or Wide Curb Lanes. We encourage shoulders to be used for bikes and pedestrians—if there’s room. If there’s too little room, then the road serves as a Wide Curb Lane by default. Shoulders serve as our Bike Lanes. The State may stripe Bike Lanes in congested areas, such as intersections. We fund the creation of municipal striping (in City X, for example) and encourage municipal Bike Lanes. It’s safer to delineate a Bike Lane if possible. However, I don’t think Bike Lanes are needed on highways between towns, but they are needed in towns.
10	Encourage more BLs than being planned. A training course for engineers and decision makers in which they’d gain a ‘handlebar perspective’ riding on bike facilities.
11	I would require that they provide the facilities without question on all road projects without always bringing up issue of cost. Often times when the need for a facility is identified the Transportation Enhancement program is the source of funds used to pay for that portion of the roadway suitable for bicyclists, beyond the minimum standard width requirements of vehicles.
12	I have developed a four-hour training on bicycle and pedestrian accommodations called Infrastructure Guidelines for Nonmotorized Transportation. Very soon I will develop this training across the state to DOT personnel to raise the awareness of options for accommodations. Topics to be covered include the DOT bike/ped policy, facility types and pedestrian design details.
13	Set up protocol with set of standards.
14	Develop a set of guidelines to determine appropriate use of BLs and WCLs.
15	Include all the stakeholders and involve Context Sensitive Solutions.
16	Allow more flexibility based on opinion and local input, rather than strictly by the numbers.
17	Have all bike decision makers evaluate WCLs and BLs.
18	We have a clear decision tree. If bike lanes are required but cannot be provided a design exception is required and we have a lot of input on granting design exceptions.
19	More input from bike/ped coordinator and traffic studies that do count bikes.

¹¹⁷ Manual on Uniform Traffic Control Devices (MUTCD); available in PDF or HTML format: <<http://mutcd.fhwa.dot.gov/kno-2003r1.htm>>.

QUESTION THREE

“If you could improve you agency’s decision-making process for determining whether Bike Lanes or Wide Curb Lanes will be used on a given facility, what would you do?”

20	Research is underway at the Center for Transportation Research at the [University of X] to help planners and designers better understand bicyclist’s and motorist’s interactions with each other on various facility types. This project should be completed by September 2007 and published a few months later.
21	Making local plans available via database accessible statewide.
22	More preference-based than criteria-driven. Insufficient space for bikes; homeowner’s opposition.
23	Stronger emphasis on engineering personnel considering bike/ped improvements during planning phase.
24	Either eliminate the addition of bicycle lanes as a performance measure, or lend equal weight to both bicycle lanes and wide curb lanes.
25	Right-of-way is very limited here so the decision is usually made by the existing roadway. Many times a bike lane will not fit within the existing roadway thus a wide curb lane is the only option.

6.6 TRANSCRIPT OF RESPONDENTS’ COMMENTS

Four of our 33 respondents wrote these comments—

RESPONDENTS’ COMMENTS	
1	Respondent reported that state ‘has no widened typical section. We do review needs of the area on an individual project basis.’
2	Respondent emailed this message: ‘We do not have official policies but I give you my take on this, which I have expressed within DOT and with local partners. I base a lot of this on AASHTO Guide for the Development of Bicycle Facilities. There are some local advocates who don’t want bike lanes but wide curb lanes are a rare choice here. Even the local committee has put funds into striping a roadway shoulder with insufficient width and continuity for bike lane as a desirable traffic calming measure to benefit cyclists. I would be happy to see what you come up with.’
3	Respondent states: ‘I’ve sent you the link to the update [for state’s Bicycle and Pedestrian Plan; see Question 4], which is in draft form. Of particular interest to you will be the BIKE LANE MATRIX which seeks to provide guidance on this very question. This is newly developed and has not been extensively vetted, but will be published with the plan update this winter’. [Note: Please contact authors of this report if you wish further information].
4	Respondent states: ‘[DOT] stripes bike lanes in urban areas, and bicyclists may use the shoulder in rural areas. We try to include adequate shoulder-width in all of our projects. However, we haven’t typically used the Wide Curb Lane - so I’m unable to provide anything of value for your survey. Our Traffic & Safety Division indicates a preference for striping (bike lane or fog line) - in the interest of safety to designate a “space” for each vehicle type. If I come across anything that I think would be helpful, I’ll send it your way. Good luck!’

7.0 APPENDIX B: Crash Reports (Bicyclist/Motorist Collisions)

Appendix B tabulates information of 85 fatal bicycle/motor vehicle collisions in the State of Arizona during 2003 - 2006. Bicycle crash typing in column 3 is based on Bicycle Crash Types: A 1990's Informational Guide.¹¹⁸ Excerpted statements by witnesses and official responders are provided; all identifiers are omitted.

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
1	Fremont Street/S 17 th Street, Phoenix. Evening. PHOENIX P.D.	Specific Circumstances: Play vehicle and backing motor vehicle.	Truck reversed on roadway, struck 3- year-old tricyclist riding behind the truck. Driver unable to see the child.	N/A	N/A
2	N Campbell Avenue/E Broadway, Tucson. Daylight. TUCSON P.D.	The Bicyclist Failed To Yield To The Motorist At An Intersection: Ride Out At Intersection— Other.	Motorist turned left on green arrow, collided with bicyclist (not wearing helmet) who was crossing against traffic light.	N/A	N/A
3	Buckeye Road/75 th Avenue. Dark; no streetlights. MARICOPA COUNTY SHERIFF'S OFFICE.	The Motorist Failed To Yield To The Bicyclist At An Intersection: Drive Out At Intersection— Other.	N/A	Truck's lights were on; speed about 5-10 MPH; hit bicyclist between right front corner of cab to middle of bumper/grill area.	Truck driver failed to yield to bicyclist while turning right on green light. Bicycle not properly equipped to be ridden at night (i.e., white headlight, red reflector/light at rear).
4	7000 Block W Van Buren Street. Dark/no streetlight. PHOENIX P.D.	Specific Circumstances: Weird—Hit & Run.	Bicyclist westbound in the eastbound lane struck from behind by westbound motorist in the eastbound lane.	N/A	Driver left scene of collision.

¹¹⁸ W. W. Hunter, Wayne E. Pein, and Jane C. Stutts, Bicycle Crash Types: A 1990's Informational Guide, FHWA-RD-96-104. (McLean, VA: United States Department of Transportation, Federal Highway Administration, 1997).

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
5	Sun Valley Parkway/M.P 128.8. Daylight. MARICOPA COUNTY SHERIFF'S OFFICE.	The Motorist Was Overtaking The Bicyclist. Motorist Overtaking— Failed To Detect.	Bicyclist westbound on Sun Valley Pkwy when struck from behind by truck that had drifted into the bicycle lane.	Victim's wife said she was not paying any attention to the traffic that was coming up behind them since they were riding in the bike lane.	Driver reports reaching to change radio station when he drifted into the bicycle lane; traveling 60 to 65 MPH. Driver states glare from sunset was bad: " I did not see [victim]. I did not know I drifted over the lane until impact."
6	I-17, southbound, in area of 7 th Avenue, (milepost 197), Phoenix. Night; "moderate illumination" from ADOT lighting. ARIZONA DEPARTMENT OF PUBLIC SAFETY.	Specific Circumstances: Weird—Non- roadway (i.e. bicycles prohibited on interstate highway).	N/A	Multiple witnesses report human remains and bicycle debris in lanes 1, 2, and 3, and running over same.	Tractor/trailer traveling about 55 MPH southbound in #3 lane when, for an unknown reason, bicyclist rode northward from emergency shoulder into truck's path.
7	S 51 st Avenue/W Broadway Road, Phoenix. Dawn. PHOENIX P.D.	The Motorist Was Overtaking The Bicyclist. Motorist Overtaking— Failed To Detect.	Bicyclist northbound on 51 st Avenue when struck by northbound motorist. Motorist fled scene and was involved in another collision on S 51 st Avenue.	N/A	N/A
8	W Glendale Avenue/N 41 st Avenue, Phoenix. Evening. PHOENIX P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	N/A	I was heading east on Glendale Avenue when two little boys crossed, heading north on 41 st Avenue. They made it as far as the left lane, heading west. A gray car hit one boy; his bike went up in the air and hit my front end ... I blocked the boy with my [vehicle] ... I was in the fast lane when the boys crossed in front of [me]	N/A
9	S Alma School/W 8 th Avenue, Mesa. Dark; streetlights on. MESA P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	Bicyclist southbound on sidewalk on west side of Alma School Road when rider decided to cross roadway. Bike entered southbound lanes traveling in a southeast direction. Bicyclist was in the southbound lane when hit by vehicle southbound in that lane.	N/A	N/A

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
10	N Columbus Blvd/E Grant Road, Tucson. Daylight. TUCSON P.D.	The Motorist Failed To Yield To The Bicyclist: Drive Through.	Bicyclist southbound on Columbus Blvd as [biker] crossed on a green light, vehicle was westbound on Grant, ran red light and collided with bike. Motorist fled scene westbound on Grant.	N/A	Suspect ran red light and struck victim. Suspect left the scene.
11	N 59 th Avenue/W McDowell Road, Phoenix. Morning/daylight. PHOENIX P.D.	The Bicyclist Turned Or Merged Into The Path Of the Motorist: Ride Out From Sidewalk.	Bicyclist eastbound on McDowell; [entered roadway from the southwest sidewalk and] collided with school bus completing right turn from eastbound McDowell to go south on 59 th Avenue.	N/A	N/A
12	N 28 th Place/E Oak Street, Phoenix. Daylight. PHOENIX P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	Bicyclist northbound on 28 th Place, on wrong side of road; abruptly turned eastbound across roadway, just south of E Oak Street; collided with truck westbound on E Oak St. turning south onto 28 th Pl.	N/A	N/A
13	S Alma School Road/W 8 th Avenue. Dark: streetlights on. MESA P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	Bicyclist westbound across S Alma School when struck by southbound motorist.	<p>Witness: I was traveling north on Alma School Road. Saw bicyclist cross street from east to west. Had to slow to miss bicycle rider. Saw bicyclist did not stop in center lane, but continued across southbound traffic and was struck.</p> <p>Witness: We [occupants of vehicle that hit bicyclist] were driving south on Alma School. [Driver] yelled 'Oh, ----', and slammed on the brakes and we hit the bicyclist on the left. Bicycle and bicyclist flew into windshield and we skidded to a stop.</p> <p>Witness: I was in the far left lane, three car lengths behind vehicle that struck bicyclist. It appeared victim rode bike from east to west across Alma School into the path of vehicle.</p>	<p>It was dark; sky was cloudy. I [police investigator] did not note any adverse weather at the time of investigation. S Alma School is a north/south arterial street. Surface is traveled asphalt. Curbs are raised concrete with concrete sidewalks. Streetlights were lit along the west side of street with an overhanging light head very near impact area. There are three through lanes in each direction, separated by a two-way-left turn lane. Posted speed limit is 40 MPH. There are no crosswalks in immediate collision area.</p> <p>Based on available information it appears bicyclist was traveling from east to west across S Alma School. Bicyclist was wearing a protective helmet and protective outer clothing. There was evidence of portable lighting on the rider.</p>

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
14	Dysart Road/Acoma Street. Daylight. EL MIRAGE P.D., MARICOPA COUNTY SHERIFF'S OFFICE, MARICOPA COUNTY MEDICAL EXAMINERS, SURPRISE F.D., SURPRISE P.D.	The Motorist Was Overtaking The Bicyclist. Motorist Overtaking— Failed To Detect.	Motor vehicle rear-ended bicycle.	[I was] traveling behind motorist (whose speed was about 40 MPH) in #2 lane northbound on Dysart Road from Thunderbird Road. Motorist did not drive into another lane before colliding with bicyclist. [Passenger in motorist's vehicle] stated he was resting in the car with his head low, looking at the floor because he was tired and feeling lazy. Said he did not see anything but heard a loud bang and glass sprayed over him. [Back seat passenger in motorist's vehicle] said he saw nothing but felt something hit the car.	Motorist was traveling in #2 (curb lane) at time of collision. Tricyclist traveling in what appeared to be a small lane (about 2 to 3 feet in width) and was located between the raised concrete curb and the #2 lane. Tricycle was turned upside down (in the #2 northbound lane of Dysart Road) with a bent rim. Motor vehicle had extensive damage to the windshield and roof. Motorist stated that he was driving about 40 MPH northbound, in a northbound lane, on Dysart Road. Said he looked away or possibly checked his rear view mirror when he heard a noise hit the car and saw someone rolling over the vehicle. It was obvious by looking at the damage that the bicycle had been struck from behind by the front of the vehicle. I also found a scuff mark in the northbound bicycle lane. This scuff appeared to be from the right rear tire of the [tr]icycle when it was struck. On the right side of the tire scuff I found what appeared to be a shoe scuff. I looked at the right shoe of the rider and found damage to the outside edge of the shoe that is consistent with dragging it on the ground. I ... found that the vehicle would have been traveling at a minimum speed of 49 MPH.
15	N 35 th Avenue/W Turney Avenue, Phoenix. Night. PHOENIX P.D.	Specific Circumstances: Unknown.	N/A	N/A	Bicyclist crossing N 35 th Ave., mid-block; struck by southbound motorist, who fled the scene, failing to aid victim.

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
16	N 5 th Avenue/E Congress Street, Tucson. Daylight. TUCSON F.D. TUCSON P.D.	The Operator Was On The Wrong Side Of The Street. Wrong Way Bicyclist.	Victim riding on sidewalk and rode into path of oncoming vehicle.	Bicyclist riding eastbound on south side of Congress on sidewalk.	Motorist westbound on Congress in the left lane; turned left at 5 th Avenue to go southbound. Bicyclist, riding on sidewalk, proceeding eastbound on south side of Congress. Bicyclist traveling very fast, rode onto 5 th Avenue in front of motorist. Wrong way on one-way street/improper use of sidewalk.
17	W Southern Avenue/S Country Club Drive, Mesa. Daylight. MESA P.D.	The Operator Was On The Wrong Side Of The Street. Wrong Way Bicyclist.	N/A	N/A	Bicyclist riding eastbound on north sidewalk of West Southern Avenue from S Country Club Drive in Mesa. Bicyclist left sidewalk, entering roadway, and attempted to go around a semi truck and trailer leaving a business driveway. The semi was beginning a right hand turn to travel westbound onto Southern Avenue. The bicycle struck the semi tractor. Both the bicyclist and bicycle went underneath the semi. The semi driver stopped immediately.
18	N Crave Creek Road/North 8 th Street, Phoenix. Daylight. PHOENIX P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	Bicyclist riding mid-block of North Crave Creek Road when struck by motorist traveling northbound on North Crave Creek Road.	N/A	N/A
19	S 16 th Street/E Roeser Road, Phoenix. Evening. PHOENIX P.D.	The Motorist Failed To Yield To The Bicyclist: Drive Through.	N/A	N/A	Bicyclist westbound, in the south crosswalk of the intersection, located at 16 th Street and East Roeser Road, when struck by motorist traveling southbound on South 16 th Street. The motorist ran a red light and fled the scene after the collision.
20	Edward Drive/16 th Street, Tempe. Daylight. TEMPE P.D.	The Bicyclist Failed To Yield To The Motorist At An Intersection: Ride Out At Stop Sign.	N/A	N/A	Bicyclist southbound, exiting private drive, failed to stop/yield before entering 16 th Street. Bicyclist collided with a motor vehicle. Bicyclist and bicycle were caught under the vehicle as it continued westbound on 16 th Street.

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
21	E Thomas Road/N 35 th Street, Phoenix. Night. PHOENIX P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	N/A	N/A	Bicyclist northbound across East Thomas Road mid-block, when struck by motorist, who was eastbound on Thomas Road approaching 35 th Street.
22	N Oracle Road/W Plata Street, Tucson. Daylight. TUCSON P.D.	Specific Circumstances: Weird—Non- Roadway [i.e., bike facility and marked bus stop].	N/A	N/A	Bicyclist traveling in bike lane north on Oracle Road. Bus was stopped at marked bus stop. Passengers exited bus. Doors were then closed prior to impact in rear of bus. Bicyclist not wearing helmet.
23	Broadway Road/Signal Butte Road, Mesa. Daylight. MARICOPA COUNTY SHERIFF'S OFFICE.	The Bicyclist Turned Or Merged Into The Path Of The Motorist: Bicyclist Left Turn In Front Of Traffic.	Elderly bicyclist westbound, adjacent to curb on Broadway Road; made southbound U-turn and was struck by westbound motorist traveling in the median lane. There is nothing to indicate that excessive speed, impairment by drugs and/or alcohol were factors in the collision.	Three witnesses say bicyclist was riding westbound next to the north curb of Broadway Road. He started to make a U-turn across the westbound lanes. He turned directly in front of the [westbound motorist] who was traveling in the median lane. The driver attempted to avoid the collision by braking hard but struck [victim] with right front part of vehicle.	78 year old bicyclist westbound adjacent to the north curb in the area of 119000 E Broadway Road when [bicyclist] made a southbound U-turn and was struck by [vehicle] which was traveling on Broadway Road in the median lane at a minimum speed range of 49-52 in a posted 45 mph zone.
24	I-10/M.P. 154.8. Dark. Tempe. ARIZONA DEPARTMENT OF PUBLIC SAFETY.	Specific Circumstances: Weird—Non- Roadway [i.e., bicycles prohibited on controlled access highway].	Motorist states: Traveling eastbound on I-10 and taking ramp to U.S. 60 eastbound in the #1 lane of the ramp; didn't see bicyclist come from the right side until too late. Hit brakes as [motorist] struck bicyclist and bicyclist came up and hit windshield. Still on brakes hard so bicyclist flew off the hood and ended up on ground over in the gore area.	N/A	Based on evidence at scene ... collision occurred because [bicyclist] was on a controlled access highway where bicyclists are not allowed. There are signs posted at the on-ramps to the highways prohibiting pedestrians and bicycles ... It is unknown where bicyclist entered highway ... I was unable to locate any lights on the bike or in the debris field and the only reflectors were on the pedals ... [victim] wore dark clothing.

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
25	SR 89/MP 312.6, Prescott. Dusk; streetlights on. ARIZONA DEPARTMENT OF PUBLIC SAFETY.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	Motorist stated: Northbound on SR 89 by SR 69 junction at about 40 MPH. Looked in rear view mirror, then looked straight ahead. Heard a passenger say 'Watch out'. Saw a bicyclist crossing the road ahead. Bicyclist came from right side of roadway. Swerved in an attempt to avoid bicycle, but bicycle and bicyclist hit windshield of car and bounced off onto roadway.	Front seat passenger in motorist's vehicle stated: Saw bicycle coming from right side of road; bicycle started to cross road right in front of car. Yelled at motorist, who swerved to avoid bicycle. Struck bicycle and rider hit windshield. Rear seat passenger in motorist's vehicle stated: Looking forward when bicycle appeared out of nowhere from the right side; they hit bicycle.	Based on statements of motorist and witnesses, and physical evidence at the scene, it was determined that [bicyclist] caused this collision.
26	W Baseline Road/S Longmore Road, Mesa. Daylight. MESA P.D.	The Motorist Failed To Yield To The Bicyclist: Drive Through.	Motorist westbound on W Baseline Road [speed limit 35 MPH during school hours, 45 MPH at other times] within middle lane, when motorist reportedly ran a red light and struck 13 year old bicyclist who was traveling southbound on west side of intersection and within the marked crosswalk	Witness: Traffic signal for north and southbound traffic was definitely green when [motorist] entered intersection and light was green for at least one to two seconds before the collision, Estimated that motorist's speed was 45-50 MPH. Witness: Thought [motorist] was traveling about 45-50 MPH. Sure that light was red while motorist was in intersection, but unsure when it changed.	After completing my [police investigator's] investigation, I believe there is sufficient evidence to show that motorist ran a red light killing [13 year old bicyclist] while motorist had no insurance on vehicle and vehicle registration was suspended for mandatory insurance reasons.
27	W Van Buren Street/N 15 th Avenue, Phoenix. Daylight. PHOENIX P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	N/A	N/A	Bicyclist was crossing W Van Buren Street near N 15 th Avenue when bicyclist collided with an eastbound vehicle in the curb lane of W Van Buren Street.

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
28	E Brown Road/Lindsay, Mesa. Daylight. MESA P.D.	Specific Circumstances: Weird—Motorist Arrested For Manslaughter, DUI, Speeding.	Bicyclist was crossing Brown Road from north to south, east of the SRP canal. Motorist was traveling west on Brown Road at speeds greater than 75 MPH. Motorist struck bicyclist, who was killed instantly. Motorist was investigated for impairment by drugs and was arrested and booked into the Maricopa County Jail for manslaughter.	N/A	The roadway evidence and vehicle damage was consistent with the following: The motorist was traveling westbound on E Brown Road in the westbound #1 lane, approaching the canal bridge east of Lindsay. A conservative estimate [of motorist's speed] was 75 MPH in a posted 45 MPH zone. The bicyclist was attempting to cross Brown Road from north to south, just east of the canal bridge. The motorist applied the brakes in an attempt to stop the vehicle. The motorist's vehicle started to skid westbound. After skidding westbound for about 138 feet, the left front of the vehicle collided with the left rear of the bicycle.
29	W Indian School Road/N 18 th Avenue, Phoenix. Daylight. PHOENIX P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	Bicyclist crossing Indian School Road in the west 1700 block. Victim was crossing mid-block when struck by an eastbound motorist.	Witness: Driving east on Indian School from 18 th Avenue. I noticed a bicyclist on the sidewalk also eastbound. Bicyclist turned off sidewalk into the far right lane and ran into the [motorist], who was about 50 feet ahead of me. The bicyclist collided with motorist's vehicle and was thrown up on the vehicle's hood, then flew up and over [the vehicle], landing about 25 feet in front of me. It did not appear to me that the motorist was speeding and the bicyclist didn't take the time to look onto the road before he pulled out onto it.	N/A
30	N 43 rd Avenue/W Frier Drive, Phoenix. Dark, streetlights working. PHOENIX P.D.	The Bicyclist Turned Or Merged Into The Path Of The Motorist: Bicyclist Left Turn In Front Of Traffic.	Bicyclist was traveling northbound on 43 rd Avenue when bicyclist turned in front of a northbound vehicle. Bicycle had no lights or reflectors. Bicycle was struck in rear by motorist.	Witness: My boyfriend and I were driving south on 43 rd Avenue, just south of Northern, when I saw a motorist slam on his brakes. I screamed for my boyfriend to stop. We barely missed the bike in the road . . . There were a few other crashes when cars slammed into each other, trying to avoid the bicyclist's collision.	N/A

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
31	E 22 nd Street/S 2 nd Avenue, Tucson. Daylight. TUCSON P.D.	The Operator Was On The Wrong Side Of The Street: Wrong Way Bicyclist.	Motorist turning right after stopping at stop sign. Cyclist was westbound on E 22 nd against traffic. Cyclist did not yield.	Witnesses state that motorist stopped at the stop sign and looked both ways before proceeding. They also indicated that victim was traveling on sidewalk area and came from the east to the west in front of the truck. Front passenger [in motorist's vehicle]: Also told me [police investigator] they were heading westbound on Southern in the inside lane. Told me the bicyclist came from the south and was crossing to the north but the area was so dark that they did not see him until he was right up on the car.	Bicyclist was westbound on the eastbound sidewalk. Rode in front of a truck making a right turn.
32	E Southern Avenue/Ellsworth Road, Mesa. Darkness; no streetlights. MESA P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	N/A		Bicyclist crossing street diagonally and rode into side of westbound vehicle. I noticed that the only light in the area came from headlights on emergency vehicles and the area on the south side of the vehicle was dark. The motorist told me when he got to approximately 9300 E Southern he noticed the elderly bicyclist crossing Southern from the south side to the north side, and that the bicyclist was crossing in a diagonal in a northwest direction. Motorist told me due to there being no lighting in the area, he was unable to see bicyclist until he was right up close to him. Bicycle equipped with white spoke mounted side reflectors, white front reflector, red rear reflector, and yellow reflectors on the pedals; no head light, side lights, or tail light.
33	3300 block of E Broadway Road, Phoenix. Darkness; streetlight <u>not</u> functioning. PHOENIX P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	Bicyclist northwest bound mid-block in the 3300 block of E Broadway Road; was struck by motorist westbound on E Broadway Road.	N/A	N/A
34	E Missouri Avenue/N 20th Street, Phoenix. Daylight. PHOENIX P.D.	The Bicyclist Turned Or Merged Into The Path Of The Motorist: Ride Out From Sidewalk.	Bicyclist westbound on the north sidewalk in the 1900 block of E Missouri Avenue. Rode off the sidewalk crossing the curb lane into the inside lane and was struck by westbound motorist.	N/A	N/A

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
35	Shea and Hayden, Scottsdale. Dawn. SCOTTSDALE P.D.	The Motorist Was Overtaking The Bicyclist. Motorist Overtaking— Misjudged Passing Space.	Bicyclist westbound in #3 through lane of Shea in the 8100 east block. Motorist was also westbound in the #3 through lane of Shea in the 8100 east block. The front of motorist's vehicle struck the rear of bicycle.	Motorist: I was driving to a [traffic] class when a bicyclist began to merge into my lane. I couldn't brake in time and I hit him. I braked immediately.	I [Scottsdale police officer] assisted case detective with damage assessment of motorist's vehicle. When I turned ignition to the 'On' position, the vehicle stereo turned on, and the music was loud from the speakers. I turned the radio down and parked the vehicle. I [Scottsdale police officer] observed [motorist's vehicle] in the curb lane, just east of Hayden, in the westbound lane. A bicycle was lodged under the front of the vehicle in the middle of the vehicle. The bicycle was still upright with a flashing light on the handlebar and a steady light on the right side near the front wheel. I also observed [bicyclist] lying in the roadway about twenty feet in front of the vehicle. [Case detective]: There was no evidence of hard braking at the scene as there were no skid marks and appeared to be no ABS tire marks either. It should be noted that this does not mean there was not hard braking, however. I cited motorist for Failure to Control Speed to Avoid a Collision. Motorist was cited into City Court.
36	Baseline Road/Darrow Drive, Tempe. Daylight. TEMPE P.D.	The Operator Was On The Wrong Side Of The Street. Wrong Way Bicyclist.	Bicyclist westbound on the south sidewalk of 1400 block of W Baseline Road when bicyclist collided with motorist who was exiting private drive while entering Baseline Road.	N/A	N/A

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
37	S Alma School Road/Main Street, Mesa. Daylight. MESA P.D.	The Motorist Was Overtaking The Bicyclist. Motorist Overtaking— Misjudged Passing Space.	Motorist traveling at high speed southbound on Alma School; struck bicyclist who was also southbound on Alma School and veered into motorist's path. Due to the speeds involved ... this case will be reviewed by the county attorney for charging.	N/A	Motorist traveling at a minimum speed of 72 MPH in a 40 MPH zone. Witnesses related that suspect driver had been at light at Main and Alma School facing south. When the light turned green motorist squealed vehicle's tires and sped south well ahead of other traffic. Vehicle left substantial anti acceleration skid marks on the roadway from all four tires. The bicycle had been traveling southbound on Alma School in the bike lane (west side of street) and suddenly veered to the east and into motorist's path. Motorist said the [motorist] was changing a CD on the CD player and noticed a bicyclist traveling south on Alma School in the bike lane next to the curb. Motorist said that bicyclist looked over left shoulder at motorist's vehicle and crossed Alma School at a 45-degree angle right in front of him; said that he slammed on his brakes but could not stop due to skidding; said that bicyclist continued across the street, and jerked the handlebars as [bicyclist] looked at approaching motorist.
38	E Thunderbird Road/N 37 th Street, Phoenix. Daylight. PHOENIX P.D.	The Motorist Turned Or Merged Into The Path Of The Bicyclist: Motorist Right Turn.	Motorist northbound on North 37 th Place; after stopping, turned right onto the frontage road and accelerated when a collision occurred with bicyclist who was westbound on frontage road on right side of roadway.	N/A	N/A
39	W Bell Road/N 17 th Avenue, Phoenix. Darkness; siretlights on. PHOENIX P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	Bicyclist crossing W Bell just west of N 17 th Avenue from north to south, mid- block, when bicyclist collided with motorist eastbound on W Bell Road in the eastbound #1 of three lanes.	N/A	N/A

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
40	E Greenway Road/N 31 st Street. Darkness: streetlights on. PHOENIX P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	Bicyclist northbound mid-block of Greenway Road at 31 st Street when struck by motorist who was westbound in the inside lane of westbound Greenway Road.	<p>Witness: I was on 31st [Avenue] and Greenway when bicyclist crossed Greenway Street north from the south side; motorist, traveling about 40 MPH, hit bicyclist.</p> <p>Witness: Driving west on Greenway, to rear of motorist. Motorist braked hard and suddenly, but struck bicyclist. The hit was 'blunt' and knocked the bicyclist to the street. The motorist did stop. The bicyclist was not run over.</p> <p>Witness: Heard tires squeal and saw motorist hit something that went flying onto the street. Our vehicle was in the far right lane; motorist was in the center lane.</p> <p>Witness: I was going south on 32nd Street and turned west on Greenway. I was going about 45 MPH about one block west of 32nd Street. From the south end of the street a bicyclist pulled out about 45 feet in front of me. I hit my brakes but could not avoid the crash.</p>	N/A

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
41	E 8th Avenue/S Fraser Drive, Mesa. Dawn; no streetlights. MESA P.D.	The Motorist Turned Or Merged Into The Path Of The Bicyclist: Motorist Left Turn—Facing Bicyclist.	Motorist westbound on 8th Avenue when motorist went left of center striking bicyclist, who was on the roadway along the south curb. Motorist failed to stop at the collision fleeing the area.	<p>Witness: Riding bike on 8th Avenue behind victim. Had just passed Home when witness saw a tan or light brown newer full-size pick-up westbound on 8th Avenue. Said the truck was weaving as it approached witness. Witness then saw the truck start to cross over to witness' side of the roadway. Witness rode up behind a white Suburban that was parked along the south curb for protection from being struck, then heard a crash. Within moments the truck passed westbound on 8th Avenue. Witness could see that a Hispanic male was driving the vehicle. The male appeared to be in his 30s and was wearing a dark colored shirt.</p>	<p>Bicyclist killed while riding eastbound along south curb by hit and run driver.</p> <p>When I [case detective] arrived it was daylight. The witness to the collision stated the sun was just coming up when the collision occurred. It was dawn and some daylight could be seen. There are no street lamps in the area of the collision. I do not know if the fleeing vehicle had its headlamps on. The bike had white reflectors in the wire spokes. A white reflector was found that looked like it came from the front goose neck area of the bike. There was also a red reflector under the seat of the bike facing to the rear.</p> <p>This was a non-intersection related collision. It occurred in an urban residential area. The road- way is paved asphalt with no markings. There are raised curbs and sidewalks on both sides of the roadway. There are homes on both sides of the road with driveways entering onto 8th Avenue. This is a posted 25 MPH residential street.</p> <p>Based on the evidence at the scene and the witness information, I believe the following took place: Motorist was westbound on 8th Avenue when it crossed the center of the roadway driving in the eastbound portion of the road. Vehicle continued in a southwesterly direction, hitting bicyclist who was traveling eastbound near the south curb. Motorist forced bicyclist in a southwesterly direction, sending bicyclist over the raised curb. Motorist continued driving after hitting bicyclist. Motorist drove over the raised curb driving with his left side tires on the side-walk for a short distance. Motorist then drove northwest, getting back onto the roadway and heading west without stopping.</p>

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
42	Broadway Road/110th Street, Mesa. Daylight. MARICOPA COUNTY SHERIFF'S OFFICE.	The Operator Was On The Wrong Side Of The Street. Wrong Way Bicyclist.	N/A	<p>Motorist's statement: Traveling eastbound on Broadway Road in the median lane; just passed through the intersection of Signal Butte Road. Saw a school bus pull onto the roadway from the south dirt shoulder. The school bus was roughly halfway between Signal Butte Road and 110th Street. When the school bus entered the roadway it began to travel eastbound in the curb lane. As motorist was approaching 110th Street, the school bus activated its left turn signal and veered into [motorist's] lane of travel. Motorist in return activated right turn signal and moved from median lane into the curb lane. Motorist had wondered why the school bus moved into [motorist's] lane. After entering curb lane motorist had just passed 110th Street and saw a bicyclist westbound in witness' lane of travel. Saw that the bicyclist was riding in the roadway about one foot into the roadway from the fog line. Once motorist observed bicyclist, does not remember when [motorist] started to brake, but swerved to the left. As motorist swerved to the left, motorist hit bicyclist.</p> <p>School bus driver: Traveling eastbound on Broadway Road in the curb lane. Said the bicyclist was riding in the roadway about two feet from the fog line. Driver said normally sees bicyclist riding bicycle on a daily basis the wrong way on the wrong side of the road. Driver was traveling about 40-45 MPH; approaching 110th Street and had just started to slow to move into the median lane. Moved into the median lane and observed [the motorist] coming up behind school bus. Driver said motorist moved from the median lane into the curb lane as they passed 110th Street. Once the motorist entered the curb lane, the motorist's vehicle struck bicyclist.</p>	<p>Bicyclist westbound in the eastbound curb lane of Broadway Road approaching 110th Street. Motorist eastbound on Broadway Road in the median lane approached 110th Street. As motorist approached 110th Street, a school bus, which had been traveling eastbound on Broadway Road in the curb lane moved into the median lane. Motorist moved from the median lane to the curb lane as motorist passed 110th Street. Once motorist entered [curb] lane, motorist struck bicyclist head on. Bicyclist was ejected from the bicycle onto the south dirt shoulder.</p> <p>I [case detective] did not locate any type of damage on the bicycle that I could relate to the collision. The bicycle was equipped with reflective tape on both sides of the frame. The bicycle also had a homemade reflector that was on a piece of cardboard in a triangular shape.</p>

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
43	Greenway Parkway/27th Street, Phoenix. Daylight. PHOENIX P.D.	The Bicyclist Failed To Yield To The Motorist At An Intersection. Ride Out At Stop Sign.	Bicyclist westbound on E Waltann Lane failed to yield from Stop sign and collided with westbound motorist on Greenway Parkway.	Witness: Bicyclist crossing Greenway Parkway unsafely was struck by motorist. From what I witnessed, the bicyclist did not look when crossing the street. The motorist had no time to react to the bicyclist.	N/A
44	S 7th Street/Westbound Maricopa Freeway access road, Phoenix. Daylight. PHOENIX P.D.	Specific Circumstances: Weird—Motorist Driving On A Suspended License And Operating Unsafe Vehicle.	Bicyclist eastbound in the north parking lot at 1800 S 7th Street, and was attempting to exit the parking lot and turn left (north) while steering with hands full of unknown object(s). Bicyclist lost control of the bicycle and fell into the roadway where bicyclist collided with the right rear wheels of a belly dump trailer that was being hauled by a semi-truck. N/A		Citations issued to motorist for: Driving on a suspended license; defective brakes; no proof of insurance; overweight vehicle; no speedometer; and for other violations.
45	Westbound on-ramp to U.S. 60 from Ellsworth Road, Mesa. Daylight. ARIZONA DEPARTMENT OF PUBLIC SAFETY.	The Motorist Failed To Yield To The Bicyclist: Drive Out At Intersection— Other.		Witness: Saw motor home hit a bicyclist and drag the bicyclist 20-30 yards. Witness also saw the bicyclist in the crosswalk, and the traffic light was green. Witness: Working at the northwest corner of Ellsworth and U.S. 60 when witness saw a motor home turn west onto the ramp. At that point the bicyclist was already underneath the motor home. The motor home dragged the bicyclist for an unspecified distance before it stopped. Witness did not see which direction the bicyclist came from. Witness: Stopped at a red traffic light, southbound on Ellsworth Road, to the left and rear of the motor home. As the light turned green, also saw the motor home make a right turn onto the westbound ramp. At the same time, the cyclist was crossing the on-ramp in the area of the sidewalk. The motor home then struck the cyclist, dragging cyclist several feet.	This collision occurred at the westbound on-ramp to U.S. 60 from Ellsworth Road. The on-ramp consists of two lanes, is constructed of concrete, and was generally free of defects or debris. The dedicated turn lane from southbound Ellsworth to westbound U.S. 60 was barricaded closed due to ongoing ADOT construction in the area. Construction workers, equipment, and barricades were present. The weather was clear and sunny; traffic volume was light to moderate. Both vehicles [bicycle and motor home] southbound on Ellsworth Road at U.S. 60. Motor home was stopped at the red traffic signal in lane #2. As the signal turned green, motor home began its right turn to enter U.S. 60 westbound. At some point in its turn, motor home struck bicycle. The first physical evidence found at the scene (three small metal pieces from the bicycle) was located inside the crosswalk, indicating the initial impact was at this point or possibly before. Motor home continued forward about 100 feet with bicycle and bicyclist underneath. At this 100 foot

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
46	1500 S Baseline Road, Mesa. Darkness. MESA P.D.	Specific Circumstances: Weird—Motorist DUI, Traveling At High Rate Of Speed.	Bicyclist was traveling north across Baseline on Rogers when struck by motorist. Motorist was eastbound on Baseline at a high rate of speed. Bicyclist was killed instantly. Motorist arrested for manslaughter and testing for drugs/alcohol. Case detective calculated a minimum speed of 64 MPH for motorist's vehicle, and determined that collision would not have occurred if motorist had obeyed posted speed limit of 45 MPH.	Witness: Noticed motorist's vehicle pass at high rate of speed.	distance, the cyclist became dislodged from under the motor home, and the bicyclist's head was struck by the motor home's tires. About 25 feet later, the motor home came to rest. It is apparent that motorist's speed contributed to the severity of the collision, and that if motorist had obeyed the posted speed limit, the collision would not have occurred. The bicyclist also had a duty to stop and yield to oncoming traffic lawfully in the roadway, but may not have expected the oncoming vehicle to be traveling at such a high speed.
47	E 8th Street/Una Avenue, Tempe. Darkness. TEMPE P.D.	The Motorist Was Overtaking The Bicyclist: Motorist Overtaking— Misjudged Passing Space.	Motorist eastbound in the 1500 block of E 8th Street collided with bicyclist traveling eastbound in the marked bike lane in the 1500 block of E 8th Street. Motorist fled the scene without providing information or assistance. Bicyclist was pronounced dead at the scene as a result of the injuries sustained in the collision. Diagram of crash scene suggests that hit and run motorist may have drifted into bike lane.	N/A	N/A
48	(Northwest) Grand Avenue/(West) 81st Avenue, Peoria. Darkness. PEORIA P.D.	The Bicyclist Turned Or Merged Into The Path Of The Motorist: Bicyclist Left Turn In Front Of Traffic.	Bicyclist was traveling northwest on Grand Avenue next to the east curb approaching 81st Avenue. Motorist was traveling northwest on Grand Avenue in the inside lane on approach to 81st Avenue. Bicyclist then moved left, across the northwest bound lanes of traffic and into the path of motorist, and was struck.	N/A	N/A

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
49	Eastbound I-10 Frontage Road/Tangerine Road, Marana. Darkness; no streetlight.	The Motorist Was Overtaking The Bicyclist: Motorist Overtaking— Other.	<p>This one vehicle collision involved a bicycle and bicyclist on Eastbound I-10 Frontage Road nine-tenths of a mile north of Tangerine Road.</p> <p>The bicyclist suffered fatal injuries; the bicycle sustained contact damage to the rear wheel, rear brake and rack that was attached to the rear, and seat. A lighted LED type reflector was found, operable (and turned on).</p> <p>The motor vehicle sustained contact damage to the front corner, the right front, the bottom right corner of the windshield, and right side of the hood.</p> <p>This portion of the Eastbound I-10 Frontage Road is a paved and striped (passing zone and fog lines on each side), east-west, two-way road. The traveled portion of the roadway is about 22 feet wide (each lane is about 11 feet wide) and is separated by dirt shoulders on each side. A chain link fence separates the north shoulder from the I-10 shoulder. The Central Arizona Project Canal borders the south shoulder. The roadway edge is not straight.</p>	N/A	Based on evidence gathered, investigation and facts obtained, the cause of this collision was the bicycle's presence in the middle of the lane of traffic in an unlighted area.

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
50	5900 N 3rd Avenue/Bethany Home Road, Glendale. Daylight. GLENDALE P.D.	The Bicyclist Failed To Yield To The Motorist At An Intersection: Ride Out At Intersection— Other.	Bicyclist, traveling north at 5900 N 3rd Avenue, attempted to cross W Bethany Home Road in the west crosswalk without stopping for a red traffic signal that regulated north and southbound traffic. The motorist was stopped facing east in lane 1 of 6300 W Bethany Home Road for a red traffic signal, but received a green traffic signal, placed the motor vehicle in first gear, and proceeded forward, not seeing, or anticipating, that the bicyclist was attempting to cross close by. Vehicle and bicycle collided in the crosswalk and the bicyclist sustained immediate fatal injury.	N/A	N/A
51	N 51st Avenue/Sunnyside Drive, Glendale. Darkness. GLENDALE P.D.	Specific Circumstances: Weird—Motorist Speeding: Hit & Run.	Bicyclist was in the roadway facing west when struck by motorist, southbound in the 11600 block of N 51st Avenue	N/A	Exceeded lawful speed. Fatal hit and run.
52	I-40B, Flagstaff. Daylight. FLAGSTAFF P.D.	The Bicyclist Turned Or Merged Into The Path Of The Motorist: Bicyclist Left Turn In Front Of Traffic.	N/A	N/A	Bicyclist traveling southwest on I-40B; attempted a sudden lane change across the Country Club off ramp, and was struck by motorist who was coming off the overpass and preparing to merge with traffic on I-40B.

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
53	99th Avenue/Camelback Road, Glendale. Daylight. MARICOPA COUNTY SHERIFF'S OFFICE.	Specific Circumstances: Weird—Motorist Traveling At High Rate Of Speed; Suspected DUI.	N/A	<p>Witness: Noticed a motorist driving southbound on 99th Avenue at about 75 MPH. Witness pulled up to 99th Avenue and looked to the right, noticed the motorist's vehicle skidding, and apparently, striking a bird. Witness then noticed legs flying in the air and assumed it was a pedestrian.</p> <p>Witness: Was Northbound on 99th Avenue from Camelback Road. Saw bicyclist lying in the street. Said that motorist explained that [motorist] was southbound, and that bicyclist was crossing the street. Motorist said that bicyclist turned suddenly, and that [motorist] didn't have time to brake before hitting bicyclist.</p>	<p>Motorist traveling southbound on 99th Avenue at minimum speed of 72 MPH and maximum speed of 78 MPH. Collided with bicyclist who was crossing 99th Avenue eastbound. Motorist arrested for suspected DUI. Case to be submitted to Maricopa County Attorney's Office for 13-1103-A.1 Manslaughter.</p>
54	Grand Avenue/Greenway Road, El Mirage. Daylight. EL MIRAGE P.D.	The Bicyclist Failed To Yield To The Motorist At An Intersection: Ride Out At Intersection— Other.	Motorist southeast bound on U.S. 60 [also known as Grand Avenue, diagonally oriented northwest/southeast] from Greenway Road when bicyclist proceeded out onto U.S. 60, failing to yield to oncoming traffic. The bicyclist was then struck by a motorist, who was in the right of way for traffic on U.S. 60 southeast bound.	<p>Investigator's statement: Based on my investigation, I made the following conclusions. A bicyclist was traveling northbound across Grand Avenue at the Coury's exit. A motorist was traveling eastbound on U.S. 60 at a minimum speed of 34 MPH [posted limit: 45MPH]. Motorist struck bicyclist, pushing the bicycle and rider east of the collision point into the depressed median, also east of the collision point. Impact occurred on the left side of the motorist's vehicle. The victim was, according to test results, well above the legal limit set by State law for being under the influence.</p>	<p>Investigator's statement: Based on my investigation, I made the following conclusions. A bicyclist was traveling northbound across Grand Avenue at the Coury's exit. A motorist was traveling eastbound on U.S. 60 at a minimum speed of 34 MPH [posted limit: 45MPH]. Motorist struck bicyclist, pushing the bicycle and rider east of the collision point into the depressed median, also east of the collision point. Impact occurred on the left side of the motorist's vehicle. The victim was, according to test results, well above the legal limit set by State law for being under the influence.</p>

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
55	I-10 Westbound/M.P. 233, Tucson. Dusk. ARIZONA DEPARTMENT OF PUBLIC SAFETY.	Specific Circumstances: Weird—Hit & Run; Unknown.	The bicyclist, located in westbound I-10 traffic lanes near M.P. 233, sustained fatal injuries; the body was struck by multiple vehicles and was almost unrecognizable as a human body. Posted speed limit: 75 MPH.	Witnesses were westbound on I-10 at M.P. 233 in the left lane when they observed a commercial vehicle in the right lane, possibly green in color, with an unknown trailer, hit a large object. Witnesses did not see the collision but knew the truck hit something because they saw the truck bounce over the object. They then saw sparks from underneath the truck, from their position about one half mile behind. The center of the impact was apparently at the front driver's side. The witnesses assumed the truck had hit a cow, and that the sparks were from the exhaust. They saw a bike wheel on the right side of the road and observed the commercial vehicle take the next off-ramp (M.P. 232).	The investigation showed that a vehicle struck the bicyclist at this location [I-10 westbound, near M.P. 233]. There was no evidence on the roadway to determine exact impact point, other than the area between the dirt median road edge and the right side emergency shoulder.

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
56	Apache Trail/Crismon Road, Mesa. Darkness; streetlights functioning. MARICOPA COUNTY SHERIFF'S OFFICE.	The Motorist Was Overtaking The Bicyclist: Motorist Overtaking— Other.	Bicyclist eastbound on Apache Trail about 200 feet west of Crismon Road. Bicyclist was riding adjacent to the south fog line (unknown which side of the line) when an eastbound vehicle struck bicyclist from behind. The vehicle then fled the scene without stopping to render assistance or notify police of the collision. The bike was equipped with amber reflectors on the pedals and a rear facing red reflector on the seat post. There was a rear facing flashing red light on the seat post that was in the on position. The bike had a white reflector on the front handlebars but did not have any type of forward facing light. The outside edges of the curb lanes on Apache Trail are marked with solid, white, painted fog lines. There was a dirt shoulder adjacent to the south side of roadway at the location of collision. The posted speed limit is 50 MPH.	Witness was walking westbound on Apache Trail on the north shoulder just west of where collision occurred. Witness heard a crash and looked in the direction of where the crash occurred. Witness noticed a large cloud of dust on the south dirt shoulder. Noticed a possible truck with a white utility box mounted on the back, driving eastbound from collision point. Noticed the truck turn right onto Crismon or might have pulled into the Quick Mart on the southwest corner. There is no description of the driver.	The bike was equipped with proper reflectors and a red flashing warning light, which was visible from the rear of the bike. The warning light was on and working. Insufficient evidence was gathered from the scene to determine minimum speeds for bicycle or hit and run vehicle.
57	W Ray Road/California Road, Chandler. Darkness; streetlights functioning. CHANDLER P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Residential Driveway.	N/A	Witness was a pedestrian in the alley that the bicyclist had exited from onto Ray Road. Stated bicyclist had ridden southbound past witness and into the roadway. Said that nothing seemed unusual about bicyclist's behavior before collision. Suggested that motorist was speeding but did not provide a speed estimate. Witness traveling in a vehicle about ten feet behind the motorist: Thought the bicyclist had sufficient time to cross street, and then began to fear a collision as they neared the bicyclist. The witness estimated the motorist's speed was 40 MPH when collision occurred.	Motorist westbound in number one lane of W Ray Road, approaching the California Street intersection. Southbound bicyclist exited an alley and entered the westbound lanes of Ray Road, and was struck by westbound motorist. Evaluation of scene evidence as well as witness and driver statements place vehicle traveling at a speed between 40 and 47 MPH in a posted 40 MPH zone. There is no evidence that these speeds are unreasonable and imprudent given the road conditions when collision occurred.

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
58	Apache Trail/114th Street, Apache Junction. Darkness; no streetlights. MARICOPA COUNTY SHERIFF'S OFFICE.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	Bicyclist traveling southbound, crossing the westbound lanes of Apache Trail. Failed to yield the right of way to a westbound motorist, who struck bicyclist on the left side. No evidence found that bicycle was equipped with light on the front or a reflector on the rear before collision.	Witness, a front seat passenger in motorist's vehicle. Said motorist was driving at about 50 MPH in the westbound number one lane. Saw a bicyclist ahead, crossing westbound lanes from right to left. Witness then knew they were going to hit bicyclist.	There is not enough physical evidence to reconstruct this collision.

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
59	N Swan Drive/E Tremaine Avenue. Daylight. GILBERT P.D.	Specific Circumstances: Play Vehicle; Motorist Suspected Of DUI; Hauling Unsafe Trailer.		<p>Motorist: A child was bicycling on the sidewalk. I saw child and proceeded with caution. The child veered off the sidewalk into the road. I swerved to miss the child but struck child with my trailer. I stopped just before the Stop sign.</p> <p>Witness (passenger in motorist's vehicle): Small child was bicycling northbound on west sidewalk. We were passing him; child slowly started into the street while looking toward the park. I saw the child wasn't paying attention and told my friend that the child wasn't looking. My friend swerved ... the child was at my passenger side window and still not looking. Despite my friend's efforts, the trailer struck the child. My friend's speed was no more than 15-20 MPH, since we were approaching a Stop sign.</p> <p>Witness: Noticed child bicycling south on the west sidewalk of Swan. Said that front tire slipped off the sidewalk, and that child attempted to correct; however, the front tire of bicycle collided with what witness thought was trailer of the truck southbound on Swan. Witness stated that truck's speed was under the limit.</p> <p>Witness: Appeared that child was attempting to 'beat the car', so he jumped off sidewalk and began to cross the road. Child could not beat the car and hit the passenger side of the trailer. Child had looked back at the truck over left shoulder and was pedaling very fast.</p>	<p>Trailer was being used in unsafe condition. It appears the condition of the trailer did not contribute to the accident based on my [p]olice investigator's] observations alone.</p> <p>Motorist was DUI, according to another police investigator.</p>

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
60	Cedar Avenue/ Gemini Drive, Flagstaff. Daylight. FLAGSTAFF P.D.	Specific Circumstances: Weird—Motorist DUI; Driving On Suspended License; Hit & Run.	N/A	Witness: Westbound on Cedar when a primer gray older model pickup struck bicyclist and then continued. Stated that truck passed [witness] in the left lane and then changed lanes in between two cars. Motorist moved too far right while changing lanes. Witness saw debris from bicyclist and the truck just continued westbound on Cedar. Witness: Westbound on Cedar; motorist's pickup came off the on ramp from West Street onto Cedar; truck passed witness at a speed of at least 45-50 MPH. Witness saw truck strike something and thought it was an orange cone but on closer observation realized that a person had been hit.	Motorist arrested at a second collision. Charged with leaving the scene of a fatal collision [with bicyclist], aggravated DUI, aggravated assault. Motorist's speed was excessive for conditions. Motorist driving on suspended license.
61	N 43rd Avenue/ W Orchid Lane, Phoenix. Darkness; streetlights functioning. PHOENIX P.D.	Specific Circumstances: Weird—Wrong Way Bicyclist; Motorist Speeding.	Motorist southbound on N 43rd Avenue at high rate of speed. At approximately 8500 N 43rd Avenue motorist collided with bicyclist, who was traveling northbound in the southbound lanes.	N/A	Motorist exceeded lawful speed; bicyclist rode in opposing traffic lane.
62	SR 260/MP 208, Cottonwood. Darkness; no streetlights. ARIZONA DEPARTMENT OF PUBLIC SAFETY.	Specific Circumstances: Weird—Bicyclist Knowingly Operated With Faulty Or Missing Equipment.	Bicyclist struck from behind by motorist on unlit street. Bicyclist had no lights, reflectors, reflective clothing, or other warning devices on bicycle.	Motorist: Saw bicyclist immediately before striking bicycle from rear—too soon to brake. Bicycle just seemed to appear. Motorist did not see any lights or reflectors on bicycle.	Based on observations of the scene, the vehicles, and marks on the roadway it was determined that both vehicles were eastbound. Bicyclist was traveling about four feet to the north of the south curb line in the number two lane, normally a legal riding position for a bicycle. Motorist legally within the number two traffic lane. The area is not lit at night.
63	Greenway Road/56th Avenue, Glendale. Darkness; streetlight functioning. GLENDALE P.D.	Specific Circumstances: Play Vehicle.	Tricyclist westbound along south edge of roadway in the 5500 block of W Greenway Road when it turned toward the center of the roadway. Tricyclist was then struck by motorist, who was traveling in outside (#2), eastbound lane.	N/A	N/A

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
64	4th Street/Patagonia Street, Benson. Dusk; no streetlights. BENSON P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Midblock.	N/A	<p>Witness: Saw vehicle traveling westbound on 4th Street, and heard brakes. Saw motorist strike bicyclist who was northbound across 4th Street; believed that impact occurred near the front, on driver's side.</p> <p>Witness: Heard brakes and saw station wagon westbound going sideways. Saw northbound bicyclist crossing 4th Street collide with vehicle.</p> <p>Witness: Heard brakes and saw westbound station wagon slide sideways and hit bicyclist crossing 4th Street northbound.</p> <p>Motorist: Westbound at about 30 MPH; had difficulty seeing due to sunset. Heard a 'thud' and saw bicycle flying in the air over the vehicle's hood. Had not seen bicyclist due to sun glare, but thought bicyclist was traveling northbound across the street.</p>	<p>Bicyclist was not in a designated crosswalk while riding [northbound] across 4th Street, where bicyclist was struck by motor vehicle in #1 westbound lane.</p> <p>The accident resulted from bicyclist's failure to yield to oncoming traffic.</p>
65	51st Avenue/Midway Avenue, Glendale. Daylight. GLENDALE P.D.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Residential Driveway.	Bicyclist eastbound through an alley on west side of 7100 N 51st Avenue. Bicyclist failed to yield to traffic on 51st Avenue, and collided with a tractor/trailer southbound in lane 2 of 7100 N 51st Avenue with the right of way.	N/A	N/A

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
66	E Mesquite Street/S Val Vista Drive, Gilbert. Daylight. GILBERT P.D.	Specific Circumstances: Weird—Motorist DUI; Hit & Run.	Bicyclist northbound in bike lane on Val Vista Road, just north of Mesquite Street. Motorist driving traffic utility truck in curb lane struck bicyclist with side mirror, causing bicyclist to lose control.	<p>Witness: While northbound on Val Vista, I saw a southbound flat bed truck hit the curb, look in his mirror North of Mesquite, I saw a bicyclist in the gutter, when I got to Palo Verde I made a U-turn and drove to Warner. I blocked [the hit and run motorist] and asked 'Did you hit the guy on the bike?' He said 'I think he hit me'. I told him I had all the info from his truck. Then he said he was going back to the scene.</p> <p>Witness: Noticed the [traffic utility truck] swerving onto the side . . . a few yards down, noticed he swerved again. Drove up beside him to see if he looked tired, etc. Noticed his eyes were almost closed, and honked. Kept following beside him and was getting ready to call non-emergency when he passed and hit bicyclist. Motorist kept going. Called 911; kept following truck to get license plate.</p> <p>Motorist: While southbound on Val Vista I noticed the bicyclist swerving left to right while riding. I tried to avoid hitting him but he swerved too much to the left and was struck by my right side mirror.</p>	Hit and run motorist tested positive for DUI (cocaine). Arrested for: 1 count Manslaughter and 1 count Leaving the Scene of a Fatal Collision.
67	Golconda/S Fifth Street, Kingman. Daylight. KINGMAN P.D.	The Bicyclist Failed To Yield To The Motorist At An Intersection: Ride Out At Stop Sign.	Bicyclist northbound on S Fifth Street; ran Stop sign and collided with motorist.	<p>Witness: Bicyclist ran the Stop sign at the bottom of the hill and then hit the side of vehicle.</p> <p>Motorist: Eastbound on Golconda when [motorist] felt something hit vehicle. Motorist turned around and saw bicyclist on ground next to bicycle.</p>	Bicyclist ran Stop sign and collided with motorist in the vehicle's passenger side.

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
68	S.R. 95/Airport Drive, Parker. Daylight. ARIZONA DEPARTMENT OF PUBLIC SAFETY.	The Bicyclist Failed To Yield To The Motorist At A Midblock Location: Ride Out At Commercial Driveway.	Collision between bicycle and two motor vehicles. S.R. 95 is a north/south highway with two lanes of travel merging into one single northbound lane. From the south, there is one lane of travel along with a left turn bay. Airport Drive accesses State Route 95 from the east side with Headgate Road accessing State Route 95 from the western side of State Route 95. The entire roadway was clear of obvious defects prior to the collision and the roadway was dry. The roadway surface is constructed of asphalt. There is desert terrain on the east and west sides of the highway.	<p>Motorist #1: Traveling east; noticed bicycle exiting shopping center. Thought bicyclist would stop or turn right. Motorist moved left to avoid bicycle and went across oncoming traffic after hitting bicyclist.</p> <p>Motorist #2: Traveling southbound; saw bicycle on the left and a truck coming the other way. Stated that bicycle ran right out in front of truck [i.e., motorist #1]; the truck turned in front of [motorist #2] to avoid the bicycle. The truck hit the bicycle and [motorist #2] hit the truck as it crossed in front of [motorist #2].</p> <p>Witness #1: Southbound on S.R. 95 following [motorist #2]; saw bicycle come out from the Airport Road going full speed for a bike. Stated the truck [motorist #1] started to swerve but it was too late. Bicyclist hit the front right corner of the truck and flew up and hit the windshield. Truck continued off the left side of the highway and barely glanced off [motorist #2's] vehicle.</p> <p>Witness #2: Saw bicyclist coming off Airport Road, westbound. Bicyclist pulled out on the highway to cross the street. Truck was turning right from Airport Road onto the highway. As truck was turning, bicyclist tried to cross the street without stopping. Truck saw bicycle and swerved to avoid the bike hitting [truck]. Witness later stated it didn't look like the bicyclist attempted to slow down before trying to cross S.R. 95. Witness could not recall, with certainty, whether truck was turning right onto S.R. 95 or whether truck had been northbound on S.R. 95. Witness did recall seeing the truck swerve to avoid colliding with the bicycle.</p>	<p>Bicycle collided with truck [motorist #1] on northbound side of State Route 95. Bicycle struck truck on its right front side. The bicycle, and bicyclist, came to final rest on northbound side of S.R. 95 about 47 feet 8 inches north of where Airport Drive accesses S.R. 95. Motorist #1 entered into evasive action to the west and crossed over into the southbound lane of travel. Motorist #1 collided with the front portion of [motorist #2's] vehicle, in the southbound lane of travel, about 79.11 feet north of where Airport Drive accesses S.R. 95. Motorist #2 came to final rest at this location. Motorist #1 continued to travel to the west where the vehicle left the roadway. Motorist #1 entered into a side slide in the desert terrain and came to final rest about 116.6 feet north of the access area facing north east.</p> <p>Motorists #1 and #2 did not show any signs/symptoms of impairment. Alcohol analysis [blood specimen] of bicyclist indicated 0.186% level of ethyl alcohol.</p>

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
69	Calle Del Media and Vista Streets, Mohave Valley. Darkness; no streetlights. MOHAVE COUNTY SHERIFF'S OFFICE.	The Motorist Was Overtaking The Bicyclist: Motorist Overtaking—Other.	N/A	N/A	The bicyclist appeared to have been riding south on Calle Del Media near the east road edge. The motor vehicle appeared to have struck the bicycle from the front as it traveled north on Calle Del Media then fled the scene. There was no evidence of skidding or braking at the scene. I observed tire tracks that appeared to drift from the east road edge to the center of the roadway and through the resting point of the bicycle. The angle of the track appeared to be consistent with the motorist turning to avoid the bicyclist, but striking the bicyclist, and dragging bicycle and bicyclist. The track was faint and a tread pattern could not be distinguished. The outer tread marks were horizontal and were consistent with truck tires.
70	East 40th Street/Avenue 12E, Yuma. Darkness; no streetlights. YUMA COUNTY SHERIFF'S OFFICE.	Specific Circumstances: Weird—Bicyclist Knowingly Operated With Faulty Or Missing Equipment.	Motorist westbound on East 40th Street at about 35-40 MPH, according to witness. Bicyclist westbound on East 40th Street on the right pavement edge at an unknown speed.	Witness #1: Traveling westbound on East 40th Street from Foothills Boulevard at about 0545 hours. Witness noted how dark it was. Witness passing Avenue 12E, noticed a set of headlights that appeared to be coming straight at [witness] in [witness] lane of traffic. Noticed that a truck was stopped in the traffic lane. Saw a man moving from the passenger side of truck where it appeared that a bicycle was lying. Witness #2: Traveling on East 40th Street and noticed a damaged bicycle and a body lying on the north shoulder of the roadway just west of Avenue 12E. Witness positioned headlights to illuminate bicyclist's body and waited for help.	Bicyclist was apparently traveling westbound on East 40th Street on the right edge of the paved westbound lane of traffic. The only rearward reflective device on the bicycle is a small cloth reflective strip sewn onto a black pouch located below and to the rear of the bicycle seat. The pedal cyclist was wearing a reflective vest and had a small headlight device on the front of the bicycle. Due to the position of the pedal cyclist while riding the bicycle, the reflective vest may have not been fully visible to someone approaching from the rear. The pedal cyclist was wearing a protective helmet. Motorist had been traveling westbound on East 40th Street in the westbound lane of traffic. According to the motorist, did not see the bicyclist until striking bicyclist from the rear. Evidence shows that the right front portion of motor vehicle struck the rear of bicycle

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
71	McDowell Road/Alma School Road, Salt River Pima-Maricopa Indian Community. Daylight. N/A.	Specific Circumstances: Unknown.	N/A	N/A	Unknown what happened in the crash. Victim was a pedal cyclist involved in a motor vehicle collision.
72	Sahuarita Road (14300 E)/Davidson Road (16100 S), Tucson. Daylight. PIMA COUNTY SHERIFF'S DEPARTMENT.	The Motorist Was Overtaking The Bicyclist: Motorist Overtaking— Misjudged Passing Space.	N/A	N/A	Bicyclist with riding partner eastbound on Sahuarita Road east of Davidson Road. Motor vehicle also eastbound on Sahuarita Road behind and approaching bicyclist. Motorist attempts to move over to the centerline and avoid contact with bicyclist. Another semi truck was westbound on Sahuarita Road approaching. Bicyclist is contacted with right side of motor vehicle [approaching from behind] and goes out of control. Bicyclist falls to the ground in the path of motor vehicle's right rear tires

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
73	Williamson Valley Road, north of Dineh Drive, Prescott. Dawn. YAVAPAI COUNTY SHERIFF'S OFFICE.	Specific Circumstances: Weird—Icy Road.	N/A	<p>Witness: Southbound on Williamson Valley Road, north of the scene. Witness saw both the bicyclist and the small truck heading north on Williamson Valley Road. Bicyclist was riding in the traffic way, in the northbound lane, on the left side of the fog line. As the truck went by the bicyclist it appeared the bicyclist lost control of the bicycle and went down. Saw the right side of the trailer go up as if going over something. Witness does not recall whether truck moved to the left to go around the bicyclist as it was passing the bicycle.</p> <p>Passenger in vehicle that collided with bicyclist: Traveling north on Williamson Valley Road; saw bicyclist on the road also northbound. Motorist slowed down and moved to the right [sic] to pass the bicyclist. Saw bicyclist fall, and that the bicyclist was hit by the trailer they were pulling. Motorist had crossed the double yellow [centerline] in attempt to avoid bicyclist.</p>	<p>The weather conditions were cold, the light condition was that of dawn, and there were no apparent defects on the roadway. As I walked up to the scene I was having a hard time walking on the icy road.</p> <p>Motorist stated that [motorist] was northbound on Williamson Valley Road. Motorist saw rider traveling in the same direction in the same lane but off to the right side of the lane, and that [motorist] attempted to pass and that the next thing [motorist] knew was that [motorist] felt the trailer pull; motorist stopped truck. Saw man lying in the roadway.</p> <p>Williamson Valley Road is a paved two lane road with one lane for each direction of traffic. The road has a painted double yellow line and painted fog lines in the area of the collision.</p> <p>Williamson Valley Road is posted 35 MPH in that area; the road there is about 26' 5" wide and each lane is about 13' 3" wide. The road has a slight uphill grade for northbound traffic and curves slightly east in that area. The collision occurred in the northbound lane.</p> <p>The road revealed a red scuff mark from the bicycle tire, placing the bicycle about 3 feet left of the northbound fog line when it slid out. If bicyclist were pedaling moderately to hard, and the rear tire met with ice on the roadway it would slip, which could cause a severe disruption for the rider. This could ultimately lead to a loss of control, causing the bike to fall and the rider to fall off the bicycle. A witness statement indicated the truck was not speeding at the time of the crash ... [and] indicated the bicyclist began losing control and appeared to be weaving when the truck began to pass</p>

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
74	Giss Parkway/Pacific Avenue, Yuma. Dawn; no streetlight. YUMA COUNTY SHERIFF'S OFFICE.	Specific Circumstances: Weird—Motorist Hit & Run; Motorist Arrested for Assault With Deadly Weapon and Other Charges.	Giss Parkway is a two way striped centerline roadway. The collision occurred where Giss Parkway curves into County 8th Street. The direction of traffic at the point of collision is northwest and southeast. Giss Parkway is about 24 feet and three inches wide and the speed limit is 45 MPH. During the collision the sun was rising and there were partly cloudy skies.	N/A	Motorist stated that [motorist] felt something strike the passenger side of vehicle while traveling on Giss Parkway ... I asked if there was anything obscuring [motorist's] vision. Motorist stated that [motorist] had to raise hand once in a while to block the sun, but was able to see the vehicle ahead ... motorist stated speed was 40 MPH. Motorist booked into Yuma County Detention Center for: Failure to stop for a fatal collision; Failure to remain at the scene of a fatal collision; Aggravated assault with a deadly weapon; Criminal damage; Failure to stop at the scene of a collision; Failure to remain at the scene of a collision.
75	St Johns Road/Palomino Road, Laveen. Darkness; no streetlight. GILA RIVER P.D.	The Bicyclist Failed To Yield To The Motorist At An Intersection: Ride Out At Intersection—Other.	Victim was crossing the intersection on a bicycle when struck by a small four door sedan eastbound on St Johns Road. Bicyclist was wearing dark clothing and the area was poorly lit by street lights. Speed did not appear to be a factor in the collision.	Motorist's statement: At about 7:45 PM, was eastbound on St Johns Road. Dimmed my lights; from out of nowhere we see a bicyclist coming from the left lane so I swerved right to avoid bike, but bicyclist swerved right with us and I hit him.	Motorist eastbound on St Johns, approaching Palomino Road. Motorist stated that [motorist] dimmed headlights for vehicle that pulled up to the stop sign, and then saw the bicyclist southbound across St Johns. Motorist said [motorist] tried to avoid bicyclist by swerving to the right but bicyclist continued into [motorist's] lane and that front of vehicle struck bicyclist.

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
76	State Route 66/Milepost 59.3, Kingman. Daylight. ARIZONA DEPARTMENT OF PUBLIC SAFETY.	The Motorist Was Overtaking The Bicyclist: Motorist Overtaking— Other.	Motor home/bicycle collision with one fatality. The collision occurred on State Route 66, at milepost 59, at 1046 hours. The motor home left the scene of the collision.	<p>Witness #1: The motor home went onto the shoulder before hitting the bicyclist. The motor home momentarily pulled off the side of the road and then left the scene.</p> <p>Witness #2: Driving eastbound on S.R. 66; saw a bike tumbling off the side of the road. Originally thought that the bike fell off the motor home but then saw a body lying on the side of the road. Witness stopped and called 911, then noticed the motor home pull off the road and continue driving.</p>	<p>At crash scene, S.R. 66 is a paved asphalt highway that has two lanes of eastbound and two lanes of westbound traffic. The eastbound and westbound lanes are divided by a dirt median. There is a 4.7 feet wide paved shoulder that borders the depressed median and the eastbound, number one lane of travel. The paved shoulder and the number one lane of travel are separated by a painted, solid yellow line. The number one lane of eastbound travel is 12.3 feet wide. The two eastbound lanes are separated by a painted, broken white stripe that allows for passing. The number two lane of eastbound travel is 12.1 feet wide and is bordered by a paved shoulder. There is a painted solid white line that divides the number two lane of travel and the paved shoulder. The paved shoulder is about 10.1 feet wide and is bordered by a dirt shoulder. The road is level in this area. There were no visible defects in the roadway at the time of the collision. The posted speed limit is 55 MPH.</p> <p>Physical evidence at the scene of the collision indicated the motor home was eastbound in the number two lane when it collided with the bicyclist. The collision occurred in the number two lane near the white fog line. The right front side of the motor home collided with the rear of the bicycle.</p> <p>The area of impact was unknown. There was not enough evidence on scene to establish a known area of impact.</p> <p>The motor home and motorist were located two days later.</p>

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
77	Ruthrauff Road (4800 North)/Kain Avenue (2500 West), Tucson. Darkness: sirenlights on. PIMA COUNTY SHERIFF'S DEPARTMENT.	The Motorist Was Overtaking The Bicyclist: Motorist Overtaking— Other.	N/A	N/A	Bicyclist westbound on Ruthrauff Road, traveling in the bike lane. The bicyclist was struck from behind by an unknown vehicle. The suspect vehicle fled the scene. There is no suspect description.
78	Benson Highway (6200S)/4200 East, Tucson. Daylight. PIMA COUNTY SHERIFF'S DEPARTMENT.	The Operator[s] Were] On The Wrong Side Of The Street: Wrong Way Bicyclist[s].	A motorist was eastbound on Benson Highway. Motorist left the roadway and struck two bicyclists who were westbound on the eastbound side of the road. One bicyclist suffered a fatal injury. The other bicyclist suffered minor injuries. The motorist suffered minor injuries when striking a light pole and seatbelt failed.	N/A	N/A
79	Nogales Highway (11700 South)/Lumber Drive (1600 East), Tucson. Daylight. PIMA COUNTY SHERIFF'S DEPARTMENT.	The Bicyclist Turned Or Merged Into The Path Of The Motorist: Bicyclist Left Turn In Front Of Traffic.	Motorist southbound on Nogales Highway from Lumber Drive. Bicyclist northbound on Nogales Highway approaching Lumber Drive. The motorist, a passenger, and a witness northbound on Nogales Highway observed the bicyclist look over left shoulder and make a movement consistent with a U-turn. The bicyclist collided with the motorist. The bicyclist died on scene. No signs of impairment seen or detected on motorist.	N/A	N/A

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
80	U.S. 95/Milepost 26.9, Yuma. Darkness; no streetlight. ARIZONA DEPARTMENT OF PUBLIC SAFETY.	The Motorist Was Overtaking The Bicyclist: Motorist Overtaking— Other.	N/A	<p>Witness: Driving to work; noticed taillights of the vehicle in front come on and observed vehicle travel off the road to the right. Never saw the bicyclist until approaching crash scene. Motorist who struck the bicyclist left the scene and returned minutes later. Noticed no impairment of motorist, whose speed the witness estimated, was 55 MPH. Witness had seen the bicyclist on U.S. 95 numerous times and commented that the bicyclist wore no reflective clothing.</p> <p>Witness: Driving to work; observed bicyclist eastbound on U.S. 95. Motorist was in slow lane when [witness] observed flashing tail lamp of the bicycle and moved over to the left, almost into the high speed lane of travel, for safety reasons. Witness was concerned for the safety of the bicyclist because the witness is also a bike enthusiast and knows how dangerous U.S. 95 is at that time of the morning. Stated that the bicyclist was only wearing a white shirt and black shorts and only saw bicyclist while passing by, when headlamps were directly on bicycle. Witness kept eyes on bicycle after passing, using rear view mirror, and observed the vehicle behind strike the bicycle. Observed collision from about 50-75 meters and stated the bicyclist was riding on the white line. Motorist who struck bicyclist didn't appear sleepy or impaired in any way. Witness thought the flashing light sucked the motorist (who struck bicyclist) over like a magnet [emphasis added].</p>	<p>Motorist was eastbound on U.S. 95 at milepost 26.9 in the #2 lane. Bicyclist also eastbound at same location near the solid white line which separates the #2 lane from the emergency lane. The emergency lane is two feet in width at this location. The bicyclist was riding an 18 speed bicycle equipped with a (working) flashing rear L.E.D. light and a Cat Eye Opti Cube front headlamp. Bicyclist was not wearing any reflective clothing. Motorist failed to see bicyclist and struck bicyclist from behind</p>

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
81	Ajo Way (3800 S)/Randolph (3300 E), Tucson. Daylight. PIMA COUNTY SHERIFF'S DEPARTMENT.	The Motorist Failed To Yield To The Bicyclist: Drive Out At Intersection—Other.	Motorist westbound on Ajo approaching Randolph. Bicyclist stopped eastbound Ajo at Randolph to turn onto northbound Randolph. Motorist fails to yield and collides with bicyclist. No signs or symptoms of impairment on motorist. N/A	N/A	N/A
82	U.S. 60 Westbound/Milepost 147.7, Sun City. Darkness: streetlights on. ARIZONA DEPARTMENT OF PUBLIC SAFETY.	The Bicyclist Failed To Yield To The Motorist At An Intersection: Ride Out At Intersection—Other.	N/A	Witness: Stopped in left turn lane of southbound 103rd Avenue waiting for the light to turn green. Saw a bicyclist cross against the light. Saw bicyclist approach intersection heading north; bicyclist paused to look for oncoming eastbound traffic on Grand, then continued past median, never stopping for westbound traffic. Bicyclist was struck by car. Witness: Traveling southeast on Grand and saw a bicyclist lying in street and another person standing next to bicyclist trying to keep other vehicles from running over bicyclist. Witness positioned vehicle to protect bicyclist.	Motorist was traveling westbound at 45 MPH through the green traffic signal when bicyclist crossed in front of motorist traveling northbound through the red traffic light.
83	Harrison Road (9500 E)/Harrison Park Drive (3950 N), Tucson. Daylight. PIMA COUNTY SHERIFF'S DEPARTMENT.	The Motorist Was Overtaking The Bicyclist: Motorist Overtaking—Failed To Detect.	Bicyclist southbound on Harrison approaching Harrison Park. Motorist southbound on Harrison behind bicyclist. Motorist saw bicyclist, but was asked question by a passenger, and lost attention. Motorist collided with bicyclist. Motorist showed no signs or symptoms of impairment.	N/A	N/A

#	LOCATION/ CITY/TIME/ JURISDICTION	BICYCLE CRASH TYPE	CRASH SYNOPSIS	WITNESS STATEMENTS	OFFICIAL STATEMENTS
84	North Longmore Road/East Montecito Road, Scottsdale. Darkness, no streetlights. SALT RIVER POLICE DEPARTMENT.	The Motorist Was Overtaking The Bicyclist: Motorist Overtaking— Failed To Detect.	Motorist northbound when it struck a bicyclist, who was also northbound.	Witnesses: Southbound on Longmore Road when they came across a SUV stopped in the northbound portion of Longmore roadway. They observed a motorist exit the SUV, who yelled at them to call police because [the motorist] had just hit someone. They observed the female run over to the east side of the roadway and try to render aid to a person lying on the east side of the roadway, who appeared to have been hit by the SUV. Motorist: Reported feeling lightheaded after inhaling CO2 cartridges. N/A	Bicyclist northbound on Longmore Road when struck from behind by motorist. Motorist stated [motorist] was bending down at the waist while driving and inhaling 'Whip Its' (CO2 cartridges) for the purpose of becoming intoxicated prior to the collision and struck the victim. Officer Pineda advised me that there was an open box of CO2 cartridges sitting on the front passenger seat of the vehicle in plain view. Officer Pineda conducted a driver's license check on motorist, which revealed [motorist] to have no driver's license.
85	McKellips Road/Dobson Road, Scottsdale. Daylight. N/A.	Specific Circumstances: Unknown.	Unknown what happened in crash. Victim was a pedal cyclist struck by a motor vehicle.		Bicyclist's blood tested positive for cocaine.