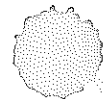


Amish Buggy Safety on Ohio's State Roadway System

Analysis and Action Plan

Ohio Department of Transportation



FINAL REPORT

September, 2000

Special recognition and acknowledgment is given to The Honorable Senator Anthony A. Latell, Ohio Senate, 32nd District and former ODOT Director Jerry Wray, who established the Amish Buggy Safety Study Committee and began this study in October, 1998.

The analysis and resulting report is the result of research, ideas, and other contributions by staff from the Ohio Department of Transportation (ODOT), Ohio Department of Public Safety (ODPS), local law enforcement agencies, the State Highway Patrol, hundreds of members from Ohio's Amish community, and other interested citizens from the many Northeast Ohio counties.

ODOT

Gordon Proctor, Director

ODOT Team Members

Steve Barbour, Central Office
Brian Bosch, District 5
Tom Culp, District 3
Mike Dotts, District 11
Suzann Gad, Central Office
Dave Griffith, District 4
Greg Gurney, District 11 (Project Chairperson)
Wendy Hitchcock, District 11
John Motl, District 12
Bryan Newell, Central Office
Dave Speer, District 11

Others

Chris Biler, Amish Schools
Robert Wakefield
Many Bishops from the Old Order Amish Church

This final report was prepared September, 2000, by the ODOT Office of Urban and Corridor Planning, 1980 West Broad Street, Columbus Ohio 43223 www.dot.state.oh.us/planning 614 466-2307

Contents

| | Page |
|--|-------------|
| <i>Executive Summary</i> | <i>i</i> |
| Section 1.0 Introduction | 1 |
| 1.1 Existing Condition Overview | 1 |
| 1.2 ODOT Amish Buggy Committee | 1 |
| 1.3 Content of this Report | 2 |
| Section 2.0 Analysis | 3 |
| 2.1 Assumptions | 3 |
| 2.2 Findings | 3 |
| 2.3 Location of Accidents | 4 |
| 2.4 Analysis | 4 |
| Section 3.0 Affected Groups and Public Involvement | 6 |
| 3.1 Affected Groups | 6 |
| 3.2 Public Meetings | 7 |
| 3.3 Public Opinion Survey and Results | 9 |
| Section 4.0 Current Projects | 13 |
| 4.1 District 12 | 13 |
| 4.2 District 11 | 13 |
| 4.3 District 3 | 13 |
| 4.4 District 11 - Projects currently being done or discussed | 13 |
| 4.5 District 4 - Proposed projects | 13 |
| 4.6 Ohio State Extension Service and ODPS | 14 |
| Section 5.0 Alternatives | 15 |
| 5.1 Alternative Solutions | 15 |
| 5.1.1 Roadway Improvements | 15 |
| 5.1.2 Types of Treatments | 16 |
| 5.1.3 Roadway Changes | 17 |
| 5.1.4 Buggy Improvements | 17 |
| 5.1.5 Bus Service for the Amish | 17 |
| 5.1.6 Education and Enforcement Programs | 18 |
| 5.2 Priority Roadways | 18 |
| 5.2.1 State Roadways to consider for Possible Improvements | 18 |
| 5.2.1 Roadway Prioritization Criteria | 19 |
| 5.3 Estimated Costs | 19 |
| 5.4 Evaluation of Alternatives | 19 |
| Section 6.0 Proposed Action Plan | 20 |

| | | |
|-----|----------------------------|----|
| 6.1 | Proposed Strategy | 20 |
| 6.2 | Funding Alternatives | 21 |
| 6.3 | Timetable | 21 |

Appendices

| | |
|-------------------------|---|
| <i>Appendix A</i> | <i>Accident Maps Reports Charts, and Tables</i> |
| <i>Appendix B</i> | <i>Survey Questionnaire and Responses</i> |
| <i>Appendix C</i> | <i>Relevant Legal Requirements</i> |
| <i>Appendix D</i> | <i>Asphalt Mix Specifications</i> |
| <i>Appendix E</i> | <i>Construction Cost Estimates</i> |
| <i>Appendix F</i> | <i>Buggy Safety Educational Materials</i> |
| <i>Appendix G</i> | <i>Roadway Prioritization Maps from Surveys</i> |
| <i>Appendix H</i> | <i>Information on the Amish Life Style</i> |

EXECUTIVE SUMMARY

Amish Buggy Safety on Ohio's State Roadway System

Overview

Ohio has the largest Amish population in the world. It is estimated that over 50,000 Amish live in Ohio. Most live in the Northeastern portion of the state. The Old Order Amish, who include over 35,000 of the Amish population, do not drive cars or motorized farm equipment.

This ODOT report analyzes the potential safety issues that occur when horse drawn vehicles, moving at approximately 5-8 mph, share Ohio's roadways with motor vehicles traveling at speeds up to 55 mph. This report also recommends the best methods to address the physical and roadway safety problems through improvements to roadway design and maintenance. ODOT worked with ODPS during this 18 month study. The companion ODPS report presents recommendations for the best methods to address safety through education and enforcement.

Findings

- From 1990 - 97 over 500 buggy/motor vehicle crashes occurred on the state system
 - Approximately 63 / year
 - 1% Fatalities
 - 51 % Injuries
 - 48 % Property Damage
- Crashes occurred primarily
 - 56% During daylight
 - 50% on straight roadways
 - 61% at intersections
 - 42% rear end crashes
 - 81% under no adverse weather conditions
- Typical cause (61%) is listed as "following too close"
- Distribution, please see Appendix A map

Improvement Options Considered

- Additional warning signs
- Shoulder widening / alternative treatments or materials
- Hill climbing lanes
- Buggy pull-offs
- Buggy improvements
- Roadway geometric improvements / vertical and horizontal
- Separate Buggy trails
- Roadway maintenance changes

Public Involvement / Public Opinion Survey

- Over 800 Amish and “English or non Amish” attended three public involvement meetings to discuss this issue and identify realistic solutions.
- Over 1250 public opinion surveys were completed and returned with comments and recommendations concerning desired solutions, improvements, and prioritizing locations that are the most critical to address.
- This information helped shaped the recommendations in the report.

Report Recommendations

- Widen shoulders to 6 to 8 feet on state roadways heavily traveled by horse drawn vehicles (Primarily ODOT Districts 3, 4, 11, 12)
 - Estimated per mile cost is \$ 150,000 to \$1.2 million /mile depending on right-of-way owned, drainage conditions, adjacent land slope, etc. (see Appendix E)
 - Use heavy duty asphalt mix as specific in Appendix D to report
- Plow shoulders during snow removal
- Cut vegetation to improve sight distance for drivers of horse drawn vehicles who sit further back than motor vehicle drivers.
- Re-evaluate signage based on perspective of horse drawn buggy drivers
- Consider changing speed limits by conducting new speed zone studies which include “slow moving vehicle” factors
- Re-evaluate vertical and horizontal geometries on state roadways heavily traveled by horse drawn vehicles

Funding Recommendations and Next Steps

- ODOT Funds Management is establishing a \$1 million / year special fund to address the findings and recommendations of this report.
- Amish Buggy Safety Committee will meet to finalize selection criteria to prioritize state roadways for improvements based on this report, findings from public opinion surveys and available funding.

NOTE:

- An additional benefit from implementing recommendations in this report is that slow moving motorized farm vehicle can use the improvements which will make the roadways safer for them.
- Typically, the number and types of crashes at a specific location would not receive high priority, under the selection criteria outlined in the Highway Safety Policy, for a project to qualify for ODOT safety funding. The potential costs for making the needed improvements would be overly burdensome to District’s budgets.

Amish Buggy Safety on Ohio's State Roadway System Analysis and Action Plan

Section 1.0 Introduction

Many different groups share Ohio's roadways. This report looks at potential safety issues that arise when a horse drawn buggy, traveling at a slow speed (5 to 8 miles per hour), shares the road with motor vehicles traveling at comparatively high speeds (up to 55 miles per hour). This report also identifies potential construction and educational improvements that could improve the safety of Ohio's roadways.

The analysis conducted for this report and the solutions recommended focus on Ohio's state roadway system. The Ohio Department of Transportation's (ODOT) primary responsibility and available funding is dedicated to the state roadway system. It is recognized that similar safety concerns may exist on local and township roadways. Unfortunately, the data for these roadways has some gaps in it which may skew the analysis and is not included in this report. Preliminary review of crash data on the local roadway system appears to demonstrate similar patterns to the findings on the state system. It may, therefore, be possible that the recommendations from this report could also apply to the local roadway systems.

1. Existing Condition Overview

Over 575 crashes involving horse drawn buggies and motor vehicles occurred on Ohio roadways in the past 9 years. Of this approximately 64 crashes per year, approximately 1.0%, resulted in human fatalities; 51% resulted in injuries; and 48% resulted in property damage only. In most crashes, the victims were members of Ohio's Amish communities.

A detailed data analysis concerning this situation is presented in Section 2 of this report. Data for the analysis was taken from the Ohio Highway Patrol crash reports involving horse drawn buggies and motor vehicles. This data analysis identifies trends and patterns in the crashes, as well as areas with the highest number of crashes.

1.2 ODOT Amish Buggy Committee

ODOT recognizes crashes involving motor vehicles and Amish Buggies as a very serious issue. To begin to address this issue, in October 1998, the Ohio Department of Transportation (ODOT) established an Amish Buggy Safety Committee. The Committee, organized in response to concerns raised by The Hon. Senator Latell, Ohio State Senate District 32, was originally composed of ODOT staff from affected Districts and Central Office. The committee's purpose was to better understand the situation on the state roadway system, identify and recommend improvements to the roadway to address the situation, and to insure a smooth and timely implementation of solutions.

While developing this report, ODOT discovered that Ohio Department of Public Safety (ODPS) was about to begin an initiative to work with local law enforcement agencies and the Amish community on issues involving buggy safety. After initial discussions ODOT and ODPS determined the public would best be served if the two agencies worked together to address the issues and needs. Public involvement activities and efforts to develop and implement recommendations therefore proceeded jointly. This partnership provided a broader base for ideas and improved public involvement with the Amish community.

The Committee's mission was to:

Analyze the existing conditions and work with the Amish communities, local officials and law enforcement agencies to find safe, cost effective recommendations that would create a transportation environment in which horse drawn buggies and motor vehicles can better share Ohio's State roadways.

To accomplish the mission the Committee:

- Worked with local law enforcement officials and the Ohio Department of Public Safety (ODPS) to conduct community/public meetings and data analysis to define and understand the existing conditions;
- Identified programs and projects that address the situation;
- Estimated the costs for recommended alternatives; and,
- Recommended a strategy for funding the program and a timetable to implement the strategy.

1.3 Content of this Report

This report includes an analysis and a proposed action plan. It:

- presents an analysis of the situation created when horse drawn and motorized vehicles share the road;
- identifies the locations within Ohio where horse drawn buggies are prominent and where transportation safety issues are a concern;
- presents the results of a survey of over 1,000 Amish residents of Ohio;
- describes ODOT's current projects and actions to address this situation;
- identifies and evaluates alternative solutions to improve safety for all roadway users; and,
- presents an action plan / strategy that:
 - recommends a program and projects to address the situation;
 - estimates the cost for various improvements;
 - identifies funding alternatives; and ,
 - recommends a timetable for addressing the situation.

Section 2.0 Analysis

Before recommending solutions, the Committee conducted an analysis to better understand why and where crashes involving horse drawn buggies and motor vehicles were occurring. Data on the state roadway system was gathered from the Ohio Highway Patrol and the ODOT Office of Traffic Engineering.

Analysis of this existing data focused on identifying trends and patterns that explained why crashes are occurring. This included: type of crashes; under what conditions, locations of crashes; times of crashes; the geometrics of the road, and design factor which may contribute to the crashes.

Section 2.2 presents the results of the analysis. Detailed results can be found in chart form in Appendix A at the back of this report. Section 2.3 of this report and the crash location map, in Appendix A, identify the crash locations in more detail.

2.1 Assumptions

The committee first hypothesized that the primary factor in the crashes was visibility. Visibility issues include: buggies going over hills and "disappearing" from sight; darkness; bad weather; or issues involving intersections and sight distance. The committee initially felt the problem was that drivers were not "seeing" the buggies until they were right on top of them and then they are unable to avoid hitting them. A review of the data revealed that the assumed lack of visibility as the primary factor in the crashes may have been overstated. While visibility is a factor, a combination of speed differential and motor vehicle drivers' misjudging the paths and turning movements of the horse drawn buggies seem to be more of the primary cause than visibility. The committee realized that a far more typical reason for crashes was the motor vehicle drivers inaccurately estimating the speed of the horse drawn buggies and how long it would take their vehicle to overtake or come up behind the buggy.

2.2 Findings (please see Appendix A for maps, charts and figures)

- Over the last nine years 575 crashes have occurred on the state highway system involving horse drawn buggies and motor vehicles. This averages approximately 64 crashes per year. Figure 1 presents a chart showing the number of crashes by year for the study years of 1990 through 1997.
- Of the crashes involving horse drawn buggies and motor vehicles, approximately 1.0% resulted in human fatalities; 51% resulted in injuries; and 48% resulted in property damage only.

This compares to motor vehicle crashes for the state which have a 0.7% fatality rate; a 32% injury rate; and a 68% property damage rate. [source: Crash Data from the Ohio Highway Patrol]

- A majority of the crashes, 56%, happened during daylight hours [Figs. 4, 5].

- Approximately 50% of crashes happened on straight, level roadways (290 out of 577), [Fig. 6].
- Approximately 81% of all crashes happened under “no adverse [weather] conditions.” and dry pavement conditions, [Figs. 7, 8].
- Approximately 61% happened at non intersection locations, [Fig. 9]
- Approximately two-thirds of the crashes involve vehicles going in a straight direction, with “following to close” as the reason for the crash most often given, [Figs. 11, 12].
- The most common crash type were rear end crashes at 42%, [Fig. 13]

2.3 Location of Crashes

The majority of horse drawn buggy and motor vehicle crashes have occurred in the northeast region of Ohio. This area includes ODOT Districts 3, 4, 11, & 12, (ODOT District map, Appendix A) and contains the highest concentration of Ohio’s Amish population. However, all Districts have experienced some crashes involving horse drawn buggies in the last eight years.

- Based on the nine years of data (1990 - 1998) available, Districts 3 and 11 combined were the locations for 54 % of all buggy crashes. Districts 12 and 4 combined were the sites for 29% of the crashes. The remaining 17 % were spread across Districts 1, 2, 5, 6, 7, 8, 9, and 10. [Fig. 10]
- Percentage by District - Eleven 28%, Three 26%, Twelve 18%, Four 11% ,Five 6% of the crashes. All other Districts are between .35% and 2.5%, [Fig. 10].
- Preliminary density analysis has shown that SR 87 in Geauga County over the period from 1990 - 97 has had more crashes per mile, 7:1, (21 crashes over 3 miles), than any other road in the state. When added to Trumbull SR 87 the ratio only drops to 6:1. Other smaller roadway sections in Holmes, Wayne, Ashland and Tuscarawas Counties had crash rates from 3:1 to 5:1. These sections are mapped by year using GIS format to determine the sections that are becoming increasingly worse. [See crash map, Appendix A]

2.4 Analysis

In attempting to conduct an analysis of these findings, one missing piece of data was “buggy counts” (“Buggy count” would include the number of buggies traveling on each roadway by time of day.) The committee considered trying to get buggy counts, including time of day, number and location of heavily traveled roadways, but this was deemed beyond the scope of the committee. The best guess for the counts came from the replies to question 4 on the Public Opinion Survey on Amish Buggy Safety (see Appendix B) conducted in conjunction with this study. Responses

indicated that the most frequent time for travel (693 of the 1256 responses) was between 7 a.m. and noon and the second most frequent time (392 responses) was from 3 p.m. to dusk. Fewer than 22 responses indicated that they traveled predominately between dusk and 4 a.m., and less than 78 responses indicated it was their second most common time to travel.

These survey results indicate that while approximately half the crashes are occurring after dusk, this is a much higher proportion of crashes to buggies on the roadways at this time. That is there is a greater chance of a buggy crash occurring after dusk than during the day.

Analysis of the Ohio Highway Patrol crash reports and anecdotal examples provided by the community and ODOT districts, identified three typical causes and several reasons for those causes. The primary cause found for the crashes appears to be the speed differential between horse drawn buggies and motor vehicles.

The three most typical causes:

- 1 Motor vehicle drivers underestimating speed differential by drivers/operators;
- 2 Lack of visibility of the horse and buggy between dusk and dawn or because of the rolling terrain; and
- 3 Vehicle actions by both buggies and motor vehicles (i.e. not signaling, sudden unexpected stops, etc.)

Examples of these causes include:

- when buggies go over the crest of a hill they are not visible to a car coming up behind them at a faster speed;
- a long "queue" line builds up behind a buggy when it is going up hill because the horse slows down, motor vehicles get impatient and pass without good visibility;
- lack of visibility of the buggy during the evening, before dawn or in the dark;
- narrow shoulders requiring buggies to use the roadways (horse and buggies are approximately six feet wide);
- motor vehicles overestimating the speed of horse drawn buggies;
- failure of drivers to give existing buggy signing due regard;
- preference by the Amish to use the roadways to avoid the need to merge back into traffic if shoulders are widened but bridges are not.

Section 3.0 Affected Groups and Public Involvement

Shared roadway usage involving motor vehicles and Amish buggy traffic is a safety issue that affects several groups in Ohio. The Amish and other residents of Ohio are affected. Tourists to Amish areas may be especially vulnerable since they are unfamiliar with travel habits of a horse drawn buggy. Trucks driving through Amish areas are impacted since trucks take longer to stop or slow down than a passenger car. Local governments, local police departments and emergency services that must deal with the crashes, are also affected. Unfortunately, members of the Amish community usually account for a majority of the victims.

While data was gathered from the Highway Patrol Crash data base through the ODOT Office of Traffic Engineering, and while others familiar with local Amish communities were contacted; the Committee believes that the ideas, insights and comments coming from public involvement with the Amish is critical to identifying realistic solutions and will lead to more realistic solutions being proposed or considered. One reason for this is that Old Order Amish have strict religious beliefs that make solutions like adding lights or reflectors unacceptable. (The Old Order Amish is the group that use buggies as their primary mode of transportation.) Public involvement within the Amish settlements was also believed to be critical for building the trust and cooperation to needed to gain acceptance for proposed solutions.

Two public involvement approaches were used:

- First, a series of open public meetings were held. The meetings were held at 7 p.m. in locations convenient to the Amish.
- Second, recognizing the possibility that only the Amish Bishops and elders might be willing to speak at such meetings, a survey form was prepared and distributed to as many Amish families as possible.

3.1 Affected Groups

Meaningful public involvement requires including representatives from all the groups that are affected by the issue or that may be affected by the project or solution. In terms of Amish Buggy safety, affected groups may include: representatives of the Amish community, local and state elected officials, the state highway patrol, local police, ODPS, ODOT, Ohio tourism bureau and or local chambers. All were invited to participate in the public involvement process.

Although crashes are occurring throughout the state, based on the crash location analysis, the committee agreed that the northeast region should remain the primary project area. The committee, therefore, recommended that ODOT initially focus on the northeast Ohio region with the hope that alternative recommendations, derived from this study, should be applicable to other areas of the state. [See crash map, Appendix A]

3.2 Public Meetings

In conjunction with ODPS and local law enforcement agencies, it was decided that a series of public meetings would be held at locations in Northeast Ohio. ODPS worked with local officials and members of the Amish community to set up the meetings and invite local officials and groups. The meetings were held at 7 p.m. in a local school or church chosen by the local officials and the Amish community. Three meetings were held. Over 800 people, mainly members of the Amish communities, attended the meetings.

The meetings provided an opportunity to present the initial findings and recommendations from Section 2.0 of this report. More importantly, the meetings provided an opportunity to receive “feed back” on whether the analysis seems logical and the recommendations realistic. The meetings also provided an opportunity to solicit other creative solutions and recommendations and give the Amish, local officials and other area residents an opportunity to identify roadway locations which they would like to prioritize.

Charts, maps and speakers from ODOT and ODPS presented the State’s understanding of the situation, the data, the analysis conducted for this report, and recommendations being considered. Meeting attendees were asked if there was “more to” the situation, if the locations are accurate and if they can recommend solutions. Public Opinion Survey forms were distributed for those

The following three meetings were held:

| <u>County</u> | <u>Meetings</u> | <u>Estimated Attendance</u> |
|--|------------------|-----------------------------|
| Geauga County Trumbull County | August 2, 1999 | 7 p.m. 400 (50 non-Amish) |
| Holmes County Wayne County | October 19, 1999 | 7 p.m. 300 (40 non-Amish) |
| Ashland County Medina County | January 11, 2000 | 7 p.m. 150 (70 non-Amish) |
| Stark County Knox County Hardin County | No meetings held | |

The overall tone of the responses by attendees at the meetings was very positive. Attendees appreciated that the State had taken an interest in their community and was concerned for their safety. The committee had been told that, at such meetings, only the Amish Elders and the Bishops speak, but the comments should be assumed to represent the opinions of more than just the individual speaking. The survey responses, described in the next section of this report, were used to get a broader base of opinions and to validate if most members of the Amish community held the same opinions as the speakers.

Following are a few highlights / comments from the meetings. All comments should be considered "opinions." Few of the facts presented by the speakers can easily be verified. A number of comments identified specific locations that the speakers felt should be improved. These comments are addressed in Section 3.3 and Appendix G of this report.

- The value of an Amish buggy is approximately \$2,800. The value of a horse is between \$1,500 and \$2,000. Average buggy width is 6 feet and they travel at an average speed from 5-8 miles per hour.
- According to an Amish Bishop from Geauga County, "Ohio's Amish community is the fastest growing Amish community in the U.S. The Geauga county area currently has approximately 10,000 Amish. Their population is expected to exceed 20,000 by 2020."
- The opinion of many attendees is that the slowness of the buggies and the inattentiveness of motor vehicle drivers is the main safety issue.
- Many attendees felt that the tourists were less of a problem than the locals. Tourists are looking to see buggies. Locals do not see the buggies as a novelty, but rather an interference to their getting where they want to go quickly.
- The Amish felt the "English" (the term used by to Amish to describe anyone who is not Amish) did not realize that the Amish do pay taxes such as property tax and sales tax.
- Meeting attendees felt that it is more important to widen the downhill side than the uphill side of a hill since a buggy going down the back side of a hill is not visible from a fast approaching vehicle traveling uphill.
- Several people spoke about the need for improved or additional buggy safety markings. One suggested a tall flag (similar to ones that bicyclists use) being attached to buggies. One individual suggested that people walking at night could use the reflective "bracelets" manufactured to go around horses' hoofs.
- There were several concerns that buggy markings were not consistent and were difficult to see. Speakers mentioned that the red flashing lights were confusing because when the buggy was to make a turn - only the one of the flashers continues to flash. The other stays red. This pattern may be confusing to people who think this flashing is a malfunction.
- It was suggested that when roadways are plowed for snow, the shoulders should also be plowed to allow buggies to ride on them or pull off to the side.
- The need for more education was expressed by many attendees. All attendees agreed that both the Amish and the "English" need better drivers' education. The "English" need education about slow moving vehicles, and the Amish need safety training at a very early age. Many Amish children start driving buggies at 12 to 14 years old.

- Signs and vegetation at intersections make it difficult for the Amish buggy drivers (who sit at a different height to the road and distance from the intersection than an automobile driver sits) to see around corners and intersections. Consideration of this should be made.
- Some speakers felt there is a need for more roadside warning signs indicating that it is a buggy area are needed. Others felt the warning signs are ignored by the locals who see them regularly and no longer notice them.
- At the meetings, ODOT spoke of widening shoulders to 6 to 8 feet. Several Amish said that six feet might be enough. Their major concern was “drop-offs.” Amish said that it is difficult for their buggy wheels to handle a 3 inch to 4 inch difference between where the roadway joins the shoulder and therefore care should be taken in keeping this joint somewhat level. Amish were also concerned with steep drop-offs at the side of the roadways (beyond the shoulder) explaining that buggies can easily go over the edge and roll down the embankment.
- Amish attendees admitted that there are some bad buggy drivers and the Amish are part of the problem. They stated that they are willing to be part of the solution.
- The Amish feel that truckers are less a problem than automobile drivers.
- Several Amish expressed an interest in developing non-picture identification cards or buggy license plates (approximately ½ inch by 3 inches) to attach to the back of the buggy seat. These items were considered helpful to identify people in case of crashes.
- Several Amish indicated that they are willing to pay license or registration fees to help cover the costs of improvements.
- Several Amish indicated they would discuss among their Bishops adding more reflective tape but stated that they prefer the grey tape.

3.3 Public Opinion Survey and Results (see Appendix B)

The study team was concerned that the Amish might be reluctant to speak in an open public meeting format. In order to get a broader perspective from the community, a “Public Opinion Survey on Amish Buggy Safety” was developed and distributed in the Amish Communities throughout Northeast Ohio. Although this concern was unnecessary, the survey provided other valuable data.

Surveys were distributed to all attendees at the three public meetings. Also, multiple copies of the surveys were provided to the Amish Bishops and local law enforcement agencies. Each of these groups was asked to distribute the surveys throughout their church or local area, trying to be sure they reached as many families as possible. While this is not a statistically valid or reliable method of sampling, given the Amish values, it was assumed that the survey distribution took place in a fair manner. (That is, individual nuclear families would only complete one survey form each.)

Because the Old Order Amish is the group that use buggies as their primary mode of transportation, the committee focused its public involvement activities and distribution of survey questionnaires to the Old Order Amish. Ohio's recorded adult "adherents" to the Old Order Amish Church is approximately 35,100. The source for this population data comes from the publication, *Churches and Church Membership in the United States 1990*, by Bradley, Green, Jones, Lynn, and McNeil, Glenmary Research Center in Atlanta, Ga.. It is based on 1990 census of Church membership in the U.S. by County.

ODOT received and coded 1,254 survey responses. Using a "t-test" to determine the validity of response size,

$$t = \frac{\bar{X} - \mu}{S \sqrt{N-1}}$$

it is statistically accurate to say the sample was large enough to conclude with 99% confidence that the possible response error due to sample error is + or - 0.1%.

In terms of the statistical reliability of the questions asked, (that is, if the same questions were asked again, would we get the same responses), it appears that several questions may have been misinterpreted by respondent. Questions were worded to try to get a ranking from most often to least often. Some respondents did not understand that they were to respond with 1, 2, 3, 4, 5 and just checked the spaces. Also, Questions 5 and 6 could have been interpreted to be asking if they drove a buggy with no markings, which is illegal, and therefore all respondents indicated that they used some type of safety equipment or markings. The responses to these questions were thrown out. Even with these concerns, responses were overwhelmingly clear in identifying the preferred responses.

Survey Responses:

Note: there was no statistical difference between the responses when cross correlated by county. As presented in the table in response to Question 1, the number of responses by county are somewhat similar to Old Order Amish population distribution by county (as per the publication, *Churches and Church Membership in the United States 1990*.) Therefore, only total responses are reported here.

Total responses: 1254

Question 1: Responses by county:

| County | Old Order Amish Members | % Total | # Survey Responses | % Total Survey respondents |
|--------------|-------------------------|----------------|--------------------|----------------------------|
| Ashland | 850 | 2.45% | 29 | 2.31% |
| Ashtabula | 0 | 0.00% | 7 | 0.56% |
| Coshocton | 0 | 0.00% | 40 | 3.19% |
| Defiance | 150 | 0.43% | | 0.00% |
| Fairfield | 50 | 0.14% | | 0.00% |
| Geauga | 7,500 | 21.65% | 143 | 11.40% |
| Guernsey | 150 | 0.43% | | 0.00% |
| Harding | 600 | 1.73% | | 0.00% |
| Holmes | 11,250 | 32.47% | 721 | 57.50% |
| Knox | 1,200 | 3.46% | | 0.00% |
| Licking | 150 | 0.43% | | 0.00% |
| Logan | 300 | 0.87% | | 0.00% |
| Madison | 150 | 0.43% | | 0.00% |
| Medina | 900 | 2.60% | | 0.00% |
| Miami | 150 | 0.43% | | 0.00% |
| Monroe | 100 | 0.29% | | 0.00% |
| Morrow | 0 | 0.00% | 1 | 0.08% |
| Perry | 50 | 0.14% | | 0.00% |
| Portage | 0 | 0.00% | 1 | 0.08% |
| Richland | 150 | 0.43% | 9 | 0.72% |
| Stark | 300 | 0.87% | 1 | 0.08% |
| Trumbull | 750 | 2.16% | 42 | 3.35% |
| Tuscarawas | 2,850 | 8.23% | 39 | 3.11% |
| Washington | 150 | 0.43% | | 0.00% |
| Wayne | 6,900 | 19.91% | 200 | 15.95% |
| Other | | | 21 | 1.67% |
| TOTAL | 34,650 | 100.00% | 1,254 | 100.00% |

Question 2: Buggy is primary means of transportation:
1200 responses - yes

Question 3: Primary reason for travel:
Most often response - Work 41%; Church 40 %; Shop 28.5%
Second most often response - Shop 28.5%; Church 27%

Question 4: Primary travel time:
Most often response - 7 a.m. to noon 55%; 3 p.m. to dusk 26 %; 4 a.m. - 7 a.m. 21 %
Second most often response - 3 p.m. to dusk 31%; noon to 3 p.m. 30%
Note: less than 1% indicated they traveled most often or second most often after dusk or before 4 a.m.

Questions 5 & 6:

Respondents appeared to misinterpret question - 1225 indicate they use reflective markings.

Question 7: Biggest safety concern:

Most often response - Cars 44%; Hills 36%
Second most often response - Hills 24%; Cars 23%
Third most often response - Trucks 22 %

Question 8: Expanding safety education:

Most often response - Emphasis in Drivers Education on dealing with slow moving vehicles 56%; Educational materials for tourists 24%
Second most often response - Educational materials for tourists 32%; Educational materials on safely driving a buggy 17.5%; Emphasis in Drivers Education on dealing with slow moving vehicles 17%;
Third most often response - Educational materials on safely driving a buggy 32%

Question 9: Expanding law enforcement:

Most often response - Strictly enforcing speed laws 63%; Strictly enforcing no passing zones 24%
Second most often response - Strictly enforcing no passing zones 40%
Third most often response - Strictly enforcing use of turn signals 42 %

Question 10: Roadway improvements that would help:

Most often response - Widen shoulders to 8 feet 54%; Construct pull-off lanes 29%
Second most often response - Construct pull-off lanes 33.5%; Widen shoulders to 8 feet 21%
Third most often response - More buggy warning signs 30%

Maps:

Inside each survey questionnaire was a map showing the roadways in the county where the survey was distributed. Survey respondents were asked to identify the three locations they feel should be improved first. For a summary of the responses by county please see Appendix G. Responses identified many local roadways. These maps will be provided to each appropriate ODOT District and each county identified. The intent was that the maps would assist ODOT and the counties prioritize which areas should be addressed first.

Section 4.0 Current Projects

Several of the ODOT Districts with Amish settlements have already begun to address the situation of horse drawn buggies on the state highway system. This section presents some of the projects being done to address the issue of crashes involving horse drawn buggies and motor vehicles. These projects will be followed closely by the committee to test possible recommendations made by the committee and to aid in developing workable solutions.

4.1 District 12

One project done by District Twelve involved SR 528 in Geauga County and the widening of the shoulders to accommodate horse drawn buggy traffic. This project will be followed closely by the committee to test initial assumptions. One initial assumption was that the widening of shoulders without widening bridges, culverts would not entice the buggies to use them. They would face an even greater risk of being hit by having to merge back into traffic when approaching a bridge as opposed to just staying on the road. Another initial assumption was that asphalt pavement would not be the most durable material to use for the shoulder widening. The reason for this thinking is because the Amish modify their horse shoes to get more grip. This is done by welding cleat like metal nobs onto the shoes. These quickly tear out the aggregate in conventional asphalt surfaces and 'rutting' becomes a problem. This project used a rubber compound additive to enhance its durability and resistance to horse shoes. Also the project area had no bridges or culverts with narrow shoulders. This project was done on one road with a high number of crash occurrences and will help the committee evaluate how effective this type of option will be for solving the problem.

4.2 District 11

District Eleven has also done shoulder widening along State Route 39 in Holmes County. The interesting feature here is the material is concrete, which is considered to be more durable than asphalt but creates traction problems for horses on hills. The committee will be watching this heavily traveled road to see how well the different type of surface material works and lasts.

4.3 District 3

District Three paved an additional 4 feet of shoulders to provide 6 foot asphalt shoulders along this section of Wayne 250 . The project length was over 22 miles SE of Wooster. Buggies are six feet wide and need, at a minimum, 6 feet of roadway.

4.4 District 11 - Projects currently being done or discussed

District Eleven is also discussing options for some smaller projects on SR 241 such as pull-offs and spot widening. District 11 will also be performing spot shoulder widening projects on 241. They are using their District allocation for this work and intend to do this over a multi-year period.

4.5 District 4 - Proposed Projects (under construction)

District Four - Trumbull 87: this project began while this report was in progress. It was awarded on 12-23-99 and is currently under construction. It includes a full depth pavement widening of both sides of the roadway to include 8 foot wide buggy lanes. The widening begins at the Trumbull county line and ends approximately 1/4 mile east of the SR 534 intersection (2.25 mile total project lengths).

This project was conceived based on complaints of dangerous buggy traffic conflicts occurring in a location known as "Mespo Hill" on TRU SR 87. Using 1990 - 97 crash data, this section of roadway revealed a buggy crash density of 5.62 buggy crashes per mile. This is 20 times more than any other route within District 4.

4.6 Ohio State Extension Service and Ohio Department of Public Safety

Through this study, the Ohio State Extension Service, together with ODPS and ODOT produced an educational video on "Keeping Amish County Safe - Sharing the Roadway." This video was distributed as to many local TV stations, local governments, ODOT Districts and law enforcement agencies for use as a public service announcement.

Ohio State Extension and ODPS also have numerous educational materials covering Amish buggy safety including materials on how to safely drive a buggy in traffic. These materials appear to be well distributed and well received by the Amish community.

Section 5.0 Alternatives

Based on the findings from the research conducted, public meeting comments, and survey finding for this report, the committee identified possible alternative safety improvements for consideration.

5.1 Alternative Solutions

Several alternative solutions are listed below together with some of the pros, cons, and issues associated with each.

5.1.1 Roadway Improvements

The horse drawn buggies being studied are 6 feet in width. Ideally the width of an improvement would be 8 feet, which would allow the buggy to have some cushion between mainline traffic and itself. This helps prevent situations that might occur due to the unpredictable actions of the horse when spooked by faster moving traffic. However, the Amish indicated that a 6 foot wide would be far better than nothing.

- ***Separate Trail, Possible Buggy/Bike Trail***
 - Pro - Gets buggies off of roadway and away from stronger faster moving vehicles.
 - Pro - Safety issues are of a lesser degree due to size, speed and maneuverability of bikes and buggies when compared to tractor trailer trucks and buggies
 - Con - Public comment and survey respondents did not rate this option very high given they preferred to travel routes that take them to their desired locations which is typically where the existing roadways go.
 - Con - Cost and maintenance issues, who pays and who maintains?
 - Con - Can they be located in places useful to the users?
 - Con - Safety issues involving bikes and buggies together on same trail.

- ***6 - 8 Foot Wide Paved / Treated Shoulder***
 - Pro - This is the option overwhelmingly preferred by most respondents to the survey.
 - Pro - Would get buggies off of the roadway and into their own "buggy lane."
 - Pro - Quick construction time if conditions are right.
 - Con - Construction costs could be high if right of way must be purchased, re-grading needed in areas with no shoulder or steep grades.
 - Con - Need to widen bridges and culverts so buggies do not need to merge in and out of traffic..

- ***6 - 8' Wide Graded Shoulder (compacted dirt with compact gravel)***
 - Con - Possible extensive right-of-way needs
 - Con - Would need to widen bridges and culverts so buggies do not need to merge in and out of traffic.

- ***Expand resurfacing program to include paving graded shoulders when road is scheduled for reconstruction or resurfacing.***
 Pro - Can be done over time and costs can be merged into other construction costs
 Pro - Shoulders can also be used to maintain two-way traffic during resurfacing or other construction projects.
 Con - Would also have to look at bridge and culvert widening in order to avoid issue of having to merge in and out of traffic and possibility of having buggies choose to stay on roadway.

- ***Buggy Pull-off or Hill Climbing Lanes for Buggies***
 Pro - Avoids long cue lines that form behind buggies going up hills, allows vehicles to pass
 Pro - Helps with visibility issues if the lane is continued over the hill
 Pro - Less costly to build than complete shoulder reconstruction
 Con - Potential safety concern when buggies need to merge in and out of lane.

- ***Widened Shoulders on Downhill Side of Roadways***
 Pro - Helps with visibility issues if on the downhill side of the roadway
 Pro - Less costly to build than complete shoulder reconstruction
 Con - Potential safety concern when buggies need to merge in and out of lane.

5.1.2 Types of Treatments

- ***Asphalt Paving***
 Pro - Fast construction time
 Pro - Ease of maintenance
 Pro - Several heavy duty mix standards are available and provided in Appendix D
 Con - Not the most durable under buggy traffic. This is primarily due to horse shoe modifications for traction that tear out the aggregate like cleats.

- ***Concrete Paving***
 Pro - Durable in comparison to other options
 Con - Expense in comparison to other options
 Con - Concrete becomes slippery to horses when wet or dirty.
 Con - Maintenance is labor intensive.

- ***Aggregate covering***
 Pro - Very fast to construct
 Pro - Very inexpensive
 Pro - Easy to repair
 Con - Will require constant maintenance
 Con - Joint area between roadway and shoulder aggregate can have a 2" or more mismatch which could be a problem for buggies as indicated by comments during public meetings. This destroys buggy wheels.

Con - Not durable enough with regard to the type of traffic it will have to support and especially in regard to the weather conditions it will experience.

5.1.3 Roadway Changes

- ***Roadway warning signs in all buggy traffic areas***
Pro - In most locations ample signage and standards already exist.
Pro - Inexpensive
Con - Motorist do not always give signing due regard
- ***Horizontal and Vertical Geometric Improvements to straighten or flatten roadways***
Pro - Improve visibility of buggies and motor vehicles at vertical and horizontal curvatures of the roadways
Pro - May be able to incorporate into resurfacing program
Con - Costs may be high
- ***Reduced speed in designated areas***
Pro - Fairly inexpensive to implement
Con - Would require "speed zone studies" to determine appropriate locations.
Con - May be difficult to "sell" the idea of reduced speeds on certain roadways; educate locals about speed changes of different roadways; may be difficult to enforce.

5.1.4 Buggy Improvements

- ***Increased number of required reflective materials on buggies and horses***
Pro - Increased visibility
Pro - Inexpensive alternative
Con - Issues dealing with religious beliefs and bright colors
- ***Buggy inspections and license plates to insure compliance with reflective markings***
Pro - Allows for a way of enforcement of safety markings
Pro - License plates would allow for a way of counting the buggies and provide a small source of revenue.
Con - Issues dealing with religious beliefs
Con - May be difficult and costly to enforce.

5.1.5 Bus Service for the Amish

- ***Bus run by county to take Amish to town once a week or a dial-a-ride service***
Pro - Would reduce buggy traffic and need for traveling long distances
Pro - Would be safer and more time efficient for Amish
Con - Amish may not call for a ride like a taxi cab

- Con - Amish prefer to use their own buggies
- Con - Limited rural transit funding is available
- Con - Survey found this to be the least desirable alternative

5.1.6 Education and Enforcement Programs

In addition to roadway improvement, law enforcement and educational programs and materials will need to be part of the solution. One of the benefits of ODOT and ODPS working together on this issue is the opportunity to utilize a multifaceted approach to addressing the issue. ODPS is currently developing programs for dealing with this issue. They are publishing a separate but companion report to this which will outline their proposed actions and initiatives.

5.2 Priority Roadways

Based on the crash location map, the following state roadways have had crashes along their length and need to be analyzed and possible improvements identified for each.

5.2.1 State Roadways to consider for Possible Improvements

| County | State Route | County | State Route |
|-----------|---|-------------|------------------------------------|
| Ashland | 42, 89, 250, 302, 545, 603 | Miami | 41 |
| Ashtabula | 7, 84, 193, 322 | Morgan | 373 |
| Fairfield | 37,312, 664 | Morrow | 314 |
| Geauga | 87, 88, 422, 528, 608 | Pickaway | 56 |
| Hardin | 31, 292 | Richland | 96, 546 |
| Holmes | 39, 62, 83, 93, 179, 241, 514, 515, 643 | Stark | 93, 241 |
| Knox | 3, 205, 229, 541, 586 | Trumbull | 45 ,87, 88, 534 |
| Logan | 47, 68, 235, 638 | Tuscararwas | 39, 93, 258 |
| Medina | 42,162,301 | Wayne | 3, 30, 95, 241, 250, 302, 539, 604 |

5.2.2 Roadway Prioritization Criteria

Routes with evident buggy traffic should be reviewed and analyzed to identify problem areas. Appropriate counter measures to improve the safety conditions for shared usage should be determined. In the analysis consideration should be given to items such as crash history, traffic volumes, cross corner and stopping sit distance. Potential projects derived for the analysis may then be prioritized a variety of factors such as:

- Crashes density (crashes per mile for sections)
- Crash frequency (# crashes at a spot location, such as intersections)
- Crash severity (fatal, injury, or property damage only)
- Roadways maintenance and resurfacing schedule
- Preference based on public input during the survey (see Appendix G)
- Project costs

5.3 Estimated Costs

The estimated costs for alternative improvements are presented in Appendix E.

5.4 Evaluation of Alternatives

It is unlikely that any one alternative could totally address the issues surrounding safety. However, implementing several may provide some level of safety improvement. In evaluating alternatives, issues such as cost, acceptance by the Amish Community, locations of most severe safety concerns, and ODOT normal resurfacing schedules should be considered.

Section 6.0 Proposed Action Plan

The original purpose for this report and the mission of the Amish Buggy Safety Committee was:

to identify safe, cost effective recommendations that would create a transportation environment in which horse drawn buggies and motor vehicles can better share Ohio's roadways.

As evidenced by this report, to accomplish this, the Committee conducted an analysis of existing conditions, worked with the Amish Community through public meetings and survey instruments, worked with local and state law enforcement officials, and contacted other states. This section presents recommendations based on the research and findings and intended to address the original mission.

6.1 Proposed Strategy

Based on the findings, the Committee recommends the following:

- In areas identified as being frequented by Amish Buggies (as presented in the crash report map in Appendix A, the priority locations identified by the Survey findings, and maps presented in Appendix G), the appropriate ODOT District should evaluate the feasibility of widening roadway shoulders and related bridges to 6 - 8 feet of heavy duty mix asphalt (as specified in Appendix D.) This evaluation and potential widening should be conducted and phased in during the District's scheduled resurfacing program. In addition, roadways being considered for widened, should be further evaluated to determine if it is feasible to simultaneously flatten grades and reduce curves.
- ODOT Districts 3, 4, 11, and 12 should consider incorporating the information identified in this report and the accompanying Appendices into their District's current and ongoing maintenance and improvement programs. For example:
 - Snow removal activities should include plowing back the shoulders.
 - Spring maintenance should include cutting back brush and trees that may hinder visibility based on the perspective of horse drawn buggy drivers.
 - The locations of signs should be re-evaluated based on the perspective of horse drawn buggy drivers.
 - Districts should consider conducting "Speed Zone Studies," that includes a "slow moving vehicle" factor to adjust for the speeds of buggies, for roadway sections incurring a high number of Amish buggy crashes.
 - Intersection visibility should be geometrically evaluate to consider the needs in terms of the height and distance back from the intersection where an Amish buggy driver sits in addition to were a motor vehicle driver sits. Signs, vegetation and obstacles should be moved or removed accordingly.
- ODOT should provide copies of this report and its Appendices to the County Engineers in Counties with significant Amish populations. Many of the roadways identified by the Amish in their survey responses were on the County and Township systems.

6.2 Funding Recommendations

Funding to implement these recommendations on state roadways is limited to existing ODOT funds. Appendix E identifies costs estimates to make the variety of roadway improvements discussed. No total cost for improvements has been calculated for this study. Initial calculations to expand the shoulders of all identified roadways were in the hundreds of millions of dollars.

Based on these findings, the Committee recommends the following:

- ODOT Funds Management Committee should establish a \$ 1 million per year special fund available to ODOT Districts to advance the recommendations presented in this report. Use of these funds should be limited to physical improvements on State roadways as identified in this report. These funds must be matched with other District funds.
- The ODOT Amish Buggy Safety Committee should meet to establish funding criteria and prioritization factors to use in determining how to distribute these funds for the next three years. Roadway prioritization criteria presented in Section 5.2.2 should be considered in establishing funding and prioritization criteria.

6.3 Timetable and Next Steps

The ODOT Amish Buggy Safety Committee should meet within the next month to establish criteria for selecting and prioritizing roadway sections to receive funding. The Amish Buggy Safety Committee will create, advertize, solicit, and evaluate applications from the ODOT Districts for the \$ 1 million / year Amish Buggy Safety funds. The committee should recommend projects for at least three years of funding to the ODOT Safety Program Manager to present for the approval of the Funds Management Committee. The Amish Buggy Safety Committee should meet annually to review funding requests and recommend projects for funding.