Assessment of the State of Alabama Rail-Highway Safety Program

FINAL REPORT

SUBMITTED TO:

Jerry L. Peters
Multimodal Transportation Engineer
Bureau of Multimodal Transportation, Room G-101
1409 Coliseum Boulevard
Montgomery, AL 36130

WRITTEN BY:

Brian L. Bowman, Ph.D., P.E.
205/844-6262

DATE:

May 20, 1994

Table of Contents

List of Figures

List of Tables

Executive Summary

The Intermodal Surface Transportation Efficiency Act of 1991 continues the provision of providing funding authorizations for individual states to improve safety at public rail-highway crossings. Inherent in this funding availability is the responsibility for developing a statewide rail-highway safety program. In today's litigious environment a solid crossing safety program is an effective method of reducing the risk of financial liability for highway agencies, railroad owners and operators.

Through the application of the rail-highway safety program, Alabama has reduced the frequency and rate of train-vehicle accidents at grade crossings. While improvements have occurred, Alabama is still experiencing a relatively high number of train-vehicle accidents. One reason for the continued accidents is the relatively low proportion of rail-highway intersections, compared to other States, that are signalized.

Alabama has a total of 4,230 public crossings of which only 21.1 percent are equipped with active warning devices (gates and/or flashing lights). Every southern State, with the exception of Mississippi, has a higher crossing activation rate. One consequence of the low percentage of activated crossings is that Alabama experiences the third highest vehicle/train accident rate in the U.S.

Sufficient Federal rail-highway grade crossing funds are available to signalize approximately 35 or more Alabama crossings per year. Frequently improving 35 crossings per year is not achieved. This failure is primarily due to the fact that managing and conducting the rail-highway safety program is more complex than typical traffic safety initiatives. The grade inventory is maintained by FRA and requires input from roadway agencies and operating railroads. Identifying deficient crossings requires information on train volumes and operating characteristics, traffic volume, type of roadway user, geometric crossing and approach characteristics, and quadrant sight availability. Conducting the site inspection requires input from State and local government, traffic

safety, enforcement and railroad signal engineers. Installing improvements requires the development of plans, FHWA funding approval, roadway agency approval, railroad agreements, and, for off-system crossings, municipal cost share and/or maintenance agreements.

This report summarizes the results of a project conducted for the Alabama Department of Transportation (ALDOT). The goal of the project was to enhance Alabama's rail-highway safety program. To achieve this goal the following objectives were established.

1. Assess the current crossing safety program.

2. Develop procedures, or upgrade current procedures, for the identification, inspection and timely upgrading of potentially hazardous railroad grade crossings.

3. Provide training for ALDOT personnel in the proper rail-highway program procedures.

Project Activities

Primary project activities consisted of the following.

- Meeting with Norfolk Southern Railroad in Atlanta on March 4, 1993.
- Meeting with Brian Bowman, Richard Mather and AHD personnel on April 29 and 30, 1993 to determine the safety program status and needs.
- Inspection of rail-highway grade crossings on Saturday May 1, 1993 by Bowman, Mather and Colson.
- Meeting with Burlington Northern Railroad on May 10, 1993.
- Development and mailing of project survey to 40 State agencies.
- Development of a plan preparation procedure for rail-highway projects.
- Analysis of the State surveys.
- Representing the State of Alabama at the National Rail-Highway Safety Conference (June 2-4, 1993) the Region IV Rail-Highway Safety Conference (July 11-14, 1993), and the High Speed Rail Workshop (October 18-20, 1993).
- Conducting a meeting with ALDOT Division personnel to present new plan procedures.
- Performing a sensitivity analysis of the various prioritization methods.
- Presenting a summary of project activities at the Alabama Traffic Safety Conference (February 23-24, 1993) and Institute of Transportation Engineers (ITE) (March 17,

- Presenting a summary of project activities at the Alabama Traffic Safety Conference (February 23-24, 1993) and Institute of Transportation Engineers (ITE) (March 17, 1993) meetings.

- Presenting two-2-day (March 22-23 and 24-25, 1993) training courses on inspecting railroad grade crossings and identifying alternative improvements.

Summary of Recommendations

Activities of the Alabama rail-highway safety program project resulted in the identification of program elements that could be enhanced to improve effectiveness and efficiency. The following actions, with support criteria are the principal recommendations resulting from project activities.

- Vest the railroad grade crossing responsibilities to one individual within each Division office

  The inspection of, and determination of appropriate countermeasures, for railroad grade crossings requires knowledge of train operation and detection characteristics. In addition, rail-highway projects require coordination with agencies and involve procedures not encountered during typical highway safety projects. These differences indicate that the rail-highway safety program would be more efficient with one designated individual within each Division office who is trained in effecting the Division's rail-highway program.

- Better coordination with railroads

  Annual meetings should be held with each railroad to coordinate planned upgrades and to discuss and identify crossings with possible problems. These meetings will enable railroads to notify suppliers of possible equipment needs and reduce implementation time.

- Increase emphasis to local governments on the importance of rail-highway approaches and crossings

  Total roadway agencies must become active participants in the rail-highway safety enhancements. Over 93% of the public grade crossings in Alabama are located on off-system roadways. Observations made during the highrail trip indicate that the majority of pavement markings and signs on the roadway approaches are not in compliance with the MUTCD. The potential liability that local governments risk is enormous. A method should be developed that will make the officials of local agencies aware of the monetary consequences that can be encumbered by failing to properly maintain roadway approaches to grade crossings. This can be accomplished by short presentations during City Council or Planning Commission meetings, presentations for meetings of elected officials or through correspondence from ALDOT.

- Perform a major update to the rail-highway crossing inventory

  Alabama's rail-highway crossing inventory is out-of-date. The survey of States indicates that this is not unusual with the majority of responses indicating problems with inventory accuracy. The inventories were initially developed in the early 1970's. Subsequent changes to roadway volumes and geometrics, roadway names and roadway jurisdiction have resulted in large amounts of obsolete data.

- Develop a timely inventory update procedure

  The new diagnostic review forms require data elements that can be used to help maintain inventory accuracy. A method should be developed that will incorporate these data items into the inventory. The constant upgrading of critical data items will help ensure accurate prioritization of crossings and prevent inventory obsolescence.

- Adopt the new rail-highway signal plan preparation procedure

  A contributing factor to the delay in project implementation was identified as the complexity of plans forwarded to the railroads. Most railroads do not require an engineering grade, to-scale diagram of the crossing or placement of the improvements. Since the work is performed on the railroad right-of-way and governed by the standards of the MUTCD and guidelines of the AAR, detailed plans are not necessary. The major railroads, during recent meetings, concur with this recommendation.

- Require the railroads to assume responsibility for traffic control

  The majority of the railroad work for signalization projects occurs within the railroad's right-of-way. Railroads should be responsible for following the work zone traffic control requirements of the MUTCD. In those cases where detours are required, it should be the responsibility of the railroad to coordinate with the appropriate AHD Division Railroad Specialist to develop an acceptable traffic control plan.

- Reduce the level of funding for crossing surface improvements

  Maintaining the serviceability of the crossing surface is the responsibility of the railroad. Expenditures of program monies for surface improvements, for other than roadway widening projects, reduces the available funds for signalization. Funding surface improvement projects should, therefore, be limited considerably or discontinued.

- Perform the roadway approach work with State forces

  Difficulty is frequently encountered with local agencies effecting the proper and timely installation of signs, stripings and markings. It is recommended, therefore, that the required signs, stripings and markings be installed by State forces for all rail-highway signalization projects. This will be for both on-system and off-system projects.

- Adopt a policy of 100 percent funding for off-system crossings

  Some small cities and rural agencies have such a small operating budget that contributing the 10 percent share can pose difficulties. If the crossing was identified from the Statewide priority process as being deficient, then the inability of the local agency to provide the 10 percent does not make the crossing any less deficient. To reduce grade crossing accidents emphasis must be placed on off-system crossings which accounted for over 93 percent of Alabama's at-grade crossings. Alabama is already pursing strategies, such as 100 percent funding or closure of one crossing for upgrade of others, rather than drop projects due to lack of local participation. The feeling of partnership can be obtained by an agreement, prior to upgrade, that the local agency will maintain the pavement markings and traffic signing on the approaches.

- Use the U.S. DOT formula method to prioritize crossings for improvement

  The U.S. DOT formula considers operational and physical characteristics at the crossing, in addition to, accident history. It is used by the majority of States, is applied on request by FRA and is a better predictor of accident potential than the use of accident frequency alone. It will also place the State in a better litigation position since it is a method accepted by the U.S. Department of Transportation,

- Encourage Legislative action to facilitate crossing closure

  Effecting crossing closure can be a difficult task especially on off-system roadways. Legislative action, vesting closure authority with the ALDOT, can be an effective tool in effecting the removal of little used and redundant crossings.

- Develop a computerized program procedure and tracking system for rail-highway signalization projects

  The complexity of rail-highway signalization projects often results in a long period of time from crossing identification to countermeasure installation. This time could be substantially reduced by a computerized tracking system. The system would have the capability of identifying the status of each project, expected time to completion of each step, and be capable of upgrading project and program activity logs.

- Develop a crossing improvement prioritization scheme that is capable of being implemented

  There are 172 crossings currently programmed for improvement. Only 18 of these crossings are ranked within the top 40 by the U.S. DOT formula. Of these 18 only 6 are within the top 10 rank of the U.S. DOT. It is recommended that the current list be closely scrutinized and those crossings that cannot be justified by unusual geometrics or sight restrictions, and not yet forwarded to the railroads, be dropped from the program. AMTRAK and those crossings ranked highest on the U.S. DOT list should be scheduled for improvement.

CHAPTER 1 - INTRODUCTION

The Rail-highway grade crossing safety program is one of the most successful traffic safety initiatives in the United States. Categorical funding for Rail-highway crossing safety projects, Section 130 funds, have been available since passage of the Highway Safety Act of 1973. Since passage of the Act, through fiscal year 1991, $2.65 billion in Federal funds have been available to carry out this program. The benefit-cost ratio of these improvements is just a fraction lower than that achieved for all other highway safety projects. Evaluation of the Rail-highway improvement program estimates that it has resulted in an 88 percent reduction in fatalities and a 62 percent reduction in injuries. These percentages indicate that 7,200 fatalities and 31,000 injuries were prevented by Rail-highway grade crossing improvements [1]. The 1973 Act made the funds available but it was the combined efforts of Federal, State, local government and railroad agencies which made it successful.

The primary responsibility for implementing the program was placed on the States. Each State was required to develop methods of identifying, prioritizing, inspecting, and developing countermeasures to correct deficient Rail-highway grade crossings. To help ensure that program objectives were achieved the Federal Highway Administration (FHWA), in conjunction with the Federal Railroad Administration (FRA), established guidelines and specific program requirements. Each State was permitted, within the guidelines, to develop their program to be compatible with the State's method of operation, record system, organizational structure and anticipated program needs.

The Intermodal Surface Transportation Efficiency Act of 1991 continues the provision of providing funding authorizations for individual states to improve safety at public Rail-highway crossings. Inherent in this funding availability is the responsibility for developing a statewide Rail-highway safety program. In today's litigious environment a solid crossing safety program is an effective method of reducing the risk of financial liability for highway agencies, railroad owners and operators.

A statewide crossing safety program must be realistic as well as comprehensive in order to be effective. Alabama has 4,230 public crossings of which 887 have either gates, flashing lights or highway signals to actively warn motorists of train presence. The majority of the crossings, 3,912, are not located on the State highway system indicating the need for cooperation with local and county roadway agencies. The magnitude of these numbers indicates that an effective crossing safety program must include a readily available method of assessing crossing hazard potential, a realistic field inspection plan and a method for obtaining the cooperation of local roadway agencies and operating railroads.

Managing and conducting the rail-highway safety program is more complex than typical traffic safety initiatives. This is primarily due to the diversity of expertise and agencies involved in conducting a successful program. The grade inventory is maintained by FRA and requires input from roadway agencies and operating railroads. Identifying deficient crossings requires information on train volumes and operating characteristics, traffic volume, type of roadway user, geometric crossing and approach characteristics, and quadrant sight availability. Conducting the site inspection requires input from State and local government, traffic safety, enforcement and railroad signal engineers. Obtaining improvement installation requires the development of plans, FHWA funding approval, roadway agency approval, railroad agreements, and, for off-system crossings, municipal cost share and/or maintenance agreements.

This report summarizes the results of a project conducted for the Alabama Department of Transportation (ALDOT). The goal of the project was to enhance Alabama's rail-highway safety program. To achieve this goal the following objectives were established.

1. Assess the current crossing safety program.
2. Develop procedures, or upgrade current procedures, for the identification, inspection and timely upgrading of potentially hazardous railroad grade crossings.
3. Provide training for ALDOT personnel in the proper rail-highway program procedures.

Project Activities

Primary project activities consisted of the following.

- Meeting with Norfolk Southern Railroad in Atlanta on March 4, 1993.
- Meeting with Brian Bowman, Richard Mather and AHD personnel on April 29 and 30, 1993 to determine the safety program status and needs.
- Inspection of rail-highway grade crossings on Saturday, May 1, 1993 by Bowman, Mather and Colson.
- Meeting with Burlington Northern Railroad on May 10, 1993.
- High rail inspection of Norfolk Southern line along 80 miles of track west of Birmingham on May 25, 1993.
- Meeting with Norfolk Southern Safety Task Force on May 26, 1993.
- Development and mailing of project survey to 40 State agencies.
- Development of a plan preparation procedure for rail-highway projects.
- Analysis of the State surveys.
- Representing the State of Alabama at the National Rail-Highway Safety conference (June 2-4, 1993), the Region IV Rail-Highway Safety Conference (July 11-14, 1993), and the High Speed Rail Workshop (October 18-20, 1993).
- Conducting a meeting with ALDOT Division personnel to present new plan procedures.
- Performing a sensitivity analysis of the various prioritization methods.
- Developing a new field inspection form and procedure.
- Presenting a summary of project activities at the Alabama Traffic Safety Conference (February 23-24, 1993) and Institute of Transportation Engineers (ITE) (March 17, 1993) meetings.
- Presenting two 2-day (March 22-23 and 24-25, 1993) training courses on inspecting railroad grade crossings and identifying alternative improvements.

CHAPTER 2 - ASSESSMENT OF THE INITIAL RAIL-HIGHWAY SAFETY PROGRAM

The initial activities of the project consisted of meetings with Class I railroads, discussions with the Rail-highway program personnel, inspection of program records, inspection of Rail-highway grade crossings and a survey of State practices. The purposes of these activities were to 1) determine the initial status of Alabama's Rail-Highway Program, 2) identify possible problem areas, and 3) determine the program elements and procedures of other States.

Summary of Program Status Resulting from Meetings and Crossing Inspections

Meetings were held with representatives of the Norfolk Southern and Burlington Northern Railroads. The minutes of these meetings are summarized in appendices 1 and 2, respectively. The results of the railroad meetings, a perusal of program procedure and inspections of grade crossings are presented below.

- A flow chart of the initial rail-highway program procedure is presented as figure 1. An inspection of the flow chart indicates that the rail-highway program is an involved process due to the necessary involvement of central office personnel, division personnel, local governments, FHWA, railroads and equipment suppliers. Unless closely monitored the rail-highway program can result in a long time from crossing identification to countermeasure implementation.

- Identification of crossings in need of analysis was accomplished by an accident based system. While this method addresses crossings at which accidents have occurred, it is subject to fluctuations due to random accident occurrence and does not measure accident potential.

- Problems were encountered with local agencies providing their 10% cost share. Alternative strategies need to be identified for use when this problem is encountered.

- Problems were encountered by requiring Division personnel to develop crossing improvement plans. Part of the problem was the result of the workload and the absence of an individual vested with grade crossing responsibilities within each division.

- The division personnel are responsible for obtaining agreements with local agencies when the crossings are off-system.

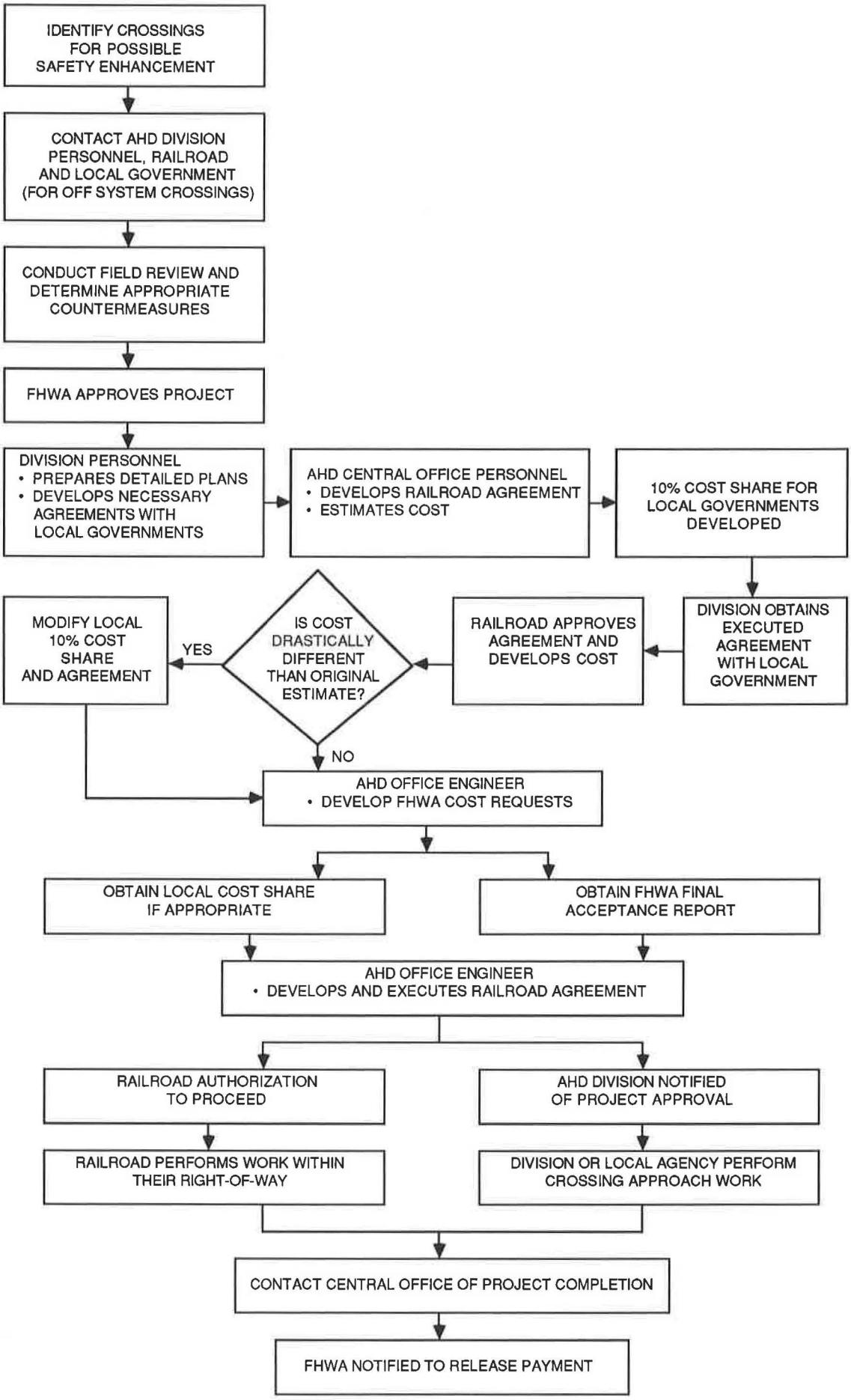


Figure 1. - Flow chart of initial rail-highway signalization procedure

- The railroads differ in their preference for grade crossing surface materials. These preferences vary from precast concrete to timber. The preference of the material is based on perceived maintenance and service life cost.

- Recent FRA efforts have included the closure of redundant or little used crossings. This effort is supported by the ALDOT and the railroads. Efforts to close crossings can be frustrated by a small number of citizens opposing the closure.

- Observations made during the field reviews indicate that a large number of crossings, under local agency jurisdiction, do not have appropriate advance signing and pavement marking.

- The lapse time from project identification to implementation needed to be reduced.

- Some railroads indicated that they prefer to install gates whenever they modify a crossing to active warning devices.

- There was no method for identifying the status of a project. Not knowing the current project status results in difficulty maintaining a timely implementation schedule.

- There is no methodological procedure for updating the crossing inventory. Many changes in traffic and train operations and physical conditions are not posted to the inventory.

- Time spent on each crossing is billable to that crossing through FHWA funds. Engineering time including crossing selecting field inspection and plan preparation are billable items.

- Time can be reduced on obtaining the final authorization to proceed by obtaining lump sum agreements, for typical improvement types, with the Class I railroads. Similar agreements are being used in some States with great success. Time savings are made in that the cost of improvement can be established during the field review, and when local participation is required, the 10% local share is known with certainty.

- Some railroads expressed a desire to not participate in the crossing inspections. A railroad that did express a desire to be present would like to visit more than one location during the review.

- The railroads expressed a need to obtain a list of prospective crossings for improvement well in advance of actual project selection. This will enable them to notify suppliers of expected equipment needs in sufficient time for prompt delivery.

- The railroads desire that utilities, which are in the vicinity of the railroad right-of-way and that may interfere with construction, to be located on the plans.

- The highrail inspection identified numerous crossings at which the roundels were out of alignment.

Summary of State Survey Results

The ability of States to develop their own programs has resulted in a wide variation in the structure and procedures of the Rail-highway grade crossing safety programs. One project task was to determine the structure, practices and successful components of the Rail-highway program of other States. This was accomplished by forwarding a survey, presented as appendix 3, to the Rail-Highway Program coordinator of each State, with the exception of Hawaii. A total of 41 responses were received and are summarized in appendix 4. The survey consisted of 34 questions related to program administration, current practices, State policy and planned enhancements. A discussion of the significant finds of the survey follows.

Crossing Responsibility: The organizational structure involved in the Rail-highway crossing safety program is diverse between States. While the Department of Transportation (DOT), or Highway Department (HD), of each State deals with the broad topic of transportation safety the grade crossing responsibilities are not the sole responsibility of the DOT or HD. Sixteen States indicated that the Public Utility Commission, Department of Rail and Public Transportation, Commerce Commission, Safety Commission or other public agency have a Rail office. The Public Utility Commission of two States and DOT or HD of six States administer the program jointly with another State agency. The rail-highway program is administered solely by the DOT or HD by 29 of the responding States.

Prioritization: A requirement of the Federal-Aid Policy Guide (FAPG) is that each State maintain a priority schedule of crossing improvements [2]. The priority schedule can be based on potential accident reduction, project cost, relative hazard or other criteria appropriate for each State. There are several advantages to using hazard indices and accident prediction formulae to rank crossings. These ranking methods remove subjectivity and are capable of being developed by computer, thereby, facilitating the process. A prior report stated that the most commonly used formulae include the Peabody Dimmick Formula, the New Hampshire Index, the National Cooperative Highway Research Program Report 50 Formula (NCHRP 50) and the U.S. DOT

Accident Prediction Formula, in addition, to several methods developed by individual States [3]. The survey results indicate that the ranking methods preferred by the States has changed. Of the States responding to the survey 13 indicated they have developed their own formula, 11 use the DOT Accident Prediction Formula, six use the New Hampshire Index, two use the Peabody Dimmick Formula and one uses the NCHRP 50 Formula. Four States do not use a priority ranking method and rely on accident occurrence, public complaints, input from railroads and field inspections to identify deficient crossings. The State which uses the NCHRP 50 Formula is planning to change to the DOT prediction method and five States which use the New Hampshire Formula have either modified the method or are planning to change to the DOT prediction method. Some of the States, Oregon for example, include a large number of variables in their prioritization methods.

Eighty-three percent of the States which use the DOT formula, 38 percent the New Hampshire and 50 percent their own methods are satisfied with the procedure. The predominant comment regarding the DOT formula is that it does not consider quadrant sight distance or roadway approach characteristics and that it places too much weight on accident occurrence. A predominant complaint on each non-subjective method was the accuracy of the FRA inventory.

Five States indicated that the available quadrant sight distance was included in the initial prioritization step. Quadrant sight distance has not been a part of the FRA inventory and these States did not indicate if sight distance information has been added to their State maintained inventory. The number of buses, passenger trains, school buses, hazardous material transporters and available sight distance is considered, often subjectively, after the initial prioritization and during the field inspection.

Implementation Time: The average time from identification to installation of appropriate countermeasures was indicated as one to two years by 19 States, two to three years by 17 States and greater than four years by four States. Twenty-four percent of the responses indicated that the primary cause of the delay was due to the amount of time that railroads take to return the plans, cost estimates and agreements. Sixteen-percent indicated that obtaining funding obligations from the

FHWA, State or local agency was the primary cause of delay. Some indicated that the quarterly approval of projects by the FHWA due to the Intermodal Surface Transportation Efficiency Act (ISTEA) will result in additional delays.

The majority of States have initiated or are considering changes to their procedure to reduce the time to installation. These steps include developing master agreements with the railroads, electronic billing, permitting advance material acquisition and meetings with the railroads to discuss the planned annual improvements. Ten States have established lump sum agreements and at least one railroad and eight other States are considering lump sum agreements. Some States will not consider lump sum agreements and one State tried it but found too many inconsistencies to continue.

Two States indicated that they had established a time frame with the railroads to expedite installation. In one State this is in the form of legislative action which has established one year, after project authorization, as the maximum time for installation or the railroad is required to perform the improvement without Federal Funds. The other State has a widely publicized verbal agreement that installation will take place within one year from the time that the initial plans are forwarded to the railroad.

Status Tracking: Eighty percent of the responding States have an established procedure for tracking the status of their rail-highway projects. Four States have utilized available software, such as Lotus, Paradox, D Base and SAS, while 15 agencies have developed their own programs. Manual systems, log books and status boards, are used by 12 agencies while seven agencies do not have a tracking system. Three of the agencies that do not have a system are in the process of developing a computerized system.

Municipal Agreements: An identified impediment to project installation is obtaining the municipal agreement. This agreement is used for crossings that are off the State system roadways and obligate local agencies for 10 percent of the improvement cost. The purpose of the municipal agreement is to commit the municipality to permit the installation of the traffic control devices on its

street and to assure compliance, as well as to commit funds. Ten States stated that it is desirable to have the local agencies sufficiently committed and supportive of the improvement that they are willing to contribute their 10 percent cost share. If the local agency was not able, or willing, to provide the cost share then they would attempt to have the railroad provide the share. If neither the railroad or the local agency were willing to provide the 10 percent then the project was dropped. Two States that currently follow this practice are considering changing their policy to reduce the local agency burden. Four States either make a special determination on a case-by-case basis or provide alternative local agency cost shares of 3 or 5 percent with the State providing the matching funds due to the reduced percentage. Twenty-one States indicated that they require no cost share from the local agency. Four of these States indicate that special funds have been appropriated by legislative action to provide the matching funds. The majority of respondents indicated that the 23 U.S.C. 120 (c) provision which permits 100 percent Federal funding for certain types of safety projects is the primary reason for reducing the financial burden on the local agencies.

State Improvement Plans: The complexity of the crossing improvement plans forwarded to the railroads varies greatly. Seven States forward six or more sheets as part of their plans including a vicinity map (6 of 7), legend sheet (5 of 7), project notes (6 of 7), project cross section (4 of 7), summary of quantities (3 of 7), railroad agreement (7 of 7), utility location layout (5 of 7), installation plan (5 of 7), traffic control plan (5 of 7), paving layout (4 of 7) and other sheets such as signal and sign standards. The plans of eleven States consist of three pages including a vicinity map (10 of 11), project notes (3 of 11), project cross section (2 of 11), summary of quantities (2 of 11), railroad agreement (8 of 11), utility location layout (1 of 11), installation plan (4 of 11), traffic control plan (1 of 11) and paving layout (2 of 11). Six States forward two sheets consisting of location sheet (5 of 6), railroad agreement (5 of 6), installation plan (1 of 6), and diagnostic field report (1 of 6). Three States forward only the agreement. Twenty-three of the responding States develop to-scale engineering quality drawings, 14 develop not-to-scale sketches and one State

provides no schematic of the planned improvements. Another State marks the planned improvements on an aerial photograph of the location.

Traffic Control: For on-State system improvements the responsibility for work zone traffic control is, in the majority of cases, assumed by the State. Fourteen States vest the traffic control responsibility with the railroad and six States work jointly with the railroad to ensure proper traffic control. Four States assume the traffic control responsibility for off-system crossings but the majority of off-system crossings is the responsibility of the railroad or local roadway agency. Only 13 of the States indicated that a traffic control plan was included in the plan packet forwarded to the railroads.

Diagnostic Reviews: Diagnostic reviews are conducted by all of the States but the team members vary. Nine States do not have a representative from the office with railroad responsibility but have the State represented by district personnel. All but two States have, or attempt to have, a railroad representative present during the diagnostic inspection. These two States and eight others indicated that a railroad representative was not required during the diagnostic inspection. If problems were encountered or unusual conditions were present then railroad personnel would be requested for a follow-up inspection.

Gate Installation: The majority of respondents indicated that they used the guidelines of the Grade Crossing and Traffic Control Devices Handbook for determining when to install automatic gates [3,4]. The guidelines include the presence of multiple tracks, high train speed, high roadway speed and volumes, sight restrictions, special roadway users (such as school buses and hazardous material haulers) and the continuance of accidents after flashing light installation. States that have quantified some of these guidelines consider train speeds of 105 km/h (72 km/h for commuter trains) (65 and 45 mph respectively) as high; greater than 30 trains and 4000 to 5000 vehicles per day as high train and roadway volume and greater than nine special roadway users per day as being high. Additional criteria considered as requiring gate installation are signalized intersections, or intersections with large turning movements, within 61 m (200 feet) of the crossing and accident prediction within the top 30 on the priority list. This last criteria, within the top 30 accident ranking,

almost guarantees that the majority of projects within the annual program will be recommended for gate installation. Five States indicated that they consider gates as being so much more effective than flashing lights that gates are always recommended. A number of States conducted corridor improvement initiatives that installed gates at all public crossings on passenger and high volume rail lines. No States were identified that installed traffic signals as the primary control device at grade crossings. Any traffic signal installations that were identified at grade crossings were related to pre-emption strategies due to signalized intersections within 61 m (200 feet) of the crossing.

Four Quadrant Gates and Medians: Five States indicated that they installed four quadrant gates and 11 States have used medians to reduce gate violations. Only one State was identified that has tried four quadrant gates in combination with medians for a wide roadway installation. One State claimed to have a large number of quadrant gate locations while the other users indicated only one installation. Four States indicated they were considering the use of four quadrant gates and three are considering the use of medians to reduce violations.

The State which claimed a large number of four quadrant gate installations considered the installation of gates at existing median locations as a four quadrant installation. Although installations on the median, in addition to the roadside, result in four gates this is not considered as a four quadrant installation.

No State on the planned high speed rail corridors (Section 1010) have definitely determined what type of warning device and traffic control to install. Some of the planning on four quadrant gates and medians was mentioned with reference to the Section 1010 corridors. The majority of responses for high speed rail crossings identified flashing lights and gates with vague references to security barrier systems as possible high speed rail warning devices.

Crossing Surfaces: Fifteen States indicated that they had guidelines for determining which type crossing surface to use. In the majority of cases these guidelines were not quantitative but based on a decision of the investigative team. Where quantitative criteria was provided the high type crossing surfaces were recommended based on ADT and truck volume. Volumes greater than

1000, 2000, 3000 and 5000 vehicles per day were identified as requiring full depth rubber or concrete crossing surfaces. Since maintaining the crossing surface is usually the responsibility of the railroad many States allow the railroad to specify the type of crossing surface.

Crossing Closure and New Crossings: Fourteen States have adopted a formal policy, four States have an informal policy and 18 States have no policy for effecting crossing closure. Three States are in the process of developing a closure policy; some of these with the assistance of a consultant. Nine of the States which have a formal closure policy also have the legislative authority to close crossings. Five additional States are planning to enact legislative authority for closure and two have tried to pass closure legislation but had the bill fail. A number of States indicated that their closure procedures provides the opportunity for public hearings.

A wide number of incentives have been used to help effect crossing closure for off-system crossings. These incentives include direct cash payments or payment in kind to the local agency by both the railroads and State. For example, one State provides $5,000, and the railroad another $5,000, to the local agency, with the railroad paying the actual cost of each closure. Some railroads object, in principle, to direct payments to local agencies but will purchase $10,000 worth of computer hardware for the school system with each closure. Other incentives used by the railroads include paying the local government share for upgrading adjacent crossings for each closure, providing parallel roadways, landscaping, and roadway turn-around costs. One State will pay for safety improvements not related to grade crossings, such as off-system traffic signal installation in exchange for crossing closure.

Inspecting only the average number of closures per year yields encouraging results. Twenty-three States claimed an active closure initiative that results in a weighted average of 4.6 crossing closures per year. When the closures of each State are considered with the number of new openings there is a net increase of 2.2 crossings per year. Thirty-one States indicated that they do not have formal thresholds or guidelines for determining when a new crossing is required. Those States which indicated that guidelines did exist did not provide any quantitative criteria. Decisions

on new crossing need are based on new roadway construction and subjective judgements of projected ADT and benefit to the public. Two States establish the need for a new crossing through a public hearing process.

It should be noted that the claims on the number of closures per year may be higher than what is actually occurring due to any closure efforts. Some States include crossings which are closed due to rail abandonment in their closure estimates. While these crossings are closed they are not the result of closure initiative.

Private Crossings: In the majority of cases a public agency has no authority over private crossings. Seven States have regulatory control vested in a public agency for opening, closure and type of warning device present at private crossings. Three other States have the authority to stipulate what type of warning device should be displayed at private crossings. One State currently has a bill before the State Legislature to give the Public Utility Commission authority over private crossings on high speed rail corridors. States which have jurisdiction over private crossings impose the same standards on the private crossings as are placed on the public crossings.

Metropolitan Planning Organization Requirements: Section 135 of ISTEA requires a State to develop and submit a Statewide Transportation Improvement Program (TIP) before FHWA can authorize Federal Funds for Rail-highway projects. In most cases this requires coordination with Metropolitan Planning Organizations (MPO's). Sixteen of the responding States stated that this requirement will result in additional delays in the installation of crossing improvements. The majority of respondents believed that this delay would be an additional one month to one year. A number of comments were received that the new requirement creates a lot of extra work and red tape.

Stop and Yield Signs: Section 1077 of ISTEA permits the installation of stop or yield signs, without an engineering study, at crossings that do not have automatic warning devices and two or more trains per day. Thirty-three responding States indicated that they plan to continue installing stop signs by the same policy as used prior to ISTEA. A number of responses indicated that they do not plan on interfering with local agencies that decide to install stop signs without an engineering

study. No State agencies were identified that plan to install stop signs at all crossings that met the ISTEA criteria. No respondents plan to install yield signs or stated that yield signs were a viable option at grade crossings.

Funding Options: The use of 100 percent Federal funding for certain types of safety projects, including active and passive devices at Rail-highway crossings is permitted by 23 U.S.C. 120 (c). Twenty-four States indicated that they do not plan on changing their 90/10 percent funding procedure for crossings located off-system. Some States, prior to ISTEA, already have established 100 percent or 95 percent funding strategies by utilizing State funds. Only four States have plans for using FTA funds for crossing improvements.

Conclusions Resulting from Analysis of State Survey Responses

Crossing Prioritization: The occurrence of rail-highway grade crossing accidents are relatively rare events. The infrequent train movements, even on high train volume lines, results in difficulty in obtaining accurate and reliable accident predictions. Since accidents are a random event, the use of accident history alone for prioritization is not good practice. A crossing can exist for years with no accident and one accident involving a van with a large number of fatalities can result in a public outcry for improvement. Without consideration to other factors, however, this crossing could go forever without another accident. To accurately prioritize crossings for improvement it is necessary to have accurate accident, inventory and roadway approach data.

Inventory Maintenance: The U.S. DOT/AAR Crossing Inventory was developed in the early 1970's. It is maintained by the FRA by means of States and railroads voluntarily submitting update material. The inventory contains information on the crossing location, amount and type of highway and train traffic, traffic control devices, and other physical characteristics at the crossing. A frequent complaint received on the survey was the poor accuracy of data items on the inventory. This complaint is self incriminating since it is the responsibility of the States and railroads to provide inventory updates. The initial update procedure recommended that the initiating agency (i.e., either

State or railroad) complete an update form and forward it to the other party (i.e., either railroad or State). After notification and agreement of the changes by both agencies the State forwards the original copy to FRA for processing. This recommended procedure has the advantage of keeping all parties informed of changes. FRA procedures also allow for State or railroad submission of inventory data without it first being confirmed by the other party. Although update procedures exist many data elements, such as ADT and train volume, are often so inaccurate that their use in quantitative formulas are guaranteed to give inaccurate results.

Updating the crossing inventory should become a prime concern of the Program Coordinator. Using complicated and involved formulae to determine a hazard index or to predict accidents will yield unreliable results if the input data is inaccurate. Procedures need to be established to update the ADT and to post items identified during the field investigations to the inventories. The FRA can provide the inventory for updating on IBM compatible personal computers. The inventory can be forwarded on floppy disks and include an update program to facilitate use and reduce errors. Further information on this update method, termed GX, can be obtained from FRA.

Sight distance along the roadway approach and within the quadrants is not part of the current inventory. The sight distance for the majority of crossings and safe approach speeds should be obtained during the field reviews and posted to, at least, the State maintained inventory.

Accident Data: The FRA requires the railroads to report any accident that involves the impact of a train with a roadway user; including pedestrians. This data, in conjunction with the inventory data, is used by the FRA to develop annual accident summaries by State and crossing characteristics. The accident data is sufficient for determining Statewide totals and national trends but should be closely inspected and augmented with other accident data prior to selecting countermeasures for individual sites. Many States do not inspect the accident descriptions, available from FRA, to determine the accident characteristics. This type of analysis considers all accidents as having the same cause with no consideration to such factors as time of day, driver

action, struck-by or striking the train. Failure to consider these factor results in the potential failure to identify less expensive or additional countermeasures, such as crossing illumination, or to possibly realize that no physical countermeasure would be effective due to driver action. Similarly, data on accidents, at or near a crossing but not involving a train, can provide useful information on available sight distance and potential timing problems at adjacent signalized intersections. This accident data is not maintained by FRA and, unfortunately, is also not readily available to many States. Some States do not maintain a computerized data base for off-system accidents and still more States cannot readily identify the milepoint of crossings on their roadway system.

The analysis procedure for each crossing should include an inspection of the accident characteristics of each accident. As a minimum the individual accident summary, available through FRA, should be used. Ideally this inspection should include all accidents at, and in the vicinity of, the crossing. This would require changes in the accident data base and/or the establishment of the locational reference point of the crossing on the roadway system.

Program Scheduling: The survey indicates that the cause of delays from project identification to countermeasure is due to the FHWA, States, local agencies, railroads and equipment suppliers. Since everyone is at fault each must realize the requirements and limitations that the other participants must operate under and review their operations to determine how to increase efficiency. For example, railroads are reluctant to purchase equipment until the authorization to proceed is received from the State. States, in many cases by law, cannot commit funds to equipment purchase until an executed municipal agreement for off-system crossings is in-hand, and FHWA approval obtained. Equipment suppliers require knowledge of the anticipated volume of hardware to enable purchases in quantities to maintain cost. Local governments, especially rural counties and small cities, often do not have sufficient resources to pay their share of improvements. The FHWA, in those States which have elected to do so, will be approving

projects on a quarterly basis instead of an individual project-by-project basis (i.e., for projects less than 1 million dollars).

Meetings should be held with the railroads at least once a year to present the anticipated improvement program. This will enable the railroads to plan their work forces and notify suppliers of equipment needs. It will also enable distributing the program into quarterly segments for FHWA approval.

Develop Status Tracking System: A status tracking system has the advantage of enabling the identification of impediments to program efficiency. A computerized system has the advantage of being able to determine the average turn around time by division, local agency and railroad. Such determinations can help identify what future actions can be taken, with individual railroads for example, to prevent future delays. Computerizing the tracking system provides the ability to enhance the program, such as automatic highlighting of projects, delayed over a certain period of time in accord with the anticipated needs of each State.

Lump Sum Payments: Lump sum payments for typical installations have been met with mixed reaction by both States and railroads. The advantages to lump sum payments are that they simplify the preparation of the improvement plans by the railroad and facilitate determining the 10 percent cost share required for off-system municipal agreements. There are a number of disadvantages to lump sum agreements. Due to the different labor agreements, and pay scales, the cost of typical improvements will differ between railroads, and often between different parts of the State for the same railroad. Establishing the initial lump sum agreements requires careful review to ensure that the interests of both the State and railroad are addressed. The lump sum agreements then need to be reviewed and updated on an annual basis.

Some States in lieu of lump sum, and wishing to expedite the municipal agreements, have opted for a 10 percent over-under understanding. If the initial estimate provided by the railroad for an individual project is within 10 percent of the final cost then the initial estimate stands. This

method necessitates monitoring to insure that the initial estimate is not consistently higher or lower than actual cost.

State Force Work: Whenever a grade crossing is improved the pavement markings and advance warning signs, no-passing treatments, traffic signal preempt and other roadway approach work should be performed. For on-system improvements this work is either performed, or contracted for performance, by State forces. For off-system crossings the approach work is often the responsibility of the local agency. In many instances the failure of the local agency to expeditiously and correctly perform the roadway approach work results in final approval delay. One remedy is to have the State forces perform the roadway approach work for both on and off-system crossings. The cost of this work is a reimbursable project cost and the use of State forces permits direct control on timely and correct application. One disadvantage to having the State forces perform work on the off-system approaches is an increase in potential liability.

Simplification of Plans. Developing comprehensive, to-scale plans for forwarding to the railroads can add a large amount of time to project implementation. This is especially true if the plans are prepared by Division Offices which are frequently under-staffed and where grade crossing improvements often are not a high priority. Most railroads do not require an engineering grade, to-scale diagram of the crossing or placement of the improvements. The preliminary engineering work necessary by the railroad to design the track circuitry and warning device upgrade will generate the drawings necessary for their force, or contractor, work. The most that should be required for the railroads to develop their detailed plans are a location sheet, description of the work to be performed, a not to scale sketch of the crossing, notes of special conditions, physical and operational conditions and a supplemental agreement. The railroads can be directed in the master agreement to perform all work in accord with the standards of the MUTCD. This removes the necessity for placing the improvements on the sketch.

Utilities and Traffic Control. The location of underground and overhead utilities should be the responsibility of the railroad. The railroad's work will be performed on their ROW and locating

hidden utilities should be the sole responsibility of the railroad. The railroads should be treated the same as a utility company with regard to traffic control responsibility. Since the majority of their work will be performed within their ROW they can provide or contract for any required short term traffic control. The State should provide assistance in establishing detours when necessary, such as for surface improvement work, but the prime responsibility for arranging traffic control should still be with the railroad. This responsibility, with reference to the MUTCD, should be made a part of the master agreement.

Local Cost Share. Feelings among the States and railroads differ with regard to local participation in grade crossing improvements. Some States have reduced the percentage of local participation, established special fund pools, and allow 100 percent Federal financing through the provisions of 23 U.S.C. 130. Other States try to get the railroad to contribute the local share. Still others feel that it should be a partnership, and if the local agency refuses to pay, then the project is deleted from the safety program. One State forwards a letter explaining that the project will be deleted and warning of the potential liability for failure to participate if the local agency will not contribute.

Some small cities and rural agencies have such a small operating budget that contributing the 10 percent share can pose difficulties. If the crossing was identified from the Statewide priority process as being deficient, then the inability of the local agency to provide the 10 percent does not make the crossing any less deficient. To reduce grade crossing accidents emphasis must be placed on off-system crossings which in 1991 accounted for over 84 percent of all at-grade crossings [5]. States should consider strategies, such as 100 percent funding or closure of one crossing for upgrade of others, rather than drop projects due to lack of local participation. The feeling of partnership can be obtained by an agreement, prior to upgrade, that the local agency will maintain the pavement markings and traffic signing on the approaches.

Crossing Surface Work. Some States expend as much as 50 percent of their Section 130 funds on crossing surface improvements [6]. Maintaining the crossing surface is the responsibility

of the railroad and the expenditure of Section 130 funds for crossing surfaces reduces the number of crossings which can receive upgraded warning devices. Surface improvements using Section 130 funds should be minimized as much as possible.

Diagnostic Team. The majority of survey responses indicate that the presence of railroad personnel on the diagnostic team is important. Some States, and railroads, do not think railroad personnel are necessary except in unusual circumstances. Some railroads state, that since their personnel will need to visit the site to develop the detailed plans, a visit with the diagnostic team is unnecessary. The presence of railroad personnel can, however, help identify unusual circumstance, provide updates or planned changes in train operations, and provide expertise generally not available at the State level. It is recommended that railroad personnel always be present at the diagnostic reviews and that the reviews be scheduled to cover as many daily inspections, with each railroad representative, as possible.

Stop and Yield Signs. None of the survey responses indicated plans to installing stop or yield signs, at crossings with two or more trains per day, without an engineering study. Installing stop signs after a diagnostic review, as an interim measure until upgrade, and a continuation of prior practice were the predominant responses. A number of railroads have expressed the belief that stop sign installation is a desirable and good countermeasure. This belief may, however, be prompted more by the relative low cost and reduction in possible liability resulting from stop sign installation than by actual effectiveness. The concern of traffic engineers with stop sign installation at crossing locations stems from the probable loss of device viability at all placement locations. No respondents expressed the belief that yield signs were a viable countermeasure.

Closure. The recent initiative of crossing closure has generated enthusiasm for the idea from both State and railroad personnel. While some States are experiencing success in closing crossings; the number of new crossings per year exceeds closure. It can be expected that as more crossings are closed the candidates for closure will diminish. Simultaneously as development continues, the number of new crossings will continue to rise. Since railroads are required to

maintain crossings they are presented with a scenario of ever increasing operating costs. It is unknown how many of the reported closures were due to closure efforts or abandonment of rail lines.

Private Crossings. Private crossings vary from crossings on driveways to industrial plants to crossings on farm field access roads. Some of the crossings, such as those to industrial plants, can carry roadway volumes that exceed the volume of public crossings. The terms of the agreements for these crossings often date from the establishment of the rail line and usually include a maintenance agreement. There are 115,425 private crossings in the U.S. which experienced 495 accidents in 1991 [5]. Only seven States were identified that had guidelines or standards for private crossings. The high speed rail initiative has resulted in increased concern for private crossings by the FRA.

Safety Management. One of the requirements of ISTEA is that each State must develop and implement six management systems, one of which is highway safety. The purpose of the safety management concept is to increase traffic safety by establishing a multi-disciplinary approach to the planning, design and use of safety principles. The FRA and State Rail Program Coordinator should establish an active role in developing the safety management system to ensure that Rail-highway crossing needs are properly addressed.

Summary of Preliminary Recommendations

- A question on the survey was designed to identify which algorithms are used to identify crossings in need of improvement. It is suggested that ALDOT adopt one of the methods used by other States or the US DOT method to initially identify crossings in need of analysis. These methods have the advantage of including traffic and train operational data in addition to accident occurrence. The ALDOT CORRECT system can be used to prioritize crossings that have been identified by the initial algorithm. Establishing the project selection and prioritization method is one of the tasks of this project.

- The potential loss of life and property due to motor vehicle train accidents is catastrophic. The failure to install active warning devices due to the refusal of local agencies to contribute their 10 percent share should not be allowed to occur. When such failure to cooperate does occur, alternative courses of action and methods to increase their cooperation should be pursued. Such actions could include:

a) Providing 100% funding by categorizing the grade crossing improvement as a safety improvement project.

b) Providing 100% funding by having the railroad contribute the 10% in return for the closing of another crossing.

c) Conducting meetings with, and distributing information to, local agencies to emphasize the possible consequences of failing to comply to the 10% share.

d) Investigating the possibility of developing legislation to require local agencies to provide the 10% cost share.

e) Conduct meetings with local agency, AHD and the respective railroad to determine if in-kind service can be given to the railroad for their assuming the 10% local share.

- The plans developed for crossing improvements should be simplified and completed by the ALDOT Division Railroad Specialist. The plans should consist of

  a) An optional crossing location map.

  b) A description of the project which consists of a form letter with inserts for location and improvement type. The development of the form letter should be developed on updated work processing software which is used by ALDOT.

  c) A sketch of the crossing that is not necessarily to scale. This sketch can be a simple line drawing constructed in the field, a straight edge drawing constructed in the office, or a CADD drawing constructed from macros for typical crossings.

  d) The plans should vest the traffic control responsibility, by reference to the MUTCD, in the railroad for flashing light and gate installation. For crossing surface improvements, and other work requiring traffic detour the traffic control plans should be the requirement of ALDOT division personnel.

- An individual within each division should be designated with the grade crossing responsibility within their division. Since this individual will be responsible for securing the agreements the individual with responsibility for secondary roads would be a good choice.

- The railroads are required to maintain their ROW and control systems. ALDOT should not, therefore, develop plans for and not fund crossing surface work except for unusual circumstances.

- The ALDOT can establish, based on their experience with different material types, those types of crossing surfaces which are unacceptable. Specific brands are, however, difficult to specify under FHWA funding unless their selection is supported by reliability data.

- Since the FRA announcement of the grade crossing closure initiative in July of 1991, a number of States and railroads have actively pursued crossing closure. It is recommended that ALDOT identify impediments to crossing closure and establish procedures to effect closure. Some States that have established closure procedures include Florida, Mississippi, and Kentucky.

- The railroad crossing designee within each division should be vested with the responsibility of ensuring the proper installation and maintenance of advance warning signs and pavement markings. This responsibility includes both on and off system crossings. Local agencies should not be permitted to ignore the MUTCD grade crossing approach requirements.

- The lapse time from project identification can be reduced by changing the plan development method to sketches, vesting grade crossing responsibility to division secondary roads personnel, and performing the roadway approach work by State funds.

- ALDOT should establish criteria or develop a policy for the installation of gates. Such criteria can include the number of tracks, prior countermeasures, train and vehicle volume, angle of crossing and type of roadway user. In addition, criteria favorable to median installation at crossings and four quadrant gates should also be inspected.

- A tracking program should be developed to assist State personnel in determining the status of each program and the lapse time within each stage of project development. This need is outside of the capabilities of the current project.

- All engineering time including crossing selection, inspection and plan preparation should be billed to each crossing project for reimbursement through FHWA.

- Lump sum prices for typical crossing improvement types, train detection circuitry and surface improvements should be established with the primary Class I railroads.

- Railroad personnel should be required to be present at all crossing inspections. A number of crossings in close proximity to each other should be selected to maximize the field trip for ALDOT and railroad personnel.

- A methodological procedure for updating the railroad crossing inventory should be made as the final step in the project status tracking program.

- A list of planned crossings for crossing safety work in the next fiscal year should be forwarded to each railroad. The railroads will need to understand that this will be a tentative list and as such, will not provide accurate estimates of equipment needs.

- Overhead utilities that can provide the power drop or that will provide impediments to project installation should be noted on the plans. The location of underground utilities should be the responsibility of the railroad or its Contractor.

- The division personnel vested with the railroad responsibilities should periodically inspect the roundel alignment and roadway approach needs.

CHAPTER 3 - RECOMMENDED RAIL-HIGHWAY SAFETY PROGRAM AND SIGNAL PROJECT PLAN PREPARATION PROCEDURE

Through the application of the rail-highway safety program, Alabama has reduced the frequency and rate of train-vehicle accidents at grade crossings. While improvements have occurred, Alabama is still experiencing a relatively high number of train-vehicle accidents. One reason for the continued accidents is the relatively low proportion of Rail-highway intersections, compared to other States, that are signalized.

Alabama has a total of 4,230 public crossings of which only 291 are on the State roadway system with the remaining 3,912 crossings on local or county roads. Table 1 summarizes the status of the percent activated crossings and accident experience compared to other southern States. Alabama has the second lowest percentage of crossings equipped with gates and/or flashing lights. One consequence of the low percentage of activated crossings is that Alabama experiences the third highest vehicle/train accident rate.

Table 1 - Summary of the percent activated crossings and accident rate

State	Percent Active Crossings	Accidents per 100 Crossings
Arkansas	22.2	3.7
Alabama	21.2	4.1
Georgia	28.1	2.4
Louisiana	27.9	6.0
Mississippi	18.4	5.2

Sufficient Federal rail-highway grade crossing funds are available to signalize approximately 35 or more Alabama crossings per year. Frequently improving 35 crossings per year is not

achieved. Enhancements to Alabama's rail-highway signalization program are required to reduce accident potential and prevent the loss of Federal funds. Changes are recommended to the plan preparation procedure and project implementation process to expedite rail-highway crossing signalization improvements. The proposed changes and substantiating reasons are:

- Simplify Plan Documents. The Department developed detailed plans for each installation. Since the work is performed on the railroad right-of-way and governed by the standards of the MUTCD and guidelines of the AAR, detailed plans are not necessary. The major railroads, during recent meetings, concur with this recommendation.

- Crossing Surfaces. Maintaining the serviceability of the crossing surface is the responsibility of the railroad. Expenditures of program monies for surface improvements, for other than roadway widening projects, reduces the available funds for signalization. Funding surface improvement projects should, therefore, be limited considerably or discontinued.

- Division Personnel. An individual within each Division should be designated as the Railroad Coordinator. This person's responsibility will be to oversee and coordinate all of the Division's efforts regarding rail-highway signalization projects.

- Traffic Control. The majority of the railroad work for signalization projects occurs within the railroad's right-of-way. Railroads should be responsible for following the work zone traffic control requirements in Section G, Volume 1 of the MUTCD. In those cases where detours are required, it will be the responsibility of the railroad to coordinate with the appropriate ALDOT Division Railroad Coordinator to develop an acceptable traffic control plan.

- Warning Signs and Pavement Markings. Difficulty is frequently encountered with local agencies effecting the proper and timely installation of signs, stripings and markings. It is recommended, therefore, that the required signs, stripings and markings be installed by State forces for all rail-highway signalization projects. This will be for both on-system and off-system projects.

Recommended Rail-Highway Crossing Signal Plans

It is recommended that the plan document for grade crossing safety work consist of:

- Site location sheet.

- Quantity and cost sheet for work to be performed by State forces.

- Not to scale drawing of the project site which contains a verbal description of improvement recommendations and instructions to the railroad.

Principal items and changes from the current plan document and procedure:

- Simplification of the plan contents.
- No work required by cities or counties.
- ALDOT will install signs, striping and markings for all grade crossing signal projects; including off system crossings.
- Cities will be required to maintain off-system signs and markings.
- Traffic control will be the responsibility of the railroad.
- Railroad will be responsible for locating all utilities.

An example of the recommended grade crossing signal plans and cover letter is provided in appendix 5.

Responsibilities and Duties of Involved Agencies for Railroad Crossing Signal Projects

It is recommended that 1) the responsibilities of program personnel be clearly defined and 2) that a realistic sequence of program steps and associated completion times be established. A list of responsibilities and duties, by agency, for railroad crossing signal projects in presented below.

Rail-Highway Safety Division of the Traffic Engineering Section

1. Identify crossings in possible need of upgrading by using the U.S. DOT accident prediction formula.
2. Establish a diagnostic review schedule with the railroad and Division Railroad Representative.
3. During the site review, determine the required type of warning device, train detection circuitry, location of controller, presence of overhead utilities, clearing and grubbing, traffic signs, stripings and markings. These determinations will be made in conjunction with the Division Railroad Representative, local agency personnel, and railroad personnel.
4. Develop program document and forward to FHWA for approval.
5. After approval, advise Division to prepare plans and local government maintenance agreement and send PMS-1 form to the Assistant Chief Engineer.
6. Check the accuracy of plans and local government maintenance agreement prepared by the Division Railroad Representative.

7. Prepare a cover letter and supplemental agreement to be forwarded with the plans to the railroad.

8. Forward the plan packet to the railroad.

9. Review the cost estimate sent to the Traffic Engineering Section by the railroad.

10. Forward the executed supplemental agreement, local government maintenance agreement and signal plans to the Office Engineer for project authorization.

11. Receive progress reports on project status from ALDOT Division. Reports on progress are required for the project start date, date signals are placed in service, date of final inspection, and project acceptance.

12. Notify Office Engineer that project is completed and accepted.

13. Update all internal files and logs.

ALDOT Division Responsibilities

1. Request presence of local officials at field inspections for off-system crossings.

2. Attend the diagnostic reviews of rail-highway crossings and assist in determining the appropriate improvements.

3. Complete and submit to the Rail/Highway Safety Division of the Traffic Engineering Section the recommendation document form (to be developed).

4. Prepare the abbreviated plans for rail-highway signal projects and send PMS-1 form to Assistant Chief Engineer.

5. Obtain the executed local government maintenance agreement from the local governing agency.

6. Submit plans and local government maintenance agreement to the Rail/Highway Safety Division of Traffic Engineering Section.

7. Assist in projects when authorized.

    - Assist in traffic control efforts when necessary

    - Install required signs, striping and markings.

    - Review the progress of crossing improvement work and provide notification and status of work to the Traffic Engineering Section.

    - Notify the Rail/Highway Division of the Traffic Engineering Section of the date work begins, when signals are placed in service, date of final inspection and when project is accepted.

Local Government Agency Responsibility

1. Have personnel attend diagnostic reviews.
2. Execute local government maintenance agreement.
3. Maintain signs, striping and markings after completion of project.

Railroad Responsibilities

1. Have personnel attend diagnostic reviews.
2. Develop installation plans, circuitry diagrams and execute agreements.
3. Locate utilities at project site.
4. Arrange for or provide required work zone traffic control.
5. Arrange for and conduct crossing upgrade work.
6. Expedite all project requirements and activities.
7. Keep ALDOT Division Office notified of project status.
8. Participate in final inspection.
9. Maintain detailed records.
10. Submit final invoice.

A flow chart of the recommended rail-highway safety program procedure is presented as figure 2 and a detailed plan guide for developing rail-highway signal plans is presented as appendix 6.

Diagnostic Review Form

A new diagnostic review form was developed for use during the field inspections. The form was patterned after field review forms used by other States with necessary revisions to meet the needs of ALDOT. The form was presented to Division personnel and modifications made to address their comments. A set of instructions were also developed to assist personnel in completing the form. the instructions and the diagnostic review form are presented as appendix 7.

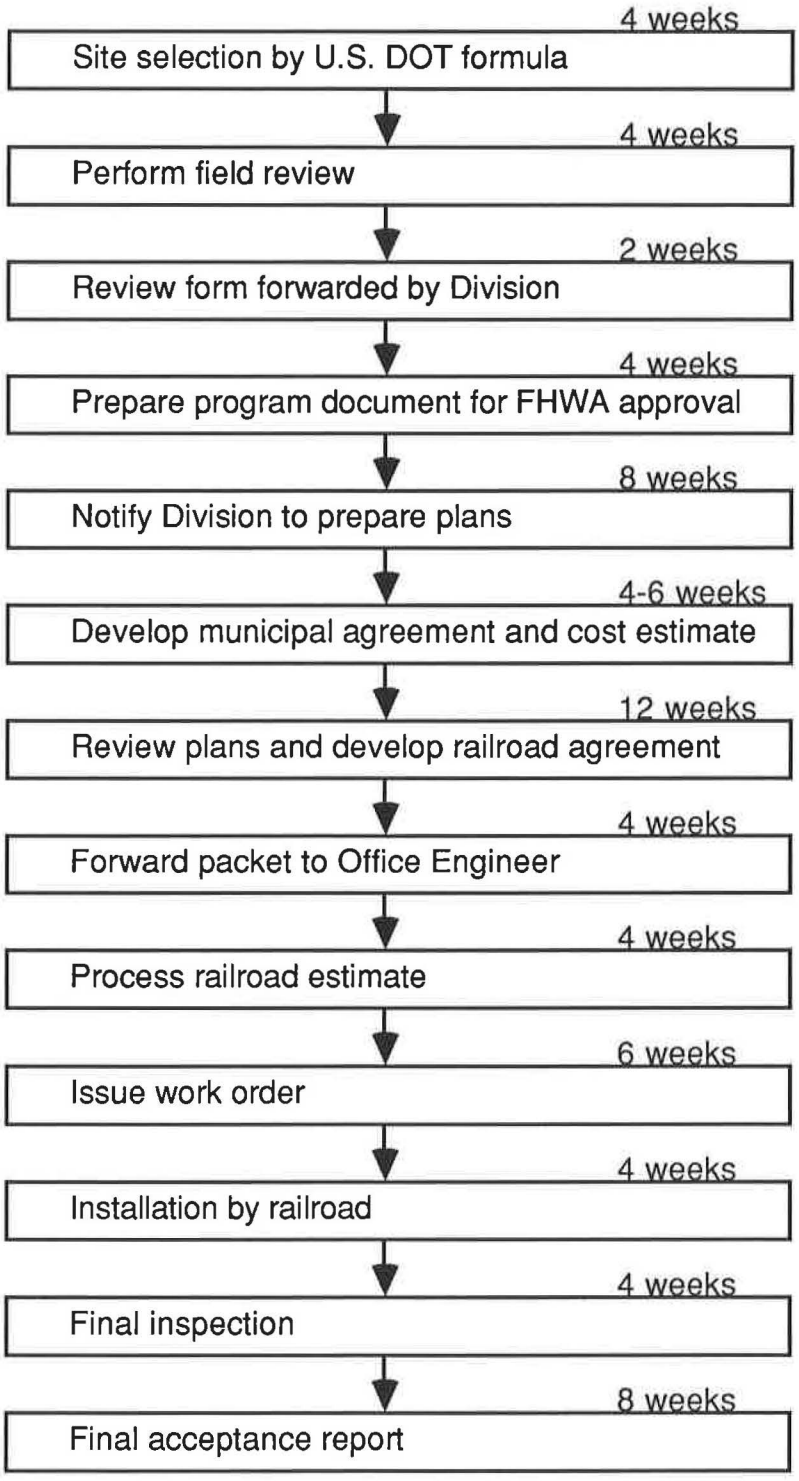


Figure 2 - Flow chart of rail-highway grade crossing improvement procedure

Training

A meeting was held on September 9, 1993 for the Division Railroad Representatives. The purposes of this meeting were to explain the changes in the proposed plan preparation procedure to obtain their input on program needs. Two, 2-day training courses were conducted on March 22-23 and March 24-25, 1994. The courses were restricted to ALDOT Division personnel that have the railroad grade crossing responsibilities. The minutes of the September meeting and the list of attendees at the training courses are presented as appendix 8.

Presentations on project progress and findings were provided on both a national and State forum. The national exposure was through the Transportation Research Board meeting in Washington, D.C. Exposure within Alabama was obtained by a presentation to the Annual Alabama Traffic Safety Conference on February 24, 1994 and to the Institute of Transportation Engineers on March 17, 1994. Four, 1-day training courses are also planned through the T^2 program for June 27 through 30, 1994.

The value of the presentations is that they increase awareness to Alabama's active role in increasing rail-highway grade crossing safety. The purpose of the training courses emphasize the proper method of conducting field inspections and completing the railroad signal plans.

CHAPTER 4 - ANALYSIS OF GRADE CROSSING PRIORITIZATION METHODS

A requirement of the Federal-Aid Policy Guide is that each state maintain a priority schedule of crossing improvements [7]. The priority schedule can be based on potential accident reduction, project cost, relative hazard or other criteria appropriate for each State. There are several advantages to using hazard indices or accident prediction formulae to rank crossings. These ranking methods remove subjectivity and are capable of being computerized, thereby, facilitating calculation. Many of the methods are based on modeling techniques that include operational and physical features in addition to consideration of accident history.

Prioritizing by mathematical models reduces the regression-to-the-mean artifact that is inherent to the consideration of accident frequency alone. Vehicle-train accidents are relatively rare events with the majority of public crossings (approximately 70 percent) in the United States not experiencing accidents during a consecutive 5 year period [8]. The occurrence of an accident at a particular crossing, therefore, does not indicate that an accident can be expected to occur in subsequent years. Analyzing only accident frequency, however, is assuming that the accident history is an average that is expected to occur. Mathematical models help mitigate this erroneous assumption by including additional variables that can contribute to accident occurrence.

An activity of this project required the mailing of a survey to determine current State practices in administering their crossing safety program. A summary of the survey responses, presented as table 2, indicate that there is a wide diversity in the methods used to prioritize crossings. The U.S. DOT formula is the single method used by the majority of States. Five States do not use a priority ranking method and rely on accident occurrence, public complaints, input from railroads and field inspections to identify deficient crossings. The State which uses the NCHRP 50 Formula is planning to change to the DOT prediction method and five States which use the New Hampshire Formula have either modified the method or are planning to change to the DOT prediction method. Some

of the States, Oregon for example, include a large number of variables in their prioritization methods. Eighty-three percent of the States which use the DOT formula are satisfied with the procedure. The predominant comment regarding the DOT formula is that it does not consider quadrant sight distance of roadway approach characteristics.

Table 2 - Summary of prioritization methods from the railroad-highway grade crossing survey

Prioritization Method	Number of States	States Satisfied with Method	States Not Satisfied with Method
Peabody Dimmick Formula	2	2	0
New Hampshire Index	6	5	1
NCHRP 50 Formula	1	1	0
U.S. DOT Formula	11	9	2
Other Quantitative	15	12	3
Nonquantitative	5	2	3
Totals	40	31	9

It is recommended that Alabama adopt the U.S. DOT formula to prioritize crossings due to 1) the survey results; and 2) FRA supports the U.S. DOT formula and provides a prioritized listing based on the method. The U.S. DOT accident prediction formula combines two independent calculations to produce an accident prediction value. The basic formula provides an initial prediction of accidents on the basis of a crossing's characteristics. The second calculation utilizes the actual accident history at a crossing over a determined number of years to produce an accident prediction value.

The basic accident prediction formula can be expressed as a series of factors that, when multiplied together, yield an initial predicted number of accidents per year at a crossing. Each factor

in the formula represents a characteristic of the crossing described in the national inventory. The general expression of the basic formula is shown below:

$$a = K \times EI \times MT \times DT \times HP \times MS \times HT \times HL$$

where:

a = Initial accident prediction, accidents per year at the crossing

K = Formula constant

EI = Factor for exposure index based on product of highway and train traffic

MT = Factor for number of main tracks

DT = Factor for number of thru trains per day during daylight

HP = Factor for highway paved (yes or no)

MS = Factor for maximum timetable speed

HT = Factor for highway type

HL = Factor for number of highway lanes

Different sets of equations are used for each of the three categories of traffic control devices: passive, flashing lights, and automatic gates. The final accident prediction formula can be expressed as follows:

$$A = \frac{T_o}{T_o + T}(a) + \frac{T}{T_o + T}\left(\frac{N}{T}\right) \quad \text{and} \quad T_o = \frac{1.0}{(0.05 + a)}$$

where:

A = Final accident prediction, accidents per year at the crossing

a = Initial accident prediction from basic formula, accidents per year at the crossing

$\frac{N}{T}$ = Accident history prediction, accidents per year, where N is the number of observed accidents in T years at the crossing

T_o = Formula weighting factor,

The formula provides the most accurate results if all the accident history available is used; however, the extent of improvement is minimal if data for more than five years are used. Accident history information older than five years may be misleading because of changes that occur to crossing characteristics over time. If a significant change has occurred to a crossing during the most recent five years, such as the installation of signals, only the accident data since that change should be used.

Study Objectives

The objectives of the prioritization study were to:

- Perform a comparison of priority ranking results between the accident frequency method based on Alabama's accident data base and the U.S. DOT formula based on the Federal Railroad Administration (FRA) accident data base.
- Perform a sensitivity analysis on the U.S. DOT formula's response to errors in traffic and train volumes.
- An analysis of crossings currently programmed for improvement.

Priority Ranking Comparison

Alabama has been using a quasi-accident frequency method of selecting and prioritizing crossing locations for improvement. It is a quasi method since occasionally crossings would enter the improvement list due to complaints and requests of local agencies. As a result a comparison of priority ranking results were performed between the accident frequency method based on Alabama's accident data base and the U.S. DOT formula based on the accident data base of FRA.

Comparisons were performed for the top 40 locations on the FRA prioritized list. This list was obtained from FRA and is based on applying the U.S. DOT formula to the FRA accident data base. This comparison necessitated an inspection of accidents reported as occurring for a five year period from 1988 through 1992. Comparison Between U.S. DOT Formula and Alabama Accident Frequency Methods.

The comparison between the ranking resulting from the U.S. DOT Formula and the Alabama accident frequency is presented as table 3. The 40 locations ranked by the U.S. DOT formula

considers operational characteristics but essentially acts as an accident frequency indicator. The formula's consideration of accident history tends to result in the high frequency locations being at the top of the priority list. There are some minor deviations from this tendency, however. An inspection of ranks 5 and 6 indicate that these locations, with 4 accidents, rank higher than a number of crossings (i.e. crossings ranked 8, 9,15,17 and 25) with 5 accidents. This minor shuffling of ranking takes place in a number of locations and indicates that the operational characteristics at the higher ranked crossings have a greater potential for accidents; even though the accident history is less than that of lower ranked crossings. This indicates that the U.S. DOT formula is working as designed.

If the U.S. DOT formula closely follows accident frequency, as indicated above, then the use of an accident frequency method should give comparable results. An inspection of table 3, however, indicates that this is not the case. Ranking by the Alabama accident data base results in only 17 in only 18 of the U.S. DOT ranked crossings being within the top 40. The crossings ranked as 6 and 7 by the U.S. DOT formula would have been ranked 123 and 296, respectively, by the Alabama accident frequency method. This indicates that 22 locations, in need of upgrade, would have been missed by the Alabama frequency method. A further inspection of table 3 indicates that only 4 of the 10 most accident prone locations would have been prioritized by the Alabama frequency method, therefore, results in the failure to properly identify crossings in need of timely upgrading. In addition, scarce resources are being expended on crossings which are ranked as low as 540 by the U.S. DOT formula.

Table 3 - Comparison between the U.S. DOT ranking and the Alabama DOT ranking

U.S. DOT Formula Ranking	Alabama Accident Frequency Ranking	Crossing ID	County	FRA Recorded Accidents	Alabama DOT Recorded Accidents	AL DOT Accidents Minus FRA Accidents
1	1	726-756J	Calh	10	10	0
2	5	728-006F	Jeff	7	5	-2
3	19	728-150X	Lee	7	4	-3
4	2	727-075K	Colb	6	5	-1
5	9	727-081N	Calh	5	4	-1
6	123	728-013R	Jeff	4	2	-2
7	296	351-369C	Esca	4	1	-3
8	25	727-839B	Mobi	5	4	-1
9	20	831-203Y	Lee	5	4	-1
10	44	728-016L	Jeff	3	3	0
11	13	351-317K	Esca	4	4	0
12	137	731-810K	Madi	4	2	-2
13	42	352-545B	Jeff	4	3	-1
14	39	727-051W	Fran	4	3	-1
15	29	726-016E	Tusc	5	4	-1
16	121	728-008U	Jeff	3	2	-1
17	7	351-389N	Bald	5	4	-1
18	48	352-067D	Lime	3	3	0
19	540	726-849D	St.Cl.	3	1	-2
20	181	726-940W	Walk	3	2	-1

Table 3 - Comparison between the U.S. DOT ranking and the Alabama DOT ranking (continued)

U.S. DOT Formula Ranking	Alabama Accident Frequency Ranking	Crossing ID	County	FRA Recorded Accidents	Alabama DOT Recorded Accidents	AL DOT Accidents Minus FRA Accidents
21	136	731-808J	Madi	3	2	-1
22	177	726-910E	Walk	4	2	-2
23	15	727-128G	Fran	4	4	0
24	23	351-459B	Mobi	4	4	0
25	11	727-610U	Dall	5	4	-1
26	54	727-836F	Mobi	3	3	0
27	67	727-089T	Calh	3	2	-1
28	10	727-100R	Colb	4	4	0
29	45	726-872X	Jeff	3	3	0
30	367	725-396K	Jeff	4	1	-3
31	74	727-710Y	Clar	3	2	-1
32	394	728-039T	Jeff	2	1	-1
33	36	351-342T	Esca	3	3	0
34	28	639-313J	Tall	3	4	1
35	166	728-276E	Tall	3	2	-1
36	Unknown	726-925U	Walk	3	Unknown	--
37	122	728-012J	Jeff	4	2	-2
38	130	725-376Y	Jeff	4	2	-2
39	21	731-790B	Madi	4	4	0
40	56	731-858M	Morg	3	3	0
			Total Accidents	163	122	-38

There is a large discrepancy in the number of accidents reported by FRA and the Alabama accident inventory. For the five year period, at the 40 crossings, FRA reports a total of 163 accidents. For the same period and crossings the Alabama accident inventory reports 122 accidents. In all but 12 crossings there were differences between the FRA and Alabama accident inventories. In all instances, with one exception, the difference was due to an under reporting of accidents by the Alabama inventory. One crossing, ranked 36, is not represented on the crossing inventory provided by Alabama. This may be due to a closure not reported to FRA or an inaccuracy in the Alabama data base. Accidents enter the FRA data base by reports submitted by the railroad; with quality control checks to reduce double entries. The Alabama accident data base relies on copies of the accident report being submitted by the enforcement agency responding to the accident. The differences between the FRA and Alabama accident data bases indicates that some local agencies are not forwarding copies of the accident report to the State.

Sensitivity of U.S. DOT Formula to Changes in Traffic and Train Volume

The U.S. DOT formula uses operational and physical data to obtain an initial prediction of accidents at each crossing. Two variables which are used to obtain this initial prediction are the traffic and train volumes. These volumes are multiplied together to obtain an exposure index. Since it is acknowledged that the traffic volumes are often inaccurate, and presumably the train volumes, it was of concern how inaccuracies in these variables would affect the priority ranking.

A sensitivity analysis was performed by investigating how the U.S. DOT ranking was influenced by the accuracy of traffic and train volumes. Predicted annual accidents were evaluated at individual sites when the exposure index was evaluated at -20%, -10%, 0%, 10% and 20%. The resultant predictions for each of the 40 top ranked crossings are presented as figure 3. Since it is a multiplicity factor which is being changed, the results imposed on each crossing is linear. The slope of the line, and hence, the effect of the exposure index change was greatest for crossing 1 which varied from an estimated annual accident frequency of 0.76 at -20% to 0.81 accidents at

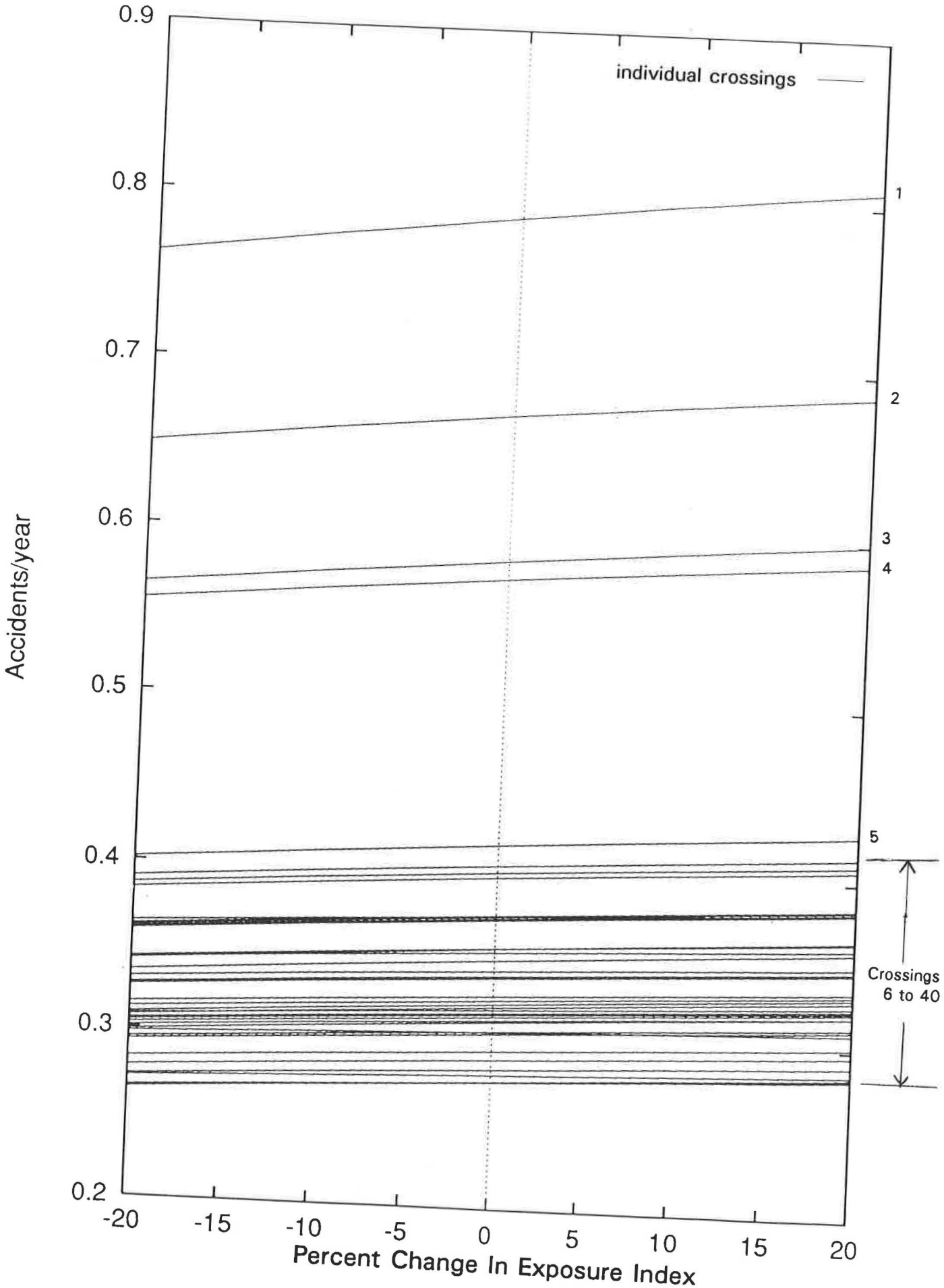


Figure 3 - Sensitivity analysis for 40% variation in the exposure index

+20%. This crossing had a relatively small traffic volume (490 ADT) and large total train volume (17 through, 2 switching). Crossings lower on the priority list had almost a zero slope change in estimated accidents. These crossings are characterized by larger traffic volumes and/or lower train volumes.

Recognizing that changes in the predicted accidents will occur, with variations in exposure, an analysis was performed to determine if a change in relative ranking would also occur. For each of the 40 ranked crossings the exposure index was fixed at 90%, 100% and 110% of the current values. The resultant accident prediction values were then plotted and connected by a vertical line. The vertical line displays the ranges of the accident prediction value when there is a 10% error in the exposure index. A similar analysis was performed by fixing the exposure index at 80%, 100% and 120% of the current values. The results for the 10% error is presented as figure 4 and for the 20% error as figure 5.

Figures 4 and 5 indicate that there is some change of ranks if errors occur in the exposure index. For example, figure 4 indicates that if the exposure index at crossing 2 is underestimated by 10%, and that of crossing 3 simultaneously overestimated by 10%, then crossing 3 will rank higher than crossing 2. The figures, however, indicate that the change in rank only occurs within a small range. A crossing will not raise or drop many places from its initial ranking. It is concluded, therefore, that accurate traffic and train volumes are important but that the U.S. DOT formula is not overly sensitive to errors in the exposure index. The largest probability for erroneous crossing omission or inclusion due to exposure error is in the lower ranks (i.e. positions 38 to 40).

Analysis of Crossings Currently Programmed for Improvement

Alabama is currently conducting a review of their grade crossing program and establishing new procedures for crossing prioritization, field reviews, plan preparation and program monitoring. Prior to this review crossings were selected for improvement based on accident frequency, complaints and requests. The result is a large number of crossings programmed for improvement

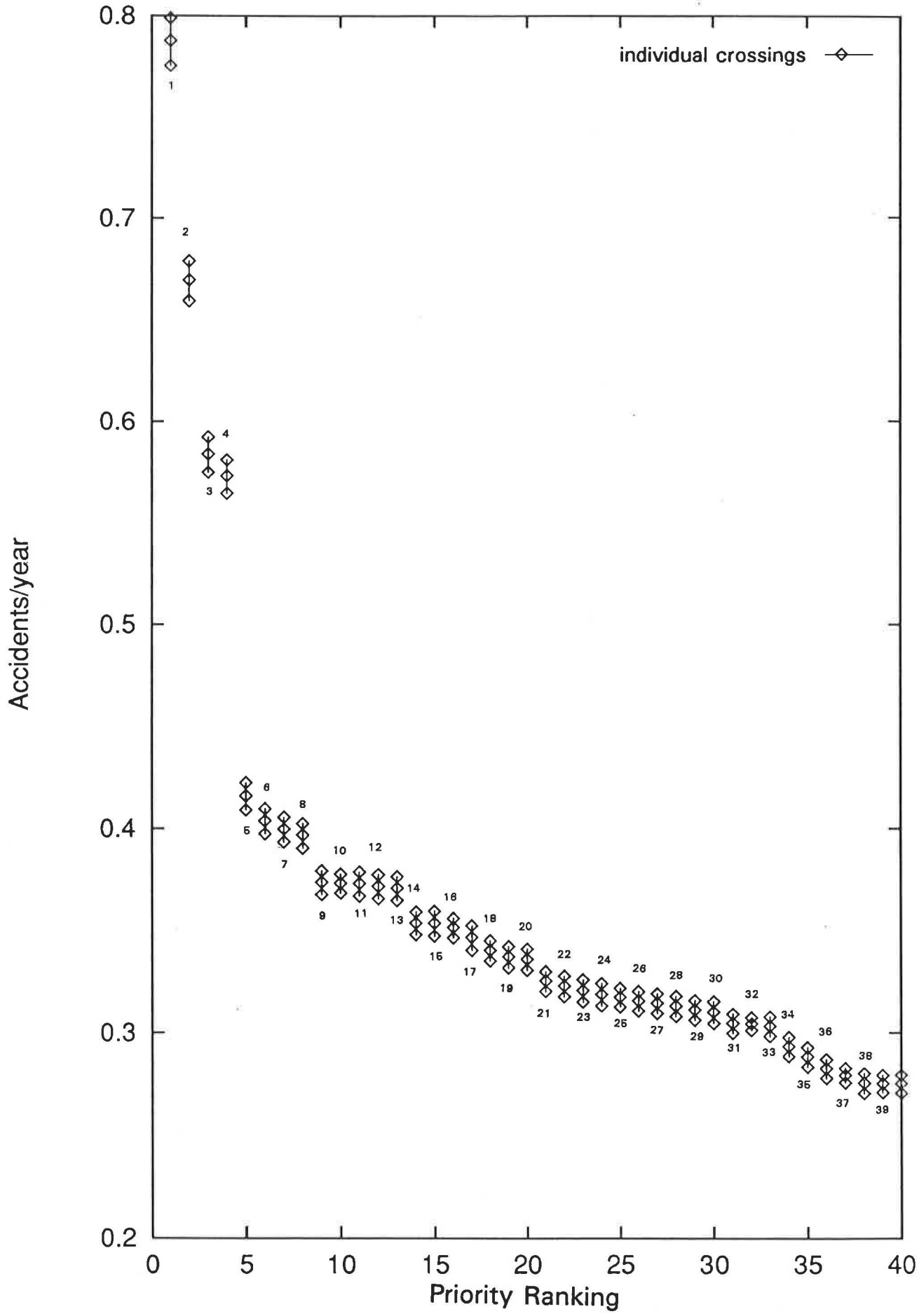


Figure 4 - Sensitivity analysis for 10% error in the exposure index

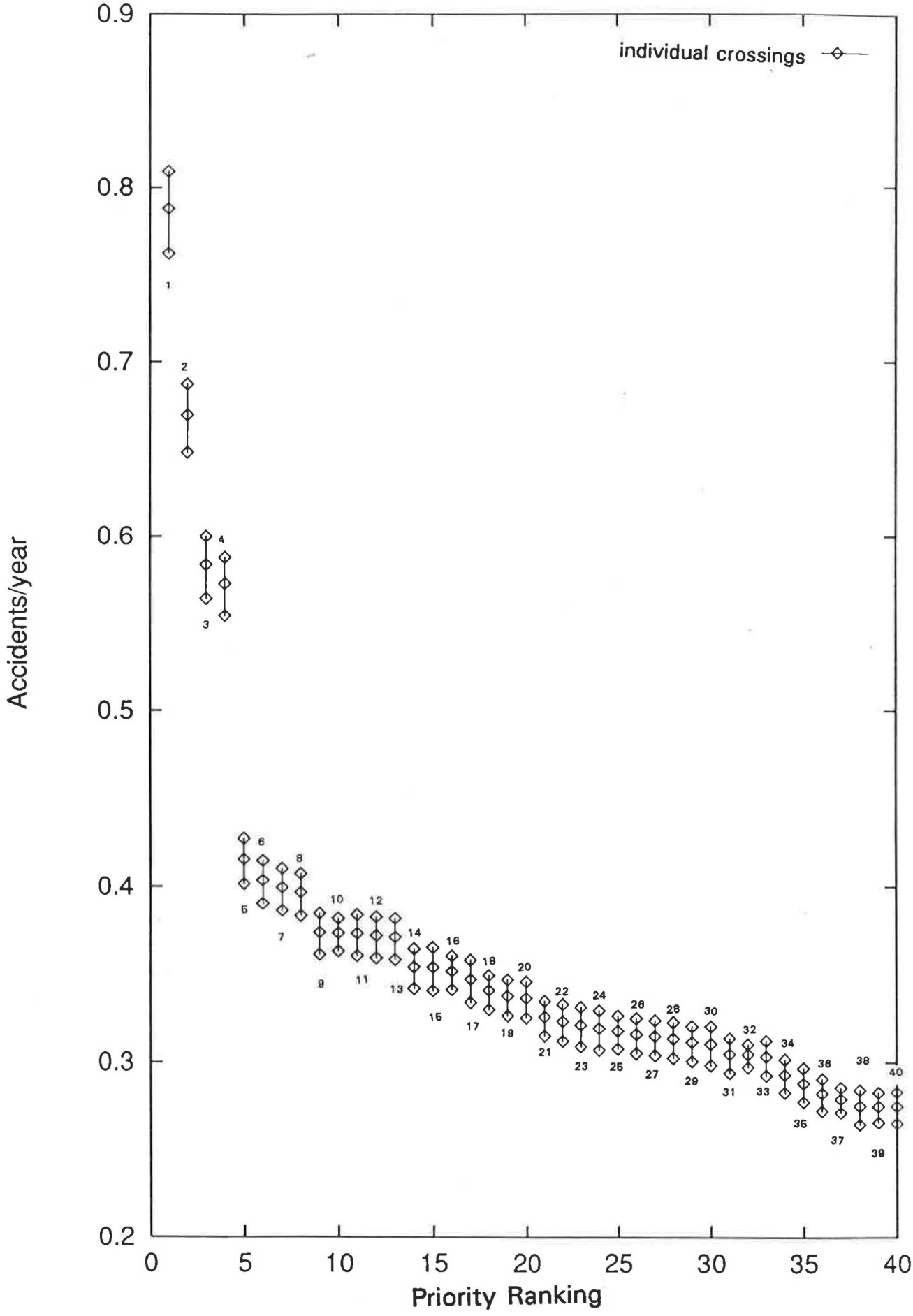


Figure 5 - Sensitivity analysis for 20% error in the exposure index

that have a very low U.S. DOT formula ranking. A list of the programmed crossings, their respective ranking, crossing ID number and status is presented as appendix 9 - 11.

There are 172 crossings, 56 on-system and 116 off-system, that have been programmed for improvement. This is an unrealistic number of programmed crossings. Sufficient funds exist to only improve approximately 35 crossings per year. Implementing improvements at all of the programmed crossings would result in the use of all of the crossings improvement funds for the next 5 years. The result will be the inability to correct the crossings that currently rank high by the U.S. DOT formula.

It is difficult to justify expenditure of funds for the majority of crossings on the programmed list due to their low ranking. Some of these crossings have been on the programmed list for a large number of years. Changes in traffic volumes, geometric conditions, land use and train activity will have undoubtedly occurred since the time of their initial selection. Even if the crossings were initially selected due to a high ranking they have not maintained sufficient activity to a high priority ranking. The current low ranking plus the possibility of these crossings being programmed due to complaints or other nonquantitative methods indicates that the majority of them should be dropped from the programmed list.

It is recommended that the current programmed list be closely scrutinized to determine which crossings should be retained. Any crossing which is not ranked in the top 40, does not have unusual geometrics or sight restrictions and have not been forwarded to the railroads should be dropped from the list. In addition, any crossing which is retained on the list and has not had the field review conducted within the last two years should have a new field review to determine if changes have occurred.

Tables 4 and 5 contain a summary of status by rank for on and off system crossing programmed for improvement. Only 17 of the programmed crossings are ranked within the top 40 by the U.S. DOT formula and only 6 are within the top 10. Agreements have been forwarded to, or received from, the railroads for 32 crossings. Only 3 of these 32 crossings have a ranking in the top

40 and 15 are ranked at 590 or higher. This type of programming is not meeting the needs of Alabama and represents a waste of scarce resources.

In summary it is recommended that the project folder of each crossing not within the top 40 rank and not forwarded to the railroad be reviewed. If no unusual geometric or operational conditions or sight restrictions are found then they should be dropped from the programmed list. The number of crossings which can realistically be funded, considering the 32 programmed crossings with the railroads, should be established. The realistic number of fundable improvements should then be used to develop a new priority list.

Conclusions Resulting From Priority Analysis

- The U.S. DOT formula is effective in prioritizing crossings by accident potential. Those crossings with high accident history are at the top of the prioritized list. Crossings with operational and physical characteristics which increase accident probability are ranked higher than other locations, with higher accident history, but less critical operational and physical characteristics.

- Ranking crossings for improvement based on accident frequency from the Alabama accident inventory results in; 1) the failure to identify locations in need of immediate upgrade; and, 2) the expenditure of funds on crossings which are not in immediate need of upgrade. The result is the failure to optimize the expenditure of improvement funds to increase crossing safety.

Table 4 - Summary of progress for programmed on-system crossings

U.S. DOT Ranking	Plans in Division	Agreement to R.R.	Agreement from R.R.	Office of Engineering	Total
1-10		1			1
11-20		1	1		2
21-30	1			2	3
31-40	1				1
41-100	2	1	1	1	5
101-500	6	3	1	4	14
501-1000	7	1	5	2	15
1001-1500	4		1	1	6
>1500	1		1	2	4

Table 5 - Summary of progress for programmed off-system crossing

U.S. DOT Ranking	Plans in Division	Agreement to R.R.	Agreement from R.R.	Office of Engineering	Total
1-10	3	1			4
11-20	1			1	2
21-30					
31-40	2			1	3
41-100	9				9
101-500	33	2	4	3	42
501-1000	22	2	2	1	27
1001-1500	11		1	1	13
>1500	7	1	1	1	10

- The Alabama accident data base is not as reliable as the FRA accident data base in reporting crossing accidents. Of the 40 crossings analyzed only 12 crossings had an equal number of FRA and Alabama data base accidents. In all cases, with one exception, the difference was due to an under reporting of accident frequency by the Alabama data base.

- The crossing inventory used to rank the crossings by Alabama accident frequency does not agree with the U.S. DOT/AAR inventory. One crossing (726925U) is not contained on the Alabama inventory. This discrepancy was noted by a comparison of 40 locations. This leads to the conclusion that there are probably many discrepancies between the two complete data bases. It is recommended that; 1) the discrepancies be identified; 2) the correct entries be posted to the FRA data base where discrepancies exist, 3) effort be taken to update ADT's and other data on the FRA and Alabama inventories.

- There are 172 crossings currently programmed for improvement. Only 18 of these crossings are ranked within the top 40 by the U.S. DOT formula. Of these 18 only 6 are within the top 10 rank of the U.S. DOT. It is recommended that the current list be closely scrutinized and those crossings that cannot be justified by unusual geometrics or sight restrictions, and not yet forwarded to the railroads, be dropped from the program. AMTRAK and those crossings ranked highest on the U.S. DOT list should be scheduled for improvement.

- There can be changes in the relative ranking of crossings, by the U.S. DOT formula, if there are errors in traffic and train volumes. Sensitivity analysis, however, indicates that the change in rank only occurs within a small range. A crossing will not, therefore, raise or drop many places from its initial ranking.

- It is concluded that accurate traffic and train volumes are important but that the U.S. DOT formula is not overly sensitivity to errors in the exposure index. The largest probability for erroneous crossing omission or inclusion due to exposure error is in the lower ranks (i.e. positions 38 to 40).

CHAPTER 5 - SUMMARY OF RECOMMENDATIONS

Activities of the Alabama Rail-Highway Safety Program project resulted in the identification of program elements that could be enhanced to improve effectiveness and efficiency. The following actions, with support criteria are the principal recommendations resulting from project activities.

- Vest the railroad grade crossing responsibilities to one individual within each Division office

  The inspection of, and determination of appropriate countermeasures, for railroad grade crossings requires knowledge of train operation and detection characteristics. In addition, rail-highway projects require coordination with agencies and involve procedures not encountered during typical highway safety projects. These differences indicate that the rail-highway safety program would be more efficient with one designated individual within each Division office who is trained in effecting the Division's rail-highway program.

- Better coordination with railroads

  Annual meetings should be held with each railroad to coordinate planned upgrades and to discuss and help identify crossings with possible problems. These meetings will enable railroads to notify suppliers of possible equipment needs and reduce implementation time.

- Increase emphasis to local governments on the importance of rail-highway approaches and crossings

  Total roadway agencies must become active participants in the rail-highway safety enhancements. Over 93 percent of the public grade crossings in Alabama are located on off-system roadways. Observations made during the highrail trip indicate that the majority of pavement markings and signs on the roadway approaches are not in compliance with the MUTCD. The potential liability that local governments risk is enormous. A method should be developed that will make the officials of local agencies aware of the monetary consequences that can be encumbered by failing to properly maintain roadway approaches to grade crossings. This can be accomplished by short presentations during City Council or Planning Commission meetings, presentations for meetings of elected officials or through correspondence from ALDOT.

- Perform a major update to the rail-highway crossing inventory

  Alabama's rail-highway crossing inventory is out-of-date. The survey of States indicates that this is not unusual with the majority of responses indicating problems with inventory accuracy. The inventories were initially developed in the early 1970's. Subsequent changes to roadway volumes and geometrics, roadway names and roadway jurisdiction have resulted in large amounts of obsolete data.

- Develop a timely inventory update procedure

  The new diagnostic review forms require data elements that can be used to help maintain inventory accuracy. A method should be developed that will incorporate these data items into the inventory. The constant upgrading of critical data items will help ensure accurate prioritization of crossings and prevent inventory obsolescence.

- Adopt the new rail-highway signal plan preparation procedure

  A contributing factor to the delay in project implementation was identified as the complexity of plans forwarded to the railroads. Most railroads do not require an engineering grade, to-scale diagram of the crossing or placement of the improvements. Since the work is performed on the railroad right-of-way and governed by the standards of the MUTCD and guidelines of the AAR, detailed plans are not necessary. The major railroads, during recent meetings, concur with this recommendation.

- Require the railroads to assume responsibility for traffic control

  The majority of the railroad work for signalization projects occurs within the railroad's right-of-way. Railroads should be responsible for following the work zone traffic control requirements in the MUTCD. In those cases where detours are required, it should be the responsibility of the railroad to coordinate with the appropriate AHD Division Railroad Specialist to develop an acceptable traffic control plan.

- Reduce the level of funding for crossing surface improvements

  Maintaining the serviceability of the crossing surface is the responsibility of the railroad. Expenditures of program monies for surface improvements, for other than roadway widening projects, reduces the available funds for signalization. Funding surface improvement projects should, therefore, be limited considerably or discontinued.

- Perform the roadway approach work with State forces

  Difficulty is frequently encountered with local agencies effecting the proper and timely installation of signs, stripings and markings. It is recommended, therefore, that the required signs, stripings and markings be installed by State forces for all rail-highway signalization projects. This will be for both on-system and off-system projects.

- Adopt a policy of 100 percent funding for off-system crossings

  Some small cities and rural agencies have such a small operating budget that contributing the 10 percent share can pose difficulties. If the crossing was identified from the Statewide priority process as being deficient, then the inability of the local agency to provide the 10 percent does not make the crossing any less deficient. To reduce grade crossing accidents emphasis must be placed on off-system crossings which accounted for over 93 percent of Alabama's at-grade crossings. Alabama is already pursing strategies, such as 100 percent funding or closure of one crossing for upgrade of others, rather than drop projects due to lack of local participation. The

feeling of partnership can be obtained by an agreement, prior to upgrade, that the local agency will maintain the pavement markings and traffic signing on the approaches.

- Use the U.S. DOT formula method to prioritize crossings for improvement

  The U.S. DOT formula considers operational and physical characteristics at the crossing, in addition to, accident history. It is used by the majority of States, is applied on request by FRA and is a better predictor of accident potential than the use of accident frequency alone. It will also place the State in a better litigation position since it is a method accepted by the U.S. Department of Transportation.

- Encourage Legislative action to facilitate crossing closure

  Effecting crossing closure can be a difficult task especially on off-system roadways. Legislative action, vesting closure authority with the ALDOT, can be an effective tool in effecting the removal of little used and redundant crossings.

- Develop a computerized program procedure and tracking system for rail-highway signalization projects

  The complexity of rail-highway signalization projects often results in a long period of time from crossing identification to countermeasure installation. This time could be substantially reduced by a computerized tracking system. The system would have the capability of identifying the status of each project, expected time to completion of each step, and be capable of upgrading project and program activity logs.

- Develop a crossing improvement prioritization scheme that is capable of being implemented

  There are 172 crossings currently programmed for improvement. Only 18 of these crossings are ranked within the top 40 by the U.S. DOT formula. Of these 18, only 6 are within the top 10 rank of the U.S. DOT. It is recommended that the current list be closely scrutinized and those crossings that cannot be justified by unusual geometrics or sight restrictions, and not yet forwarded to the railroads, be dropped from the program. AMTRAK and those crossings ranked highest on the U.S. DOT list should be scheduled for improvement.

REFERENCES

1. Dettmann, C.E. Presentation at the 1993 National Conference on Highway Rail Safety, St. Louis, MO, July 12, 1993.

2. Federal-Aid Policy Guide, U.S. Department of Transportation, Federal Highway Administration, Washington, D.C., December 9, 1991.

3. Tustin, B.H., Richards, H., McGee, H. and Patterson, R., Railroad-Highway Grade Crossing Handbook - 2nd Edition, Report Number FHWA TS-86-215, Office of Implementation, Federal Highway Administration, Washington, D.C., 1986.

4. Traffic Control Devices handbook, U.S. Department of Transportation, Federal Highway Administration, Washington, D.C., 1983.

5. Rail-Highway Crossing Accident/Incident and Inventory bulletin, No. 14, Federal Railroad Administration, Office of Safety, Washington, D.C., July 1992.

6. Unpublished survey by the Norfolk Southern Corporation Fine Number 117-24098-AL (TDW), Atlanta, GA, April 1991.

7. Federal-Aid Policy Guide, U.S. Department of Transportation, Federal Highway Administration, Washington, D.C., December 9, 1991.

8. Pennell C., et al. Synthesis of Safety Research, Related to Traffic Control and Roadway Elements. Volume 2. Federal Highway Administration, Washington, D.C., 1982.

APPENDICES

Appendix 1

Minutes of Meeting Between Alabama Highway Department and Norfolk Southern Railroad March 4, 1993

The following individuals were in attendance at the meeting:

Michael Williams	NS, Grade Separations	404-529-1362
Linda Hill-Everett	NS, Contracts & Conveyancing Dept.	404-529-2387
Ann Miles	NS, Contracts & Conveyancing Dept.	404-529-2344
Bob Kratzer	AHD, Agreements	205-242-6253
Brian Bowman	Auburn University	205-844-6262
William J. McAteer	AHD	205-242-6004
Linda Harris	AHD	205-242-6131
Clarence Hodges	AHD	205-242-6258
Cecil W. Colson, Jr.	AHD	205-242-6128
David Wyatt	NS, Grade Separations	404-529-1641
Arthur T. Hanak	NS, Admin. Hwy. Grade Crossings	404-529-1234
Wesley E. Elrod	FHWA	205-223-7380
Bill Fleming	AHD, O.E.	205-242-6524
John Baker	NS, Resident Vice President	205-262-7602
Joe Sims	NS, Real Estate Engineering	404-529-1422
J.W. Smith	NS, Comm. & Signals	404-529-1250
Conrad Golias	NS, Signal & Electrical	404-527-2868

Cecil Colson stated that he had recently been vested with responsibility of Alabama's rail/highway safety program and that there was a number of purposes to this meeting. One of the purposes was to introduce members of the Highway Department to the Norfolk Southern Railroad personnel. Another purpose was to find out what methods Alabama Highway Department could use to make the program move faster. Specifically, Cecil expressed interest in those methods that will cut the red tape and reduce the amount of time from project identification to implementation of the appropriate countermeasures.

Wesley Elrod (FHWA) stated that his reason for attending the meeting was to acquaint himself of Norfolk Southern (NS) people and to mention some policy changes prompted by the new Intermodal Surface Transportation Efficiency Act (ISTEA) and by procedural changes within FHWA. One million dollars is the threshold that needs to be expended on a project before FHWA review is required. Surface Transportation Projects (STP) are primarily the responsibility of each State. The necessary review and approval of all railroad grade crossing and safety work using Federal funds is now the responsibility of one FHWA representative in each area. For Alabama that representative is Wesley Elrod . All projects are reviewed on a program basis by FHWA.

Cecil Colson stated that he had recently contacted representatives from the State of Georgia regarding their rail highway safety program. Some interesting

information came out of these contacts that Cecil would like to investigate for possible adoption within Alabama. For example, Georgia has no railroad representative present during their field review. If the railroads were agreeable to this, it could save a lot of administrative time and facilitate the field review process.

NS stated that they would rather not go on field reviews as part of our diagnostic team. Doing so results in NS personnel going to the site two times. NS sends out an engineer or the contractor for review after the request for specific projects have been received. Furthermore, NS stated that there is no need for an individual State to forward detailed plans for the installation of flashing lights or gates in the majority of cases. The American Association of Railroads (AAR) and the Manual of Uniform Traffic Control Devices (MUTCD) have standard plans that are applicable in almost all instances. These standard plans in addition to the general guidelines, (i.e., on offsets that are used by NS), result in standard drawings already being available.

Wes Elrod stated that possibly the AHD could send general plans and then each individual railroad change these plans as necessary.

NS stated that they would prefer to receive requests as simply statements of need, i.e., the State would send a request stating that what is required is gates, cantilevers, lights, etc., and then allow the railroad to install these devices according to the MUTCD and the AAR established standards.

NS stated that it would help if, in addition to the requests for specific need they receive from the Highway Department, information on the presence and location of overhead and underground utilities that would impact the installation process. Identifying these items up front reduces the possibility of unpleasant surprises and contractor change orders during installation.

NS stated that they treat the type of agreement required for surface work separately from agreements which are required for bridges and crossing warning device work. They stated that they would be willing to work with the AHD up front to set up standard agreements for these different types of work. Separating these agreements would reduce the amount of time NS spends to review and approve each project.

Colson stated that he was not aware of this and that currently AHD places signal, surface, and all types of requests to railroads in one type of agreement.

NS stated that this results in different routing for authorizing signatures for surface work, signal, bridges, since they are all handled by separate departments. This is why there is an increase in turn around time for NS when all these items are included in one agreement.

NS stated that separating projects on different agreements can have disadvantages in certain cases. One disadvantage is that uncoordination can exist for new road installations or road widening. In these instances it is preferable to have everything together in a package.

NS was asked if their review process would be expedited if certain types of projects were funded as lump sum agreements. NS said that they were agreeable to lump sum agreements for standard straight forward work and upgrades.

NS was asked if they prefer a certain type of surface crossing material or surface crossing design. NS stated that they prefer standard timber guarded asphalt design with some full depth rubber pads considered as being okay.

Cecil Colson stated that AHD does not specify any brand of rubber pads, but have had some problems with certain types. Cecil wondered if NS had any particular types of rubber pads that they had better experience with. NS responded that they did not recommend any particular product. Wes Elrod stated that if generic pads were not specified, there would have to be something to backup recommending a particular manufacturer. This could be accomplished by NS having the policy for a particular manufacturer supported by reasons. In this instance FHWA could accept specific manufacturer recommendations.

NS stated that one type of crossing they do not want is concrete. Their experience with concrete crossings has been very poor, especially on those lines carrying large volumes of train traffic.

NS entered into the general discussion on the advantages and disadvantages of separate agreements. They mention the fact that separate agreements require additional paperwork and pricing agreements on the part of the Highway Department. They also mentioned the fact that agreements for upgrades should be forwarded to J.W. Smith and agreements for new roads forwarded to _____.

NS stated that a recent initiative of the Federal Roadway Administration (FRA) to obtain a 25% closure of railroad grade crossings is something they support whole heartedly. They are taking every opportunity they can to close crossings but frequently run into problems getting local municipalities and highway agencies to agree to closures. There have been instances where closures have been agreed to by all parties only to wind up in court with a judge deciding whether the railroad grade crossing should in fact be closed. The ability to close crossings could be facilitated by State legislative action. For example, Illinois has recently passed legislation that enables the highway department to close crossings without going to court. The railroad is very interested in doing what is necessary to get similar legislation for Alabama. They further stated that they would prefer not having the authority for railroad grade crossing closure vested in any public utility commissions.

NS (and most railroads) pay close attention to the structural integrity of the bridges. Bridge failures, besides the obvious safety consequences, result in huge expenditures for the railroads both in repair work, lost equipment, and loss of productivity. Norfolk Southern also indicated that they would like to be appraised when maintenance inspections of bridges are going to take place and if possible, to participate in the actual inspection. There have been instances, for example, when the free cantilevered end of a wooden structural bridge member has been eroded. In some instances the State inspector will state that the bridge is not structurally sound and in need of maintenance. In this example it is not true since the free end is not load bearing and can be merely cut off. While its actual solution to the problem is quick, the amount of paperwork resulting from this is not. NS believes that instances of this nature could be reduced if in fact an NS inspector accompanied the state inspector during the maintenance review.

NS stated they could forward to AHD a list of crossings that they consider as in need of additional work and inspection. Cecil Colson said that such a list would be more than welcome.

Cecil Colson stated that AHD's priority will be to signalize unsignalized crossings.

NS stated that some locations that have high accidents in Alabama are already signalized but need to be upgraded to newer modeled equipment. NS also stated that there is an Alabama division grade crossing task force that meets monthly to discuss crossing safety. AHD personnel are welcome to attend these meetings which are used to discuss specific improvements needs. NS also has computer programs and near miss information that are generated monthly. AHD is welcome to obtain copies of this information by contacting Mr. McGinnis at 205-951-4737. NS also stated that the Department of Transportation (DOT) crossing inventory number should be included on all crossing agreements and correspondence.

Cecil Colson asked if anyone at the meeting was aware of any State which would provide 100% funding for grade crossing improvements on local roadways. He stated that AHD had a policy of not funding crossing improvement projects when the local governments refused to contribute their portion of the funding. No one at the meeting knew of other States that would buy out the local government participation.

Norfolk Southern suggested that they might be willing to participate in the funding of grade crossing improvements if it was a negotiating item with respect to closure. NS does not want to set a precedent for contributing to the local funding portion of grade crossing improvements, but NS will sometimes work by coming in the back door. For example, NS has contributed computers for schools in return for closure of other crossings. The general feeling of NS, however, is that if grade crossing improvements are in fact important then the local community should be willing to put up their share of the funds.

Cecil Colson asked NS personnel about traffic control during grade crossings improvement projects. NS said that they are now and will work in the future with locals to provide traffic control during installation. There are, however, no formal traffic control plans that are used, but rather the guidelines of the MUTCD and work zone standards are followed. NS mentioned that in the majority of the cases the work that is being done is out of the roadway and minimal or no traffic control is required. The exception to this are projects that are related to surface improvements at which time applicable standards are followed.

Cecil Colson stated that Tom Espy had required review of all class 2 and class 3 railroads. This review resulted in the prioritization of improvements to class 2 and class 3 railroads. What is remaining, therefore, for current work is class 1 railroad improvements. NS responded that they would appreciate knowing the anticipated number of agreements and active projects planned for the next year. In response personnel from AHD produced a list of projects and explained that the abbreviations RRP, RRS, and SPRR were Alabama codes for highway projects.

A general discussion on the NS procedure for grade crossing improvements was then presented. NS said that when requests and agreements are received from the AHD the request is forwarded to the engineer for an estimate. If the NS engineers estimate is lower than that in the agreement, then the procedure continues. For NS's purposes authorization for construction can be obtained after a review signature is affixed to the agreement. AHD currently requires an attest signature to agreements which is a whole new ballgame. Individuals who can attest for the railroad are at a higher level within NS than the people who are authorized to provide a review signature. When the contractual agreement requires an attest signature, therefore, the amount of time required to get the agreement through NS is increased dramatically. The contractual agreements can be expedited by getting rid of the attest requirement. After signature the agreement and estimate are forwarded back to AHD and NS waits until authorization to proceed is received. From the receipt back to AHD and the authorization to proceed, the AHD needs to obligate state and local funds. If more than one year expires between NS's signature and the authorization to proceed, then NS considers the estimate expired and the procedure has to start again.

Cecil Colson mentioned that there are no firm guidelines on when gates should be installed. His contacts in Georgia mentioned that Georgia wants gates at just about every place that they are going to be putting in flashing lights. AHD just wants gates at places with multiple moves. NS said that their general policy is to recommend gates when there is more than one track present or when the speeds are 60 mph or greater. They mention that gates require more maintenance, but they are also so much more effective that they prefer gates at main lines and high speed installations.

NS also mentioned some other procedural differences that could be used to help expedite projects. One of these has to do when projects require the use or the acquisition of railroad right of way. It is easier for the railroad to process requests that require use of railroad right of way when a sale of property right is not requested. The

land owned by the railroad varies drastically in value from locality to locality and all is not free of mortgage. Requesting a sale of property right requires a property description by metes and bounds. This requires record search, surveying work, and legal attention that could be avoided by requesting a construction right rather than a sale of property right. Grade crossing agreements done with construction right results in no transfer of property. This is done in Georgia and the provided easements make it easier, cheaper, and faster than property right acquisition. Possible exceptions to this are in areas such as Birmingham that are high priced lands and when the agreement is for something other than a straight across crossing.

The railroad does not like parallel land acquisition or construction rights for anything that is within 25 feet of the track. Construction rights are possible in these instances, but not until a significant struggle takes place.

NS also mentioned that property transfers can be speeded up by handling it as a separate estimate for grade crossing projects. NS would also like to see some construction plans up front when temporary property taking or property transfer requests are initiated. They also mentioned that force account agreements are a better instrument for transfer of property rights, but this cannot be done for parallel property transfers.

NS asked if there is an AHD organizational chart that would help them identify who to contact with regard to railroad safety projects, bridge projects, and right of way problems. Cecil Colson mentioned that an organizational flow chart for the AHD would be developed and forwarded to NS.

NS asked if the new agreements for the railroads will be the same as that used by AHD in the past. Bob Kratzer of AHD responded yes, it would be the same unless results of this meeting and subsequent talks with NS could identify items which would expedite the current process. Ann Miles from NS indicated that changes that she pencils in on agreements from AHD should be permanently posted to word processing for use in later contracts. Ann mentioned that she reviews the agreements word for word, and any deviations from the norm require her to do a lot of explaining. Ann mentioned that posting the changes and then being consistent with each type of agreement would help expedite the approval process.

Cecil Colson inquired if the railroad's liability insurance would go up if the railroad was to perform traffic signal installations. Ann Miles mentioned that traffic signal agreements are supplemental agreements. Supplementals to agreements must be attested, and as previously discussed, this is going to increase the amount of time. NS also mentioned that agreements in all company correspondence should be addressed to the proper individual.

NS mentioned that in July of 1992 they tried to obtain insurance at a higher level than 20 million. They wanted this higher level of insurance for Amtrak routes. NS also mentioned that their current insurance agreements allow contractors to buy

into the railroad policy thereby indemnifying the railroad and making it easier for contractors to obtain the required insurance. NS mentioned that the office in Roanoke, Virginia is in charge of the billing for contract work. NS also feels that something must be worked out so that the railroad is not required to pay up front for any portions of their cost share. There have been cases in the past where the railroad has paid their portion up front, the project is never implemented, and the railroads have a heck of a time getting reimbursed.

Cecil Colson asked if NS had any overpass recommendations. NS responded that such a list could be provided to the AHD. NS also said that what they want to do is get out of the highway bridge business. Currently NS has responsibility for some highway bridge maintenance. They have gone into 80/20 bridge replacement projects where they will actually pay 50% of the local share with the understanding that the local agency will then assume responsibility for future maintenance.

NS stated that they consider their participation in preconstruction meetings as vital to the interest of the railroad. They also stated that their participation in the final inspection is necessary. If they do not participate in the final inspection, they cannot close out the projects. There have been instances where there has been a lack of communication. The project is finished. The railroad is not appraised of it, and the project is not closed out nor final payments made. The other item that the railroads would like to see is that they remain appraised of bridge maintenance inspection results and to actually participate in the field inspections when possible.

NS mentioned that there had been prior surveys of State practices. They expressed a willingness to forward the results of these surveys to AHD and mentioned that the Nashville meeting would be a good time to help fill in some of the elements on a new AHD questionnaire.

Meeting adjourned.

Appendix 2

MINUTES OF MEETING CONDUCTED BETWEEN
ALABAMA HIGHWAY DEPARTMENT AND
BURLINGTON NORTHERN RAILROAD ON
MAY 10, 1993 IN MONTGOMERY, AL

Attendees:

Brian L. Bowman	Auburn University (AU)
Cecil Colson	Alabama Highway Department (AHD)
Wes Elrod	Federal Highway Administration (FHWA)
Linda Harris	Alabama Highway Department (AHD)
Robert Kratzner	Alabama Highway Department (AHD)
J. Allen Kuhn	Burlington Northern Railroad (BN)

Cecil Colson conducted the meeting by using a list of nine primary agenda items. The major discussion items and relevant findings are summarized below.

- Kuhn stated that BN considers it important that railroad personnel are part of the safety inspection diagnostic team. If the railroad is part of the team then decisions concerning equipment needs appropriate for train operations can be made during the field inspection. The early identification of these needs such as motion sensors or constant warning time devices can reduce lost time and provide reliable early estimates of total cost. Kuhn also stated that he thinks AHD should have input as to where the crossing control box (bungalow) is placed. The railroad's concern for bungalow placement is primarily related high ground elevation and power source proximity. AHD's input should be to ensure that bungalow placement does not result in sight restrictions between motorists and approaching trains. Having Railroad personnel present during the diagnostic review can also result in the identification of crossings that can be closed.

- BN supports the crossing closure initiative and is willing to use incentatives to achieve closure. An example of a recent incentative was that BN assumed the 10% local government cost for improvements at 3 crossings plus the cost of 2 closures in exchange for the agreement of 2 closures.

- Kuhn mentioned that he was aware of some states that used the FRA formula for the initial identification of crossings and then another method, such as the Peabody Dimmick Formula, to prioritize the initial list.

- BN does not want to take responsibility for traffic control on those projects occurring within the roadway. Typical gate and flashing light unit work can be accomplished on the roadside with minimal, if any, interference to roadway traffic. Work within the roadway, however, frequently requires the detour of traffic. The Railroad is not qualified, and will not assume the subsequent liability, of determining which alternative routes are capable of carrying the additional volumes and wheel loads of the detour traffic.

- Kuhn stated that BN does not require detailed plans for the installation of flashing lights or gates. A simple sketch of the site is all that is required since the design standards of the MUTCD and AAR are applicable.

- For surface work the BN needs to know the current roadway width, the new width, in which direction any widening will occur and a description of the typical roadway section at the track.

- BN prefers precast concrete crossing surfaces. Kuhn mentioned that the early problems with precast concrete have been solved where they now provide longer service life and reduced maintenance cost over rubber and wood surfaces. BN prefers Wilson or Century precast concrete crossings which have proven to last twice as long as rubber or wood. BN has had terrible experience with SafNDri and Parkco rubber surfaces. One disadvantage to the precast concrete surfaces is that their weight, approximately 1,500 to 2,500 pounds, requires powered mechanical equipment for placement and removal.

- Kuhn has the authority to bind the railroad for all grade crossing improvements. For this to occur, however, there must be no attest requirement. Kuhn stated that BN would forward a letter to AHD verifying that no attest signature is required.

- BN approves of the lump sum concept for typical crossing improvement work. BN has lump sum agreements with Oklahoma and Missouri that work very well. Each of these States, with assistance from BN developed a cost book for different combinations of circuitry, number of tracks, warning device types and other variables that affect cost. These costs are reviewed and, if necessary, adjusted annually. Kuhn promised to provide information of how the States developed and verified their costs in addition to an example of a cost book.

- BN does not use old equipment even if it has been refurbished. Kuhn said that the reasons for this are related to reliability and FHWA's refusal to pay for used equipment. BN will sell old equipment at its depreciated value for use by other lines that are willing to use it.

- BN is placing emphasis on obtaining crossing closure and may be willing to provide cash incentives, on a case by case basis, to local governments.

- BN requires a 2 to 3 week notice for their personnel to be present for diagnostic reviews. They prefer to conduct reviews of 3 or 4 crossings, in the same area, for each day. It is not cost effective for their personnel to travel to an area for the purpose of inspecting only one crossing.

- BN would appreciate being informed of the planned projects for the next year. This information would assist them in equipment purchase, work scheduling and budgeting.

- Kuhn stated that BN prefers installing gates and flashing lights rather than just flashing lights alone. He believes that it reduces lawsuits and stated that a number of States are adopting the gates policy.

- BN would be willing to pay more than their share for roadway bridge replacement projects, where they currently have the maintenance responsibility, if this responsibility would be assumed by a governmental agency.

The meeting concluded with visits by Kuhn, Colson and Bowman to the offices of Thomas Wheeler and Dykes Rushing of AHD. The purpose of the office visits was to personally acquaint individuals who usually correspond by mail and telephone.

STATE OF ALABAMA
RAIL/HIGHWAY SAFETY PROGRAM SURVEY

Responding State:_____.

Responding Individual:_____.

Position:_____. Telephone Number:_____.

Program Administration

1. Which agency within your State deal with transportation safety issues? Check all that apply.

___ DOT
___ PUC
___ Commerce Commission
___ Corporation Commission
___ Safety Commission/Board/Committee
___ Other _____

2. For those agencies identified in question #1, indicate which have either or both a rail office or a highway office/section/division/directorate/agency.

Organization	Highway Office	Rail Office
_____	Yes / No	Yes / No
_____	Yes / No	Yes / No
_____	Yes / No	Yes / No
_____	Yes / No	Yes / No

3. Please circle the office/agency in question #2 that handles the crossing safety program.

4. What procedure, formula and/or method does your agency use to identify and prioritize rail/highway intersections for possible improvement? (Please provide a copy if it is unique to your agency.)

5. Have you been satisfied with the performance of the identification/prioritization procedure or do you think it could be improved? Please explain your response.

___ Yes ___ No Comments:

6. What is the average time from identification of appropriate countermeasures to date of installation?

___ Less than 1 year. ___ 2 to 3 years

___ 1 to 2 years. ___ greater than 3 years

7. For #4, where in the process from countermeasure identification to installation is the largest time delay?

8. Has your agency initiated any policies, procedures or guidelines that accelerated your program? If yes please describe.

___ Yes ___ No Comments:

9. Does your agency have a procedure for tracking the status of rail/highway projects from the point of location identification to project completion. If yes please describe the system indication if it is a computerized process.

10. What is the average number of projects, for the following improvement types, that are authorized by your agency for construction each year?

____flashing lights

____flashing lights and gates

____surface improvements

____overpass/underpass

11. What is your agency's policy for rail/highway projects when the responsible local governmental agency cannot provide the 10 percent matching cost share?

12. Do you forward a complete set, or an abbreviated set of plans, for typical flashing light and gate installations to the railroad companies?

___ Complete ___ Abbreviated

13. Please indicate below , with a "C" for complete and an "A" for abbreviated, the items in the plan packet forwarded to the railroad for typical flashing light and gate installations.

____vicinity map	____utility location layout
____legend sheet	____installation plan
____project notes	____traffic control plan
____typical project cross section	____paving layout
____summary of quantities	____other. Please identify
____Agreement between State and Railroad	

14. Do you use lump sum agreements for typical flashing and gate installations? Please comment on your experience if you have used lump sum agreements or your thoughts on such agreements if you have not tried them.

___ Use lump sum. ___ Do not use lump sum. Comments:

15. Who is responsible for work zone traffic control during the actual installation for:

On system crossings.

Off system crossings.

Field Reviews and Improvement Types

16. Does your agency conduct diagnostic team field reviews to determine countermeasures? If yes, please indicate who participates in the reviews.

___ Regulatory agency official

___ Railroad representative

___ State District personnel

___ Local government official

___ Law enforcement officer

___ Other (please specify).

17. Do you consider the presence of a railroad company representative as being necessary for a typical field review that will probably result in the recommendation for flashing lights or gates?

___ Yes ___ No Comments:

18. What are your agency's guidelines for determining when to install gates? If written guidelines exist please provide a copy.

19. What is your agency's guidelines for determining when to install the following types of traffic control at rail/highway intersections? If written guidelines exist please provide a copy.

flashing lights:

traffic signals:

20. Does your agency have guidelines for determining which type of surface improvement to use? If written guidelines exist please provide a copy.

___ Yes ___ No Comments:

21. Has your agency installed four quadrant gates at any crossings? If yes please state the number of crossings and reasons for installation.

___ Yes ___ No Comments:

22. What type of warning device and traffic control does your agency use, or plan to use, at high train speed (greater that 90 mph) crossings?

Crossing Closure/New Crossings.

23. Has your agency adopted any policies (either formal or informal) for crossing closure? If yes please describe.

___ Yes ___ No Comments:

24. Has any legislative action been taken, or plan to be taken, to facilitate crossing closure by vesting the authority to do so in one State agency or other type of legislative action? If yes please explain.

___ Yes ___ No Comments:

25. Has your agency used any incentives or trade-offs to encourage or effect crossing closures? If yes please describe.

___ Yes ___ No Comments:

26. What is the average number of crossing closures per year?

27. What is the average number of new crossings per year?

28. Does your agency have any thresholds or guidelines to determine when a new crossing is required? If yes, please describe.

___ Yes ___ No Comments:

Private Crossings

29. Does a State agency have jurisdiction with regard to private crossings? If yes, please indicate the state agency and type of jurisdiction.

The _____ has jurisdiction for

_____ private crossing opening

_____ private crossing closure

_____ type of warning device at private crossings

30. Does the State have standards or guidelines pertaining to private crossings. If yes please provide a copy.

ISTEA Changes

31. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) Section 135 of Title 23 now require a State to develop and submit a statewide Transportation Improvement Program (TIP) before FHWA can authorize Federal funds for rail/highway projects. In most cases this requires coordination with the Metropolitan Planning Organization.

Do you believe that this new requirement cause delays?

___ Yes ___ No Comments:

Has your agency developed plans for implementing this requirement?

___ Yes ___ No Comments:

32. Section 1077 of ISTEA authorizes States and local governments to install, at their discretion, stop or yield signs at a rail/highway intersection without automatic warning devices with two or more trains per day. FHWA has since defined two trains per day as 731 trains per year. No engineering study is required if the two or more train criteria is achieved.

For crossings without warning devices, that meet the two train criteria, does your agency plan to:

____install stop signs at all crossings.

____install stop signs only when_____
_____
_____
_____.

____install yield signs when_____
_____
_____
_____.

____install stop and yield signs by the same policy as before ISTEA.

Comments:

33. Subsection (c) of Section 120 ISTEA states that for safety projects (including rail/highway intersections) such as traffic control signalization, pavement markings, traffic signs and traffic signals the Federal share may amount to 100 percent of project cost. Does your agency plan to utilize 100 percent Federal funding for rail/highway intersection projects. If yes, please indicate typical applications where you may apply this funding strategy.

___ Yes ___ No Comments:

34. Will your State be spending any FTA funds for rail/highway crossings in this or the next _____ years?

Thank you. Please indicate if you wish to receive a summary of the survey responses.

_____ yes please forward a summary.

_____ no a summary is not desired.

Please forward response by June 30, 1993 to the address below or by FAX at 205/844-6290:

Brian L. Bowman, Ph.D.,P.E.
Associate Professor
Auburn University
Harbert Engineering Center
Auburn, AL 36849

205/844-6262

Appendix 4

STATE OF ALABAMA
RAIL/HIGHWAY SAFETY PROGRAM SURVEY

Program Administration

1. Which agencies within your State deal with transportation safety issues? Check all that apply.

DOT	44/44	100%
PUC	10/44	23%
Safety Commission/Board/Committee	6/44	14%
Commerce Commission	4/44	9%
Corporation Commission	2/44	5%
Other _____	14/44	32%

---

2. For those agencies identified in question #1, indicate which have either or both a rail office or a highway office/section/division/directorate/agency.

Organization	Highway Office	Rail Office
DOT	44/44 = 100%	37/44 = 84%
PUC	2/44 = 5%	9/44 = 20%
Safety Comm./Board/Committee	3/44 = 7%	3/44 = 7%
Commerce Commission	1/44 = 2%	1/44 = 2%
Corporation Commission	0/44 = 0%	1/44 = 2%
Other _____	5/44 = 11%	10/44 = 23%

---

3. Please circle the office/agency in question #2 that handles the crossing safety program.

DOT	42/44	= 95%
PUC	5/44	= 11%
Commerce Commission	0/44	= 0%
Corporation Commission	1/44	= 2%
Safety Commission/Board/Committee	0/44	= 0

---

4. What procedure, formula and/or method does your agency use to identify and prioritize rail/highway intersections for possible improvement? (Please provide a copy if it is unique to your agency.)

US DOT accident prediction formula	7/44	= 16%
FRA- FHWA formula	7/44	= 16%
Modified New Hampshire Index	7/44	= 16%
State Developed Formula	5/44	= 11%
Hazard Index	5/44	= 11%
Accident History	3/44	= 7%
Peabody - Dimmock	2/44	= 5%
Other Formula	6/44	= 14%
Not available	2/44	= 5%

---

5. Have you been satisfied with the performance of the identification/prioritization procedure or do you think it could be improved? Please explain your response.

Yes	34/44	= 77%
No	10/44	= 23%

Negative comments are listed below with the procedure used. Most of the negative comments deal with accident history or a state developed procedure and not with the federal formulas or hazard indices.

- U.S. DOT Accident Prediction Equation.
  Does not cover sight distance, severity of accident or injured, and is too general.

- FRA accident prediction model
  I believe sight distance should be included.

- A Modified New Hampshire Index. But it is only used as a tool for further evaluations.
  I think all formula's need a good sound engineering judgement. No one formula will provide all the right answers to rail/highway safety issues.

- A hazard rating index that rates all potential crossings.
  RR train counts, ADT are outdated. The agencies do not keep information current.

- Priority is established by RR. When we have time we intend to establish a more formal procedure to establish priority.
  N/A at this time.

- Every crossing is priority one, first come, first served.
  From a liability point of view, it protects every company/agency involved. When a RR/agency are ready to improve crossing, funds are provided.

- Accident History
  Will probably change to FRA accident prediction formula.

- See attachment(State Procedure)
  Too much political involvement & lack of data for rural areas.

- See attached Procedure 500-000-100-c (1.4.9) Identifying rail-highway grade crossing hazards.(State Procedure)
  Too much emphasis put on high volume/fully protected crossings leading to a high number of candidates yielding few projects.

---

6. What is the average time from identification of appropriate countermeasures to date of installation?

0 Less than 1 year	= 0%	18/44 2 to 3 years	= 41%
22/44 1 to 2 years	= 50%	4/44 greater than 3 years	= 9%

---

7. For #4, where in the process from countermeasure identification to installation is the largest time delay?

From notice to proceed to start of construction	13/57	= 23%
Largest time delay is in planning stages	12/57	= 21%
Obtaining RR force account estimate	10/57	= 18%
Waiting for funding availability	7/57	= 12%
Ordering of supplies and installation by railroad companies.	4/57	= 7%
Obtaining DOT - FHWA authorizations	1/57	= 2%

---

8. Has your agency initiated any policies, procedures or guidelines that accelerated your program? If yes please describe.

Yes	29/44	= 66%
No	15/44	= 34%

The following are the programs listed to accelerate the particular state's program.

Adoption of FHWA alternate rail-highway procedures.

Allowed advanced acquiring of materials.

When a project reaches the construction year in the construction program, it will only be carried over one year, then the local governing jurisdiction will be required to resubmit for a project if it is still needed.

All agreements are processed through one division.

Electronic billing allows quicker payment time to RR.

We have had the RR's sign off on agreement in accordance w/a master agreement. And this has streamlined out safety process.

We are trying to get authorization to issue an early notice to proceed so that RR's can order material before an agreement is in place.

Meet with all involved agencies and railroads to discuss and initiate improvements.

We have hired consultant to prepare Detours, and we have contractor (by bids) make and install Detour signs.

Dropped a presignalization agreement with local road authorities, initiated a diagnostic field review process as documented policy.

Established Nebraska Grade Crossing Protection Fund - State tax money to augment federal money.

Attempt to resolve all concerns prior to initiating any formal action.

Federal authorization for preliminary engineering prior to the diagnostic team inspecting.

Currently attempting to initiate lump sum billing procedures.

Agreed with FHWA that project by project inspection is not necessary.

Ohio has undergone many changes which have accelerated our program, the most beneficial was the inclusion of our PUC in the program. PUC has regulatory power to place orders on the RR companies.

Decentralized all field activities to our regional offices.

---

9. Does your agency have a procedure for tracking the status of rail/highway projects from the point of location identification to project completion. If yes please describe the system and indicate if it is a computerized process.

Have a computerized procedure for tracking the status of projects	37/44	= 84%
Have a non-computerized procedure for tracking the status of projects	2/44	= 5%
Do not have a procedure for tracking the status of projects	6/44	= 14%

---

10. What is the average number of projects, for the following improvement types, that are authorized by your agency for construction each year?

flashing lights	< 10	31/44 = 70%
	> 10	13/44 = 30%
flashing lights and gates	< 10	16/44 = 36%
	10-50	23/44 = 52%
	50-100	2/44 = 5%
	100 +	3/44 = 7%
surface improvements	< 10	26/44 = 59%
	10-50	15/44 = 34%
	50-100	2/44 = 5%
	100 +	1/44 = 2%
overpass/underpass	< 5	41/44 = 93%
	5-10	0/44 = 0%
	> 10	3/44 = 7%

---

11. What is your agency's policy for rail/highway projects when the responsible local governmental agency cannot provide the 10 percent matching cost share?

• Ask Railroad to Provide Matching Funds	13/49	= 27%
• Use State Money to Pay the Matching Funds	17/49	= 35%
• Federal Government Pays 100% of Funds	9/49	= 18%
• Not Available	3/49	= 6%
• Other Type of Funding	4/49	= 8%
• Drop Project	3/49	= 6%

Alternative funding sources are listed below along with the state in which the particular type of funding is utilized.

Utah	DOT has a policy which allows the use of B&C funds (city and county road funds), distributed by DOT, to pay back the matching funds over a three-year period.
Idaho	There is a special fund set up by the legislature that provides the matching funds for local governmental agencies. This fund can be used to fund the construction of a project totally or provide the 10% match for construction. The local governmental jurisdiction must come up with 10% match for P.E.
Wisconsin	A petition is presented to the Office of the Commissioner of Transportation to make a determination.
Illinois	If the local agency can not provide the match, the Illinois Commerce Commission will contribute if the proposed improvements meet their warrants.

---

12. Please indicate below the items which are in the plan packet forwarded to the railroad for typical flashing light and gate installations.

#1	vicinity map	33/44
#2	legend sheet	8/44
#3	project notes	17/44
#4	typical project cross section	13/44
#5	summary of quantities	9/44
#6	Agreement between State and Railroad	34/44
#7	utility location layout	12/44
#8	installation plan	17/44
#9	traffic control plan	14/44
#10	paving layout	11/44
#11	other. Please identify	6/44

Other items included in the plan packet forwarded to the railroad for typical flashing light and gate installations include the following:

Special provisions that contain minimum physical & geometric requirements.

Top of rail profile 500 ft each side of crossing. Highway profile across tracks.

Amount, Estimate

Diagnostic team field report.

Standards for signal/sign installation

1"=20' 8.5"x 11" sketch

---

13. Please indicate if the drawings which are in your plans are of to-scale engineering quality or not to-scale sketches.

To-scale engineering quality	17/44	= 39%
Not to-scale sketches	24/44	= 55%
Not Available	3/44	= 7%

---

14. Do you use lump sum agreements for typical flashing and gate installations? Please comment on your experience if you have used lump sum agreements or your thoughts on such agreements if you have not tried them.

Use lump sum	10/44	= 23%
Do not use lump sum	32/44	= 73%
Not Available	2/44	= 4%

---

15. Who is responsible for work zone traffic control during crossing surface work, and other installation activities which are within the roadway, for:

On system crossings.

Railroad	23/46 = 50%
State	10/46 = 22%
Local	1/46 = 2%
DOT or Contractor	11/46 = 24%
Not Available	1/46 = 2%

Off system crossings.

Railroad	26/51 = 50%
State	4/51 = 8%
Local	9/51 = 18%
DOT or Contractor	9/51 = 18%
Not Available	3/51 = 6%

Field Reviews and Improvement Types

16. Does your agency conduct diagnostic team field reviews to determine countermeasures? If yes, please indicate who participates in the reviews.

#1	Regulatory agency official	29/44	= 66%
#2	Railroad representative	42/44	= 95%
#3	State District personnel	37/44	= 84%
#4	Local government official	35/44	= 80%
#5	Law enforcement officer	10/44	= 23%
#6	Other (please specify).	20/44	= 45%

---

17. Please forward a copy of your form completed during the safety and operational review.

Not Available	15/44	= 34%
No Form	6/44	= 14%
Under Review	2/44	= 5%

---

18. Do you consider the presence of a railroad company representative as being necessary for a typical field review that will probably result in the recommendation for flashing lights or gates?

Yes	32/44	= 73%
No	12/44	= 27%

Explanations for the negative comments have been provided below if given:

In most situations a RR representative is not required. If the RR has a problem with our dept, they will contact us and we can usually work it out by phone.

RR officials tend to not recommend or over recommend.

Unless there are unusual condition.

We usually discuss this with the RR representative. If there is a particular problem then we make a site visit.

Unless we run into complications then we meet with appropriate representatives at site.

RR personnel are involved if concerns for a specific safety issue or a specific request has been received.

---

19. What are your agency's guidelines for determining when to install gates? If written guidelines exist please provide a copy.

FHWA Grade Crossing Handbook or FRA	13/48	= 27%
State Policy	13/48	= 27%
MUTCD	6/48	= 13%
High speed rail traffic (> 60 mph) and Double main tracks	6/48	= 13%
Gates are used exclusively	4/48	= 8%
Federal Aid Policy Guide	2/48	= 4%
Not Available	3/48	= 6%
No Policy	1/48	= 2%

---

20. What is your agency's guidelines for determining when to install the following types of traffic control at rail/highway intersections? If written guidelines exist please provide a copy.

flashing lights:

Diagnostic Team	8/44	= 18%
MUTDC	7/44	= 16%
State Program	7/44	= 16%
Physical Characteristics of Intersection	6/44	= 14%
FHWA	4/44	= 9%
Gates Whenever Possible	4/44	= 9%
Funding	2/44	= 5%
None	2/44	= 5%
Local Need or Want	1/44	= 2%
Not Available	3/44	= 7%

traffic signals:

MUTCD	10/44	= 23%
Do not use traffic signals	7/44	= 16%
Used in conjunction with flashing light when near intersection	7/44	= 16%
No Guidelines	6/44	= 14%
Study (Diagnostic)	4/44	= 9%
State Policy	2/44	= 5%
Other	4/44	= 9%
FHWA	1/44	= 2%
Not Available	3/44	= 7%

---

21. Does your agency have guidelines for determining which type of surface improvement (i.e. rubber, precast concrete, timber etc.) to use? If written guidelines exist please provide a copy.

Yes	18/44	= 41%
No	24/44	= 55%
Not Available	2/44	= 5%

Comments:

Basically 3 different responses:

1. Railroad Decides
2. Determined by ADT
3. Determined by State Policy

---

22. Has your agency installed four quadrant gates at any crossings? If yes please state the number of crossings and reasons for installation.

Yes	6/44	= 14%
No	36/44	= 82%
Not Available	2/44	= 5%

Half of the positive replies have only tried this procedure on one crossing.

---

23. Has your agency installed raised medians at grade crossings to reduce gate violations?

Yes	12/44	= 27%
No	31/44	= 70%
Not Available	1/44	= 5%

---

24. What type of warning device and traffic control does your agency use, or plan to use, at high train speed (greater that 90 mph) crossings?

No Trains at This Speed	19/44	= 43%
No Current Decision	7/44	= 16%
Not Available	1/44	= 2%
Gates	18/44	= 41%
Flashing Lights	10/44	= 23%
Warning Circuitry	4/44	= 9%
Advanced Warning Signs	3/44	= 7%

Other:

90-110 mph - flashing lights with gates and C.W.T.
100 mph and above - grade separation or closure.

Four quad gates, median separated roadways and high security barrier systems.

With inductive loop system - four quadrant gates - Netting trap system similar to that in Europe - Automatic train slowing system as motorist enters crossing & the vehicle stalls - TVD - trapped vehicle detection can be used with gates or netting system.

It is proposed to follow the FHWA guidelines as a minimum railroad flashing lights and gates would be utilized, with constant warning time track circuitry.

Separation or 4-Quadrant gates as a minimum.

Net (drag net vehicle arresting barrier, looked at safety).

We have had standard gates and flasher supplemented with "High Speed Trains" signs and predictors at crossings with 110 MPH trains, for 13 years. For speeds above 110 MPH we propose four-quadrant gates.

Crossing Closure/New Crossings.

25. Has your agency adopted any policies (either formal or informal) for crossing closure? If yes please describe.

Yes	19/44	= 43%
No	24/44	= 55%
Not Available	1/44	= 2%

---

26. Has any legislative action been taken, or plan to be taken, to facilitate crossing closure by vesting the authority to do so in one State agency or other type of legislative action? If yes please explain.

Yes	19/44	= 43%
No	23/44	= 52%
Not Available	2/44	= 5%

---

27. Has your agency used any incentives or trade-offs to encourage or effect crossing closures? If yes please describe.

Yes	28/44	= 64%
No	16/44	= 36%

---

28. What is the average number of crossing closures per year?

0 - 1	9/44	= 20%
1 - 2	10/44	= 23%
3 - 10	11/44	= 25%
> 10	3/44	= 7%
Unknown	11/44	= 25%

---

29. What is the average number of new crossings per year?

≤ 5	27/44	= 61%
6 - 10	6/44	= 14%
> 10	1/44	= 2%
Not Available	10/44	= 23%

30. Does your agency have any thresholds or guidelines to determine when a new crossing is required? If yes, please describe.

Yes	8/44	= 18%
No	36/44	= 82%

Private Crossings

31. Does a State agency have jurisdiction with regard to private crossings? If yes, please indicate the state agency and type of jurisdiction.

The _____ has jurisdiction for

____ private crossing opening

____ private crossing closure

____ type of warning device at private crossings

No	23/44	= 52%
Railroad	5/44	= 11%
DOT	3/44	= 7%
Public Service Commission	2/44	= 5%
PUC	1/44	= 2%
Corporation Commission	1/44	= 2%
Other Ageny	3/44	= 7%
Not Available	6/44	= 14%

---

32. Does the State have standards or guidelines pertaining to private crossings. If yes please provide a copy.

Yes	4/44	= 9%
No	38/44	= 86%
Not Available	2/44	= 5%

ISTEA Changes

33. The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) Section 135 of Title 23 requires a State to develop and submit a statewide Transportation Improvement Program (TIP) before FHWA can authorize Federal funds for rail/highway projects. In most cases this requires coordination with the Metropolitan Planning Organization.

Do you believe that this new requirement will cause delays?

Yes	21/44	= 48%
No	21/44	= 48%
Not Available	2/44	= 4%

Has your agency developed plans for implementing this requirement?

Yes	32/44	= 73%
No	9/44	= 20%
Not Available	3/44	= 7%

---

34. Section 1077 of ISTEA authorizes States and local governments to install, at their discretion, stop or yield signs at a rail/highway intersection without automatic warning devices with two or more trains per day. FHWA has since defined two trains per day as 731 trains per year. No engineering study is required if the two or more train criteria is achieved.

For crossings without warning devices, that meet the two train criteria, does your agency plan to:

@1 install stop signs at all crossings.

@2 install stop signs only when_____
@3 install yield signs when_____
@4 install stop and yield signs by the same policy as before ISTEA.

@1	0/44	= 0%
@2	19/44	= 43%
@3	2/44	= 5%
@4	16/44	= 36%

Comments:

Not Available	7/44	= 16%
No Signs	3/44	= 7%

---

35. Subsection (c) of Section 120 ISTEA states that for safety projects (including rail/highway intersections) such as traffic control signalization, pavement markings, traffic signs and traffic signals the Federal share may amount to 100 percent of project cost. Does your agency plan to utilize 100 percent Federal funding for rail/highway intersection projects. If yes, please indicate typical applications where you may apply this funding strategy.

Yes	12/44	= 27%
No	28/44	= 64%
Not Available	4/44	= 9%

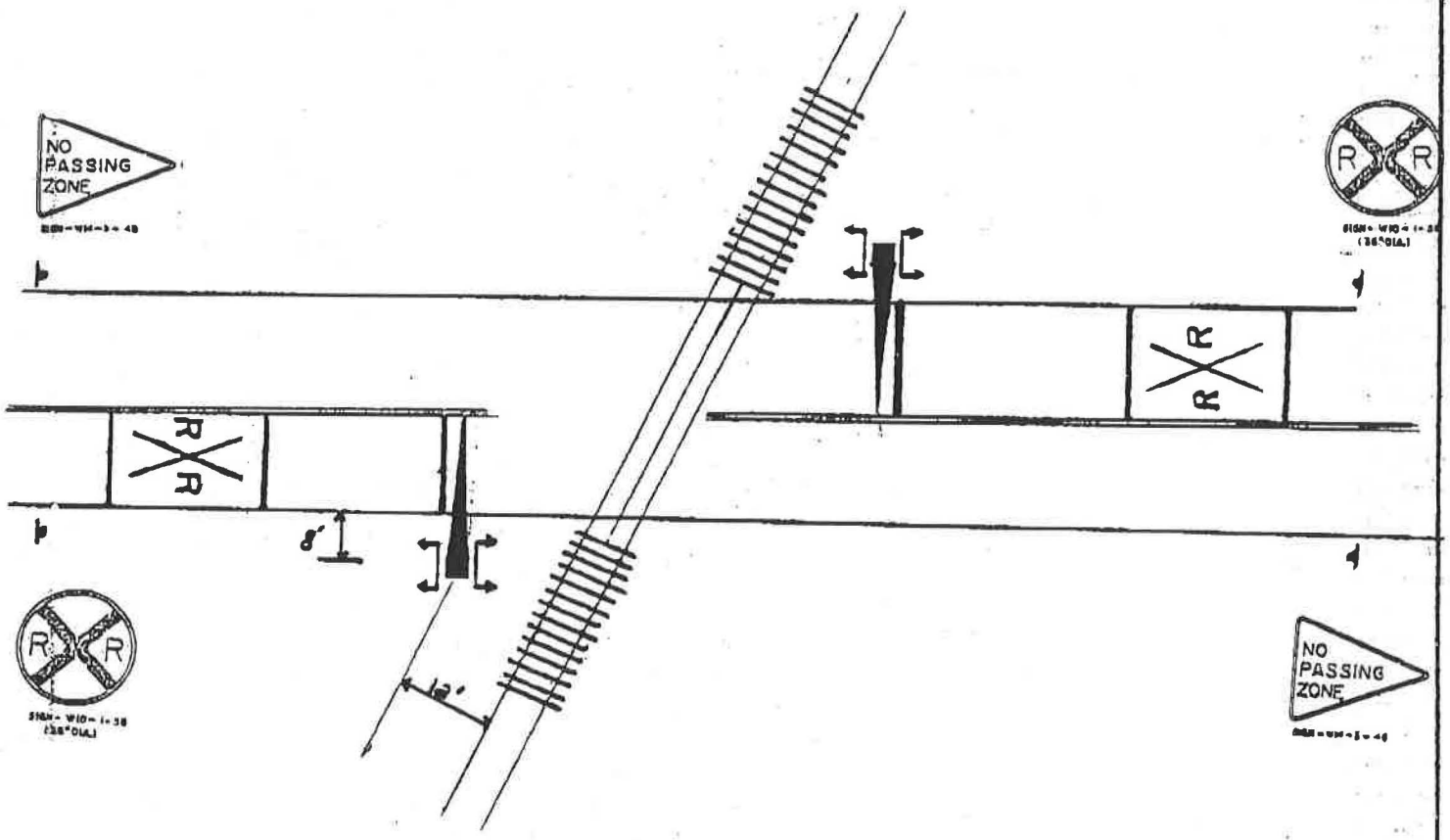
---

36. Will your State be spending any FTA funds for rail/highway crossings in this or the next _____ years?

Yes	5/44	= 11%
No	25/44	= 57%
Not Available	14/44	= 32%

Appendix 5

Railroad Signalization Plans



SKETCH: NOT TO SCALE

N O T E S:

1. ALL WORK TO BE COMPLETED IN ACCORDANCE WITH ALABAMA STANDARD SPECIFICATIONS AND THE NATIONAL MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.
2. THE RAILROAD IS RESPONSIBLE FOR LOCATING ALL UTILITIES PRIOR TO CONSTRUCTION.
3. THE RAILROAD IS RESPONSIBLE FOR PROVIDING REQUIRED WORK ZONE TRAFFIC CONTROL IN ACCORD WITH THE NATIONAL MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, LATEST EDITION.

NO. & TYPE OF TRACKS One (1) Mainline

EXISTING DEVICES Crossbucks (to be removed by railroad.)

PROPOSED IMPROVEMENTS Signals, Bells, Gates, and Grade Crossing Predictors

SIGNING & MARKING REQUIREMENTS Revitalize edge & ctr lines, markings, legends & advance warning signs.

DATE 05-16-94

PROJECT NO. STPRR-0008( )

COUNTY Butler

LOCATION County Road 8

RAILROAD CSXT

REF. NO. 596(V-R)AMTRAK

R/R INV. NO. 351-279D

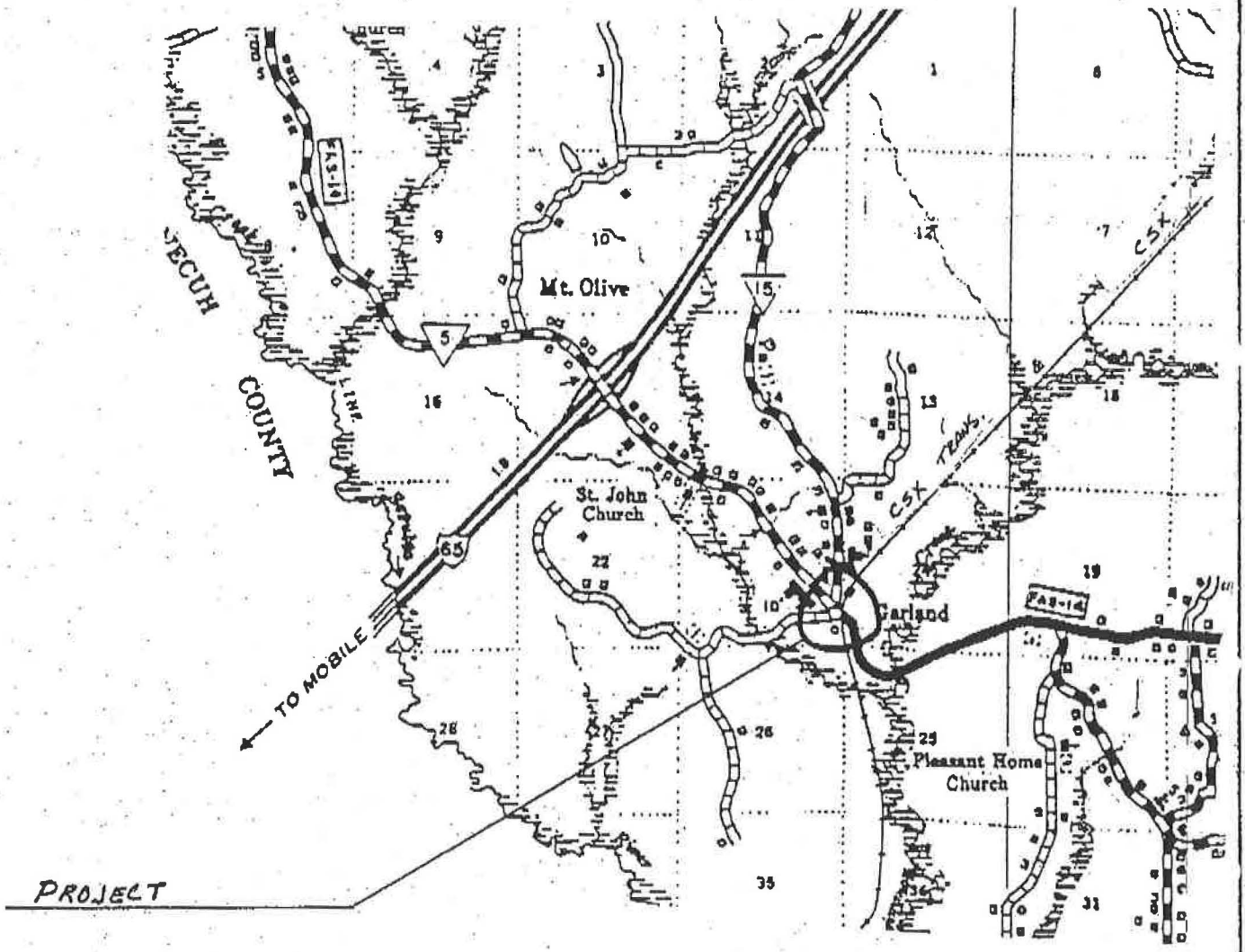
STATE OF ALABAMA
DEPARTMENT OF TRANSPORTATION

Railroad Grade Crossing Improvement

County Butler Project No. STPRR-0008( )

Ref. No. 596(V-R) AMTRACK DOT No. 351-279D

Location Butler County Road 8 near Garland



DIVISION ENGINEER

CHIEF ENGINEER

TRANSPORTATION DIRECTOR

Prel. Proj. No.

Code No.

REMAINDER OF PLAN CONSISTS OF

AGREEMENT APPROPRIATE

FOR EACH RESPECTIVE RAILROAD

Appendix 6

Detailed plan guide for use by ALDOT multimodal transportation personnel

STATE OF ALABAMA DEPARTMENT OF TRANSPORTATION
GUIDE FOR DEVELOPING RAIL/HIGHWAY SIGNAL PLANS

Reference No. _____ Project No. _____ Crossing No. _____

Division: _____ County: _____ City: _____

Railroad: _____

Location: _____

Transaction Date

1. Crossing was identified by ___ U.S. DOT formula _____

   Complaint from _____

   Remarks: _____

   _____

   _____

2. Establish field inspection date with railroad and Division. Date of inspection _____

   is _____ at _____. If off-system, inform Division to
   mo day year *time*
   request presence of local agency.

   Remarks: _____

   _____

   _____

3. Provide Division the crossing inventory information requesting that Division review data and update ADT and any erroneous items in addition to providing information on the movement of school buses, commercial buses and hazardous material trucks over crossing. Enter this information in the remarks section. _____

   Remarks: _____

   _____

   _____

Transaction Date

4. Conduct field inspection using the inspection work sheets. Include sight distance measurements for each quadrant on all approaches. _____

Remarks: _____

_____

_____

5. Determine with the Railroad Representative and the Division Railroad Coordinator the most appropriate countermeasures for the geometrics, traffic and train volumes and roadway vehicle types. _____

At crossing upgrades:

___ None

___ Flashing lights (bell)

___ Flashing lights (bell) and gates

___ Cantilever lights (bell)

___ Cantilever lights (bell) and gates

___ Additional Signals

Detection Device (_____)

Approach:

___ each of W10-1 and ___ each of _____ advance warning signs

___ each of RxR pavement markings

___ feet of double center line

___ each of "No Passing" pennant

___ each of stop bar

Other: _____

_____

Remarks: _____

_____

_____

_____

_____

Transaction Date

6. Prepare program document and forward to FHWA. _____

Remarks: _____

_____

_____

7. Receive approval from FHWA. _____

Remarks: _____

_____

_____

8. Notify Division of approval and authorize them to prepare plans and local government maintenance agreement. _____

Remarks: _____

_____

_____

9. Obtain the location and site sketches (not to scale) of the crossing and the local government maintenance agreement (for off-system crossings) from the Division. _____

Remarks: _____

_____

_____

10. Review plans and local government maintenance agreement. _____

Remarks: _____

_____

_____

Transaction Date

11. Complete the cover letter, develop the supplemental railroad agreement and forward to Railroad. _____

Remarks: _____

_____

_____

12. Obtain the executed railroad agreement, detailed cost and circuitry plans from Railroad. _____

Remarks: _____

_____

_____

13. Forward the cover letter, location and site schematic, railroad supplemental agreement, State force costs, circuitry plans and local government maintenance agreement to the AHD Office Engineer. _____

Remarks: _____

_____

_____

14. Obtain the date that the plans were authorized for construction from the Office Engineer. _____

Remarks: _____

_____

_____

15. Obtain date that signal crossing work is to begin from Division. _____

Remarks: _____

_____

_____

Transaction Date

16. Obtain date signals were placed in service from AHD Division. _____

Remarks: _____

_____

_____

17. Receive notice of date of project final inspection from AHD Division. _____

Remarks: _____

_____

_____

18. Receive notice of project completion and acceptance from AHD Division. _____

Remarks: _____

_____

_____

19. Notify Office Engineer that project is completed and accepted. _____

Remarks: _____

_____

_____

20. Update crossing inventory and all internal office files and logs. _____

Remarks: _____

_____

_____

Appendix 7

INSTRUCTIONS FOR COMPLETING THE RAIL/HIGHWAY DIAGNOSTIC REVIEW FORM

The diagnostic review form is intended to assist field reviewers in collecting data at rail/highway grade crossings. This data has two purposes: 1) to determine what, if any, improvements are required to increase safety, and 2) to provide data for updating the grade crossing inventory. The review form will become a permanent part of the crossing file.

The field review is both safer and easier if it is conducted by two persons. The recommended equipment for the field review includes:

- Safety vests for each member of the review team
- Measuring wheel
- Measuring tape
- Twine
- Spirit level
- Four traffic cones
- Compass
- Stop watch

PAGE 1.

AAR/DOT NO. Each crossing is assigned a unique identification number consisting of six numeric characters and an alphabetic character. The number should be present at each crossing by being nailed or strapped to a crossbuck or flashing light post. The number should be recorded on each page of the review form.

DATE OF DIAGNOSTIC REVIEW. Enter the date that the field inspection takes place.

REF NO. This number will be assigned by the Multimodal Bureau.

RAILROAD. Enter the complete name of the railroad rather than just the letter abbreviation.

STREET/ROAD NAME. Enter the local name of the roadway.

STATE/COUNTY/CITY ROAD. Circle the appropriate agency that has the responsibility of maintaining the roadway. If it is a County or City, then enter the appropriate name of the responsible agency. Also enter the number designation or name of the roadway that is the primary route identifier if it is different than the local road name. For example: College Street in Auburn, AL is also State Route 147.

DIAGNOSTIC TEAM. The diagnostic team should consist of representatives of the local police department, responsible roadway agency and the railroad, in addition, to the Division Railroad Coordinator. It is recommended that a representative of the railroad be present at the diagnostic reviews. They will be able to provide current information on train movements, train operations and required circuitry.

RAILROAD DATA. The initial entry for the railroad data pertains to information contained on the grade crossing inventory. A copy of this inventory will be provided with the request for review by the Multimodal Bureau, or it can be obtained by on-line access to the main computer. The revised information should be obtained during the field review. It is recommended to request updated information on train movements while establishing a meeting time with the railroad personnel. Obtaining the revised information is important since the data from the review form will be used to update the crossing inventory.

ROADWAY DATA. The first four items in this category are items contained on the inventory. The inventory entries should be checked with current conditions and necessary revisions noted on the review form. The ADT information is one of the variables used in determining the relative safety hazard of the crossing and should be

as accurate as possible. For off-system crossings it can be expected that the initial estimates of ADT will be highly inaccurate. In many cases the initial estimates were rough estimates that have not been updated in many years.

Information on the number of hazardous material haulers, school buses, pedestrians and shoulders is data not currently part of the inventory. The number of hazardous material haulers should be estimated from the number observed while conducting the field review. Attention should be paid to identifying generators of hazardous material transport, such as gasoline depots/refineries, in the vicinity of the crossing. Information on school bus volumes can be obtained by contacting the schools in the crossing area.

Pedestrians can be expected in urban areas, in the vicinity of schools, when sidewalks are present and where pedestrian activity has worn a path parallel to the roadway. Where pedestrian activity is present, the consideration of continuing a pedestrian facility through the railroad right of way should be considered.

PAGE 2.

EXISTING WARNING DEVICE. The most common types of warning and traffic control devices located at grade crossings are listed on the form. Enter the number of each device present on both approaches. Include in the comments any devices that are improperly placed or in poor condition.

Evidence of flagging by train crews can be obtained by inspection the roadway surface at the crossing. Flare casings, burn marks and powder residue are indications that the train crew are conducting flagging operations at the crossing.

FIVE YEAR ACCIDENT DATA. This data is available from the Multimodal Bureau.

TYPE OF DEVELOPMENT. The type of development is included as part of the initial inventory data and may need updating. The definition of the different categories are:

Open Space. Undeveloped or sparsely developed, very lightly populated, agricultural.

Residential. Built-up residential area.

Commercial. Retail stores and businesses, offices, personal services.

Industrial. Manufacturing, construction, heavy products, factories, warehouses.

Institutional. Schools, churches, hospitals, parks, and other community facilities.

NEW DEVELOPMENTS THAT COULD AFFECT ADT. Completing this section may require contacting the local community or county personnel. The greatest probability of such development occurring is in developing areas of cities and on roadways that are planned for reconstruction, or that will be impacted by improvements to adjacent roadways.

ADJACENT CROSSINGS. The purpose of the adjacent crossing information is to provide data for possible crossing closure.

PAGE 3.

SIGHT DISTANCE LOCATION SKETCH. This sketch should be similar to the example provided at the top of the page. Measurements are required on both approaches, in two directions, for both on the approach and at a stopped position. The sight distance is best obtained by using traffic cones. As an example consider a crossing where the maximum train speed is 80 km/h (50 mph) and the roadway speed is 65 km/h (40 mph). The roadway cones should be placed at 104 m (340 ft) from the nearest rail on the roadway and at 160 m (520 ft) from the edge of the road along both directions of the track. Do not place the cones between the rails in case of train arrival. Standing at the cone on the roadway there should be no sight obstructions within both sight triangles for each approach. Similar measurements, conducted at 3 m (10 ft)

upstream from the stop bar, should provide clear sight of the track for 366 m (1200 ft). Enter the required distances, from the table at the top of the page, the actual distances and the reason for any sight obstructions on the bottom portion of the page. Also draw any sight obstructions, at the correct quadrant, on the sketch.

PAGE 4.

SITE SKETCH. Construct the site sketch so it contains sufficient information to draw the sketch required for the plan submittal. Pay particular attention to the width of the road, presence of shoulders and drainage features and other changes that may be required by installing flashing lights and gates. It will also be advantageous to take photographs of each site including photos on the approach, along the track in both directions toward the roadway and of the locations where flashing lights and gates may be placed.

PAGE 5.

RECOMMENDATIONS. Based on the results of the site review indicate if improvements are recommended. If no improvements are recommended provide an explanation for why no improvements are required.

Emphasis should be placed on closing crossings that have low ADT's and are within 1/4 mile of adjacent crossings. Considerations to closure include access to land use and possible use of the crossing by emergency vehicles. Contact the Multimodal Bureau if the crossing appears to be a good candidate for closure.

The sight improvement recommendation pertains to those crossings where the sight restrictions such as trees and foliage, can be removed. While the railroad ROW can vary, it usually extends for 15 m (50 ft), from the center of the tracks, in each direction. The railroad should be contacted to remove any foliage on their ROW

causing sight obstructions. Sight obstructions can be temporary as well as permanent. Agricultural crops, parked vehicles and truck loading facilities can result in sight obstructions that are not present during the field review.

An improvement that may be appropriate in the other category is related to crossings where the tracks are at a different elevation than the roadway. Such crossings require more time for vehicles, which have stopped at the crossing, to clear the hazard zone, and can result in large vehicles with low ground clearance becoming hung on the crossing. Gouges in the pavement and on the crossing surface is evidence of crossing elevation problems. The American Railway Engineering Association (AREA) Manual for Railway Engineering recommends that the crossing surface be in the same plane as the top of the rails for a distance of two feet outside of the rails and that the surface of the highway be not more than three inches higher nor six inches lower than the top of the nearest rail at a point 30 feet from the rail. These measurements can be obtained by using twine with spirit level and a measuring tape. Pay attention to traffic operations during the site review. Traffic signals within 200 feet of the crossing should be interconnected to permit preemption. Heavy traffic volumes, however, may require the consideration of signal preemption for distances greater than 200 feet. In situations where there is little stacking distance between the crossing and a parallel roadway, additional lanes may decrease the potential for rear end accidents. Observing traffic operations can provide information on these and other safety improvements.

ALABAMA DEPARTMENT OF TRANSPORTATION RAIL/HIGHWAY DIAGNOSTIC REVIEW FORM

AAR/DOT NO:

DATE OF DIAGNOSTIC REVIEW:

REF NO.

LOCATION DATA

RAILROAD	COUNTY
STREET/ROAD NAME	CITY
STATE/COUNTY/CITY ROAD	

DIAGNOSTIC TEAM

	NAME	AFFILIATION	TELEPHONE
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

RAILROAD DATA

CROSSING CHARACTERISTIC	*INITIAL*	*REVISED*
TOTAL TRAINS/DAY (24 Hours)		
DAY THRU		
DAY SWITCHING		
NIGHT THRU		
NIGHT SWITCHING		
NUMBER OF MAIN TRACKS		
NUMBER OF OTHER TRACKS		
MAXIMUM TRAIN SPEED		
AMTRAK MOVEMENTS PER DAY		
CROSSING SURFACE TYPE		
SMALLEST CROSSING ANGLE		

ROADWAY DATA

ROAD CHARACTERISTIC	*INITIAL*	*REVISED*
NO. OF TRAF. LANES CROSSING RR		
TYPE OF HIGHWAY SURFACE		
AVERAGE DAILY TRAFFIC		
PERCENT TRUCKS		
NO. OF HAZARD MAT'L HAULERS		
NO. OF SCHOOL BUSES		

WIDTH OF APPROACH TRAFFIC LANES
____BOUND_____ ____BOUND_____

PEDESTRIANS ☐ YES ☐ NO

IF YES, SIDEWALKS: ☐ YES ☐ NO

THROUGH CROSSING ☐ YES ☐ NO

SHOULDERS ☐ YES ☐ NO

IF YES: TYPE _____

WIDTH _____

COMMENTS

AAR/DOT NO:

EXISTING WARNING DEVICE

QTY	TYPE OF WARNING DEVICE	
	ADVANCE WARNING SIGNS	COMMENTS:
	STOP SIGNS	COMMENTS:
	STOP AHEAD SIGNS	COMMENTS:
	PAVEMENT MARKINGS: R X R, STOP BAR, DOUBLE YELLOW	COMMENTS:
	"NO PASSING" PENNANTS	COMMENTS:
	CROSSBUCKS	COMMENTS:
	NUMBER OF TRACKS SIGNS	COMMENTS:
	INVENTORY TAGS	COMMENTS:
	INTERCONNECTED HIGHWAY TRAFFIC SIGNALS	
	OTHER	SPECIFY:

QTY	LENSES 8"	LENSES 12"	TYPE OF WARNING DEVICE	
			MAST MOUNTED FLASHING LIGHTS	COMMENTS:
			CANTILEVER FLASHING LIGHTS	
			SIDE LIGHTS	COMMENTS:
			AUTOMATIC GATES	COMMENTS:
			BELL(S)	COMMENTS:
			PEDESTRIAN GATE ARMS	COMMENTS:
			VARIABLE MESSAGE SIGNS	NLT: NRT:
			ILLUMINATION	DISTANCE FROM CROSSING:
			OTHER	SPECIFY:

FIVE YEAR ACCIDENT DATA

TOTAL ACCIDENTS			PROPERTY DAMAGE ONLY
			PERSONAL INJURY ACCIDENTS
			FATAL ACCIDENTS
NUMBER OF PERSONAL INJURIES		NUMBER OF FATALITIES	

IS CROSSING FLAGGED BY TRAIN CREW?

TYPE OF DEVELOPMENT

☐ OPEN SPACE ☐ RESIDENTIAL
☐ INDUSTRIAL ☐ INSTITUTIONAL ☐ COMMERCIAL

LOCATION OF NEARBY SCHOOLS:

NEW DEVELOPMENTS THAT COULD AFFECT ADT? ☐ YES ☐ NO

IF YES, DESCRIBE:

ADJACENT CROSSINGS

AAR/DOT NO.	STREET/ROAD NAME	DISTANCE	WARNING DEVICE	ADT

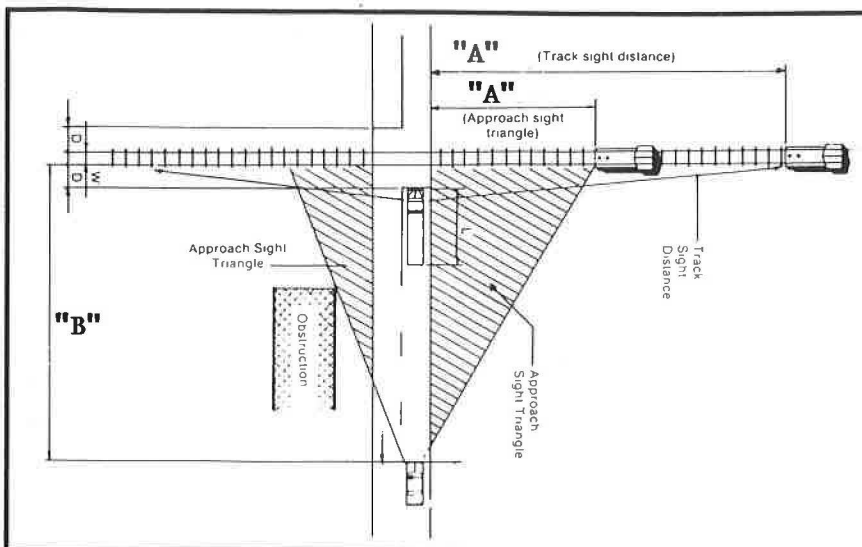
IS THERE ADEQUATE ACCESS FROM THIS CROSSING TO ADJACENT CROSSINGS? ☐ YES ☐ NO

IF YES, WHICH CROSSING(S):

CAN ROADWAY REALIGNMENT BE ACCOMPLISHED TO ALLOW CONSOLIDATION OF CROSSINGS? IF YES, PROVIDE SKETCH. ☐ YES ☐ NO

IMPACT OF CLOSURE:

SKETCH:



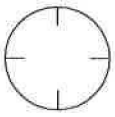
AAR/DOT NO:

REQUIRED DESIGN SIGHT DISTANCE FOR COMBINATIONS OF HIGHWAY AND TRAIN VEHICLE SPEEDS

TRAIN SPEED	HIGHWAY SPEED MPH							
	0	10	20	30	40	50	60	70
	DISTANCE ALONG RAILROAD FROM CROSSING ("A")							
10	240	145	105	100	105	115	125	135
20	480	290	210	200	210	225	245	270
30	720	435	310	300	310	340	370	405
40	960	580	415	395	415	450	490	540
50	1200	725	520	495	520	565	615	675
60	1440	870	620	595	620	675	735	810
70	1680	1015	725	690	725	790	860	940
80	1920	1160	830	790	830	900	980	1075
90	2160	1305	930	890	930	1010	1105	1210
	DISTANCE ALONG HIGHWAY FROM CROSSING ("B")							
	n/a	70	135	225	340	490	660	865

NOTE: 1 mph = 1.61 km/h 1 foot = 0.304 meters

SIGHT DISTANCE LOCATION SKETCH:



DIRECTION

TYPICAL TRAIN SPEED: mph / km/h

TYPICAL HIGHWAY SPEED: mph / km/h

APPROACH SIGHT DISTANCE

REQUIRED DISTANCE "A": ft. / m

REQUIRED DISTANCE "B": ft. / m

STOPPED VEHICLE SIGHT DISTANCE

REQUIRED DISTANCE "A" (WITH VEHICLE SPEED OF 0): ft. / m

NORTHWEST QUADRANT

	APPROACH	AT STOP BAR
SIGHT OBSTRUCTION:		
ACTUAL DISTANCE: (A)	ft. / m	ft. / m

NORTHEAST QUADRANT

	APPROACH	AT STOP BAR
SIGHT OBSTRUCTION:		
ACTUAL DISTANCE: (A)	ft. / m	ft. / m

SOUTHWEST QUADRANT

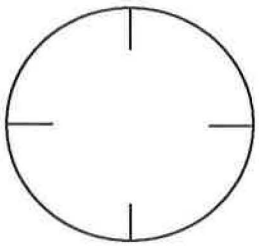
	APPROACH	AT STOP BAR
SIGHT OBSTRUCTION:		
ACTUAL DISTANCE: (A)	ft. / m	ft. / m

SOUTHEAST QUADRANT

	APPROACH	AT STOP BAR
SIGHT OBSTRUCTION:		
ACTUAL DISTANCE: (A)	ft. / m	ft. / m

AAR/DOT NO:

ALABAMA DEPARTMENT OF TRANSPORTATION
RAIL-HIGHWAY GRADE CROSSING
SITE SKETCH



DIRECTION

AAR/DOT NO:

RECOMMENDATIONS

ARE IMPROVEMENTS TO THE CROSSING RECOMMENDED?	☐ YES ☐ NO	IF NO, EXPLAIN:
IF YES, WHAT IMPROVEMENTS		

YES	NO	TYPE OF IMPROVEMENT	DESCRIBE
		CROSSING CLOSURE	
		SIGHT IMPROVEMENT	
		ROADWAY APPROACHES	
		HIGHWAY TRAFFIC SIGNS	
		CROSSING FLASHING LIGHTS	
		CROSSING GATES	
		CROSSING SURFACE	
		OTHER	

COMMENTS:

PREPARED BY:	TITLE:	DATE:

Appendix 8

MINUTES OF
"RECOMMENDED PLAN PROCEDURE FOR RAIL/HIGHWAY SIGNAL PROJECTS"
MEETING CONDUCTED IN MONTGOMERY, ALABAMA ON SEPTEMBER 9, 1993

LIST OF ATTENDEES:

Edwin H. Allen, Don Arkle, Ronnie Baldwin, Waymon Benifield, Larry W. Black, F.L. Blankenship, Brian Bowman, James E. Braden, James D. Brown, Robert F. Camp Jr., Jimmy Cobb, Cecil Colson, Wayne Crocker, Randall Crumpton, Dalmus Davidson, Billy Joe DeRamus, William A. Flowers, Stacey Glass, Linda Harris, Clarence Hodges, Jerry L. Holt, Les Hopson, Robert J. Jilla, Alfred H. Lipscomb, Foy Lunsford, Barney R. McIntosh, Billy S. Shoemaker, Hugh A. Stewart, Lamar Strickland, Timothy Taylor, Bruce Thomason, Burl Wallace, and Paul Weldon.

MEETING MINUTES:

The meeting was started at 10:00 a.m. and conducted by Mr. Cecil Colson. Mr. Colson started the meeting by explaining why changes to the plan preparation procedure were needed and where Alabama ranks Nationwide with respect to signalized crossings and vehicle/train accidents. After the introduction he discussed, item by item, the proposed changes to the plan procedures and responsibilities of involved personnel. The comments and questions resulting from the meeting are summarized below.

- The reorganization of the Highway Department into the Alabama Department of Transportation has resulted in a change of responsibilities for the rail/highway program within the Central Office. Mr. Cecil Colson is the Assistant Bureau Chief for Multimodal Transportation and will not be directly involved in grade crossing activities. Ms. Linda Harris is the Rail/Highway Safety Program Coordinator. Mr. Clarence Hodges will review the railroad involved plans and Mr. Robert Kratzer will develop the necessary agreements for rail/highway safety projects.

- One of the principal changes in the plan preparation procedures is that off-system improvements will be 100 percent funded, thereby, eliminating the municipal cost share agreements. These agreements were one of the primary reasons for large time delays and the failure to implement improvements. If projects are currently under way that will be funded with STP funds and do not have an executed agreement, they should be changed to 100 percent funding once the abbreviated plans are approved and the Divisions are informed of such action. Projects that

have been developed with 10 percent local government share and are with the railroad should not be changed.

- Mr. Paul Weldon stated that his understanding of the 100 percent off-system funding was that it is a funding option only for high priority crossings. All other crossings were to have 10 percent local share. This was not the understanding of the rail/highway safety program members. If the selection of crossings are by a ranking procedure, they can all be considered as high priority and, therefore, eligible for 100 percent funding by either understanding.

- Discrepancies in the allowable ISTEA limit for payment of the local cost share were raised. One understanding was that the cumulative total of local share paid by 100 percent funding could not exceed 10 percent of the STP funds. The other understanding was that it could not exceed 10 percent of the grade crossing improvement funds. Mr. Colson stated that a clarification of the ISTEA provisions would be obtained.

- Many of the off-system crossings are on secondary roadways that result in decreased service life for regular pavement marking materials. These roadways may require State crews to use thermoplastic materials. Mr. Colson reiterated that while State crews will be performing the initial work, the local municipality will be required to sign a maintenance agreement in lieu of their 10 percent share. It will be their responsibility, therefore, to ensure that the markings remain up to standard.

- The rail/highway program is to concentrate on installing automatic warning devices in order to increase the number of signalized crossings and increase safety. Program monies should not, therefore, be used for surface improvements or for grade separation.

- Some Division personnel were concerned that not funding surface improvements will result in unacceptable conditions. One Division stated that they have forwarded certified letters to railroads requiring them to repair poor crossing surfaces, but no action has been taken by the railroad. Mr. Colson stated that it is the responsibility of the railroad to maintain equipment and materials within the railroad's right-of-way. Instances where the railroads fail in this responsibility, and refuse to cooperate, should be reported to the Railroad Coordinator who will contact the Legal Department to effect action.

- Some crossings require grade separation and the concern was expressed that the inability to use program funds may result in no separation being effected. Mr. Colson stated that the costs of one

separation can exceed the annual funds available for all crossing safety improvements. He stated that grade separations will be handled on a case-by-case basis considering alternative funding sources.

- Some participants expressed the reluctance to install warning upgrades without surface improvements. The need for surface improvements should be stated on the field inspection form and requested in the cover letter as a project component that is to be paid by the railroad within. The railroads should be allowed to install their preferred type of crossing material that is appropriate for the volume and type of traffic. Some problems with current surface maintenance may be due to the reluctance of many railroads to use rubberized crossing materials. Mr. Colson stated that he did not want the need for surface work to delay the installation of automatic warning devices.

- The simplified set of plans will be appropriate for the majority of cases. Improvements requiring signal preemption, geometric changes, culvert relocation, etc., will require more extensive plan development.

- Concern was expressed that changing the prioritization procedure will result in the Southern part of the State not receiving its fair share of improvement monies. It was explained that while the AAR/DOT formula considers ADT, it also includes accident frequency. The less populated portions of the State will still, therefore, be represented in the prioritization procedure.

- There are existing regulations that enable the Public Service Commission to impose fines on railroads for not removing vegetation that poses sight restrictions. The comment was made that while these laws exist, they are not being enforced.

- Changing to a prioritizing procedure that includes ADT and other inventory data requires that the inventory data be updated. For example, the ADT data for many off-system crossings was initially estimated and never updated. Mr. Colson agreed and stated that the new field inspection form includes inventory data update information and updating of the inventory would be a priority in the new multimodal bureau.

- The participants were requested to consider closure during their field inspections. Mr. Colson stated that the CSX railroads are attempting to effect closure of three crossings prior to agreeing to one new crossing.

- Upgrade plans that are currently in the process of being developed, which include surface improvements, should be changed to not include

surface improvements. This suggestion was prompted by liability concerns.

- A comment was made that new agreements should be developed with clear distinctions between "should" and "shall." If specific responsibilities are not established, then arguments on tasks and duties will develop between the State, railroad, and local agencies.

- Work is being expended to develop the abbreviated plan format and blanks on disk for use by each Division.

- Concerns were expressed that the costs for State work on off-system crossings may vary drastically from location to location. The variation in cost is FHWA's refusal to permit State forces to include mobilization as a line item. Travel costs for distant crossings is, therefore, hidden in material application and installation costs. Mr. Colson stated that the resultant differences between projects should not be a concern since FHWA, for projects under $1M, are no longer inspecting on a project-by-project basis.

- A request was made that the certification requirements of railroad work be changed. The current procedure results in some Divisions checking railroad progress on a daily basis. It was suggested that the requirement be changed to read "adequate inspection to verify final quantities." This wording will enable the Division to conduct only needed inspections. This is handled by the office engineer and this decision would have to be made by that office.

- One Division stated that they plan to submit plans that have already been developed in the old format without modification to reflect the new procedure.

- Concerns were expressed that installing gates at all crossings may result in extensive traffic delays during fail-safe operation. A participant stated that a rural location operated in the fail-safe mode for three days prior to repair by the railroad. Mr. Colson stated that maintenance was the responsibility of the railroad and that railroads are required to respond quickly to improper operation conditions.

- Mr. Colson requested that any questions or problems with the new procedures, that were not presented or resolved during the meeting, be forwarded in writing to him within one week.

The meeting was adjourned at 11:10 a.m.

Registration List:

March 22-23, 1994

Darrell L. Cobbs, 421-54-2874
Railroad Coordinator
Alabama Department of Transportation
1020 Bankhead Highway
Birmingham, AL 35205
581-5637

Cecil Colson, 422-66-3736
Asst. Multimodal Transportation Engineer
Alabama Department of Transportation
1409 Coliseum Blvd.
Montgomery, AL 36130

Linda E. Harris, 422-64-4326
CE II Rail-Highway Safety Coordinator
Alabama Department of Transportation
1409 Coliseum Blvd., G-101
Montgomery, AL 36130
242-6131

Clarence Hodges, 422-58-3289
CE IV
Alabama Department of Transportation
1409 Coliseum Blvd.
Montgomery, AL 36130
242-6258

Les Hopson, 422-92-6722
Rail Coordinator
Alabama Department of Transportation
First Division Office
P.O. Box 550
Guntersville, AL 35976
582-2254

Bob Kratzer, 421-80-4755
Asst. Coordinator Rail/Highway Safety
Alabama Department of Transportation
1409 Coliseum Blvd., G 101
Montgomery, AL 36130
242-6253

Barry R. McIntosh, 423-54-2489
CE III, Division Traffic Engr.
Route 2, Box 21
Grove Hill, AL 36451
275-4103

Choyce Roberts, 421-52-6681
Location Engineer
AL DOT Division 3
249 Rebecca Drive
Gardendale, AL 35071
631-3213

H.A. Stewart, 422-44-6309
Pre-Construction Engineer, 5th Division
P.O. Box 70070
Tuscaloosa, AL 35407
553-7030

Lance Taylor, 423-17-4689
Division Traffic Engineer
P.O. Box 495
Highway 20 East
Tuscumbia, AL 35674
381-5060

Registration List:

March 24-25, 1994

Ronald L. Baldwin, 420-72-7626
Asst. Division Engineer-Preconstruction
P.O. Box 647
Troy, AL 36081
670-2424

James R. Crumpton, 419-66-2158
CE IV, Rail Planning Engineer
Alabama Department of Transportation
Multimodal Transportation Bureau
1409 Coliseum Blvd.
Montgomery, AL 36024
242-6429

Ken Cush, 226-13-8197
4th Division Traffic Engineer
Alabama Department of Transportaiton
P.O. Box 1179
Alex city, AL 35010
234-8495

David D. Nichols, 424-98-6257
Engineers Assistant II
P.O. Box 95
Letohatchee, AL 36047
242-6663

Donald Pemberton, 420-72-2995
Civil Engineer I
Alabama Department of Transportation
P.O. Box 1179
U.S. Hwy 280
Alexander City, AL 35010
234-4265

J. Lamar Strickland, 416-70-0477
Division Traffic Engineer, 6th Division
Alabama Department of Transportation
P.O. Box 8008
Montgomery, AL 36110
241-8574

James B. Thomason, 422-70-3439
Asst. Division Engr., County Transportation
1701 Beltline Hwy., N.
Mobile, AL 36618
470-8298

Appendix 9

Summary of Crossing Projects Currently Programmed for Improvement

U.S. DOT Ranking	Reference Number	Crossing ID Number	Status
2	851(IV-RO)	728-006F	Plans in Div
5	852(IV-RO)	727-081N	Plans in Div
6	878(IV-RO)	728-013R	Plans in Div
7	601(V-R0)	351-369C	Plans Rec in Multi Trans
9	912((IV-RO)	821-203Y	Agree to R.R. 7-21-93
10	572(V-R)	728-076L	Agree to R.R. 4-28-93
14	951(IV-RO)	727-051W	Plans in Div
15	583(V-R)	726-016E	Agree from R.R. 21-1-93
18	520(IV-R)	352-067D	Agree to R.R. 11-12-93
19	865(IV-RO)	726-849D	To O.E. 7-26-93
21	421(IV-R)	731-808J	Plans in Div
29	571(V-R)	726-872X	To O.E. 10-1-93
30	573(V-R)	725-396K	To O.E. 9-17-93
31	922(IV-RO)	727-710Y	To O.E. 10-18-93
34	916(IV-R)	639-313J	Plans in Div
39	591(V-R)	731-796B	Plans in Div
40	to be reviewed	731-858M	Plans in Div
41	604(V-R)	726-063M	Plans in Div
45	582(V-R)	726-011V	Agree to R.R. 8-11-93
49	840(IV-RO)	726-754V AMTRAK "C"	Plans in Div
51	41A(1R)	663-599R	To OE 6-10-92
58	881(IV-RO)	728-031N	Plans in Div
61	to be reviewed	351-371D	Plans in Div
64	781(III-RO)	639-540P	Plans in Div
67	847(IV-RO)	726-748S Amtrak "C"	Plans in Div

U.S. DOT Ranking	Reference Number	Crossing ID Number	Status
70	519(IV-R)	352-125W	Plans in Div
73	375(V-R)	726-127N	Agree from R.R. 11-12-93
78	883 (IV-RO)	725-387L	Plans in Div
79	942 (IV-RO)	351-366G	Plans in Div
92	943 (IV-RO)	351-367N	Plans in Div
100	952 (IV-RO)	352-289M	Plans in Div
101	874 (IV-RO)	728-003K	Plans in Div
104	856 (IV-RO)	726-762M Amtrak "L"	Plans in Div
105	585 (V-R)	726-123V	Agree from R.R. 11-12-93
106	896 (IV-RO)	726-014R	Agree to R.R. 11-1-93
109	871 (IV-RO)	726-875T	Plans in Div
114	604 (3-RO)	726-943S	Agree from R.R. 11-12-93
119	947 (IV-RO)	831-160H	Plans in Multi Trans
128	891 (IV-RO)	725-427G	Plans in Div
136	588 (V-R)	731-795K	Plans in Div
137	325 (V-R)	352-268V	Agree to R.R. 9-3-93
139	930 (IV-RO)	731-956D	Agree from R.R. 11-12-93
141	823 (IV-RO)	728-278T	Plans in Div
152	649 (3-RO)	352-095G	Plans in Div
159	929 (IV-RO)	728-288Y	Plans in Div
160	936 (IV-RO)	728-007M	Plans in Div
161	884 (IV-RO)	725-393P	Plans in Div
162	594 (V-R)	352-323S	Plans in Div
175	791 (3-RO)	353-165X	Plans in Div
192	879 (IV-RO)	728-029M	Plans in Div
193	801 (IV-RO)	731-819W	Plans in Div
199	955 (IV-RO)	352-052N	Plans in Div

U.S. DOT Ranking	Reference Number	Crossing ID Number	Status
201	844 (IV-RO)	728-287F	Plans in Div
203	898 (IV-RO)	726-125H	Agree from R.R. 11-12-93
205	232 (V-R)	727-663T	To O.E. 10-1-93
209	911 (IV-RO)	853-215E	Agree from R.R. 11-4-93
214	326 (IV-R)	725-401E	To O.E. 11-8-93
227	925 (IV-RO)	727-706J	To O.E. 10-12-93
233	862 (IV-RO)	726-825P	Plans in Div
239	228 (1-RO)	352-109M	Plans in Div
245	880 (IV-RO)	728-030G	Plans in Div
251	885 (IV-RO)	725-403T	Plans in Div
253	886 (IV-RO)	725-405G	Plans in Div
265	909 (IV-RO)	726-746M	Plans in Div
266	720 (3-RO)	727-608T	Plans in Div
272	589 (V-R)	351-566R	Plans in Div
274	349 (V-R)	304-189D	Agree to R.R. 5-27-93
276	857 (IV-RO)	726-763U	Plans in Div
281	593 (V-R)	727-450H	Plans in Div
286	411 (3-RO)	731-783R	Plans in Div
303	575 (V-R)	725-400X	To O.E. 9-17-93
314	602 (V-R)	726-378R	Agree to R.R. 7-9-93
319	815 (IV-RO)	635-898X	Plans in Div
322	548 (V-R)	635-885W	Plans in Div
327	908 (IV-RO)	352-603U	Plans in Div
340	937 (IV-RO)	306-564H	Plans in Div
345	574 (V-R)	725-399F	To O.E. 10-18-93
351	933 (IV-RO)	351-472P	Agree to R.R. 6-24-93

U.S. DOT Ranking	Reference Number	Crossing ID Number	Status
356	685 (3-RO)	725-280J	Plans in Div
363	848 (IV-RO)	726-750T	Plans in Div
405	892 (IV-RO)	725-429V	Plans in Div
411	906 (IV-RO)	853-220B	To O.E. 10-29-93
416	606 (3-RO)	725-392H	To O.E. 3-11-92
432	949 (IV-RO)	352-240D	Plans in Div
447	577 (V-R)	725-422X	Plans in Div
477	722 (3-RO)	352-069S	Plans in Div
455	945 (IV-RO)	351-375F	Plans in Div
468	887 (IV-RO)	725-407V	Plans in Div
501	888 (IV-RO)	725-410D	Plans in Div
502	875 (IV-RO)	728-004S	Plans in Div
509	811 (IV-RO)	727-945J	Plans in Div
519	914 (IV-RO)	353-047V	Plans in Div
531	863 (IV-RO)	726-836C	Plans in Div
570	950 (IV-RO)	351-244C	Plans in Div
581	934 (IV-RO)	352-341P	Agree to R.R. 11-8-93
588	652 (3-RO)	352-170R	Plans in Div
593	338 (IV-R)	728-071L	Plans in Div
601	792 (3-RO)	351-965C	Agree from R.R.
626	957 (IV-RO)	002-969T	Div Notified to Proceed with Plans 08-15-93
637	647 (3-RO)	731-852W	Plans in Div
646	537 (V-R)	726-116J	Agree from R.R. 11-12-93
668	948 (IV-RO)	728-167B	Plans in Div
672	946 (IV-RO)	351-345N	Plans in Div
673	487 (IV-R)	352-670N	Agree from R.R. 9-20-93

U.S. DOT Ranking	Reference Number	Crossing ID Number	Status
679	873 (IV-RO)	727-996U	Plans in Div
681	488 (IV-R)	352-669U	Agree from R.R. 9-20-93
689	354 (V-R)	726-009U	Agree from R.R. 12-1-93
708	495 (IV-R)	727-391H	Plans in Div
713	858 (IV-RO)	726-764B	Plans in Div
715	580 (V-R)	725-442J	Agree from R.R. 12-1-93
749	859 (IV-RO)	726-765H	Plans in Div
759	956 (IV-RO)	727-439H	Plans in Div
765	523 (IV-R)	352-982W	Plans in Div
770	920 (IV-RO)	352-319C	Plans in Div
789	849 (IV-RO)	726-751A	Plans in Div
812	872 (IV-RO)	727-995M	Plans in Div
821	600 (IV-RO)	903-934F	Agree to R.R. 11-23-93
841	893 (IV-RO)	725-430P	Plans in Div
850	845 (IV-RO)	726-736X	Plans in Div
903	903 (IV-RO)	726-025D	To O.E. 7-10-93
906	596 (V-R)	851-279D	Plans in Div
907	401 (IV-R)	353-099M	Plans Rec in Multi Transp. 11-17-93
925	579 (V-R)	725-440V	Plans in Div
934	860 (IV-RO)	726-771L	Plans in Div
940	953 (IV-RO)	727-587C	Plans in Div
944	536 (V-R)	727-853N	Plans in Div
953	361 (IV-R)	728-033C	To O.E. 9-13-91
954	544 (V-R)	306-530N	Plans Rec in Multi Trans 11-19-93
960	846 (IV-RO)	726-746D	Plans in Div
965	486 (IV-R)	725-386E	Plans to O.E. 9-13-91

U.S DOT Ranking	Reference Number	Crossing ID Number	Status
982	207 (V-R)	304-228S	Agree to R.R. 5-27-93
995	867 (IV-RO)	726-853T	Agree from R.R. 11-12-93
1008	496 (IV-R)	727-381C	Plans in Div
1013	868 (IV-RO)	726-856N	Plans in Div
1056	900 (IV-RO)	726-114V	Plans in Div
1068	724 (3-RO)	731-850H	Plans in Div
1081	897 (IV-RO)	726-129K	Plans in Div
1083	695 (IV-RO)	352-804K	Hold
1101	869 (IV-RO)	726-846F	Plans in Div
1118	889 (IV-RO)	725-414F	Plans in Div
1171	578 (V-R)	725-428N	Plans in Div
1179	954 (IV-RO)	639-235E	Agree from R.R. 11-12-93
1207	530 (V-R)	306-024M	Plans in Div
1213	853 (IV-RO)	727-082V Amtrak "D"	Plans in Div
1218	576 (V-R)	725-402L	To O.E 9-17-93
1220	191 (II-RO)	352-513V	To O.E 12-16-93
1245	855 (IV-RO)	726-761F Amtrak "C"	Plans in Div
1346	542 (V-R)	667-469H	Agree from R.R. 12-01-93
1360	895 (IV-RO)	725-439B	Plans in Div
1418	864 (IV-RO)	726-843M	Plans in Div
1462	796 (IV-RO)	639-542D	Plans in Div
1482	358 (V-R)	639-618G	Plans in Div
1572	586 (V-R)	726-150R	To O.E 07-06-93
1620	901 (IV-RO)	726-034C	To O.E 07-19-93
1623	518 (3-RO)	726-952R	Plans in Div
1689	513 (3-RO)	731-860N	Plans in Div

U.S DOT Ranking	Reference Number	Crossing ID Number	Status
1774	924 (IV-RO)	736-014T	Agree to R.R 04-30-93
1778	813 (IV-RO)	350-270N	Agree from R.R 11-08-93
1906	894 (IV-RO)	725-431W	Plans in Div
1967	546 (V-R)	853-231N	To O.E 09-27-93
2011	836 (IV-RO)	843-934N	Plans in Div
2014	529 (V-R)	727-282E	Plans in Div
2557	938 (IV-RO)	639-572V	Plans in Div
2178	861 (IV-RO)	726-773A Amtrak "D"	Plans in Div
2319	359 (V-R)	725-346G	Agree from R.R 11-12-93
2456	958 (IV-RO)	637-970T	Div notified to proceed with plans 08-15-93
3866	931 (IV-RO)	727-322A	Plans in Div
Not on Index	590 (IV-R)	305-855L	Agree to R.R 1-19-93 (Row Portion authorized 05-05-93)
Not on Index	870 (IV-RO)	726-873E	Plans in Div
Not on Index	941 (IV-RO)	877-481U	Plans in Div
Not on Index	603 (V-R)	727-668C	R.R working up Plans
Not on Index	605 (V-R)	347-009X	Division

Appendix 10

Summary of Programmed Crossing Projects With Plans Currently in Division

U.S. DOT Ranking	Reference Number	Crossing ID Number	Status
2	851(IV-RO)	728-006F	Plans in Div
5	852(IV-RO)	727-081N	Plans in Div
6	878(IV-RO)	728-013R	Plans in Div
14	951(IV-RO)	727-051W	Plans in Div
21	421(IV-R)	731-808J	Plans in Div
34	916(IV-R)	639-313J	Plans in Div
39	591(V-R)	731-796B	Plans in Div
40	to be reviewed	731-858M	Plans in Div
41	604(V-R)	726-063M	Plans in Div
49	840(IV-RO)	726-754V AMTRAK "C"	Plans in Div
58	881(IV-RO)	728-031N	Plans in Div
61	to be reviewed	351-371D	Plans in Div
64	781(III-RO)	639-540P	Plans in Div
67	847(IV-RO)	726-748S Amtrak "C"	Plans in Div
70	519 (IV-R)	352-125W	Plans in Div
78	883 (IV-RO)	725-387L	Plans in Div
79	942 (IV-RO)	351-366G	Plans in Div
92	943 (IV-RO)	351-367N	Plans in Div
100	952 (IV-RO)	352-289M	Plans in Div
101	874 (IV-RO)	728-003K	Plans in Div
104	856 (IV-RO)	726-762M Amtrak "L"	Plans in Div
109	871 (IV-RO)	726-875T	Plans in Div
128	891 (IV-RO)	725-427G	Plans in Div
136	588 (V-R)	731-795K	Plans in Div
141	823 (IV-RO)	728-278T	Plans in Div

U.S. DOT Ranking	Reference Number	Crossing ID Number	Status
152	649 (3-RO)	352-095G	Plans in Div
159	929 (IV-RO)	728-288Y	Plans in Div
160	936 (IV-RO)	728-007M	Plans in Div
161	884 (IV-RO)	725-393P	Plans in Div
162	594 (V-R)	352-323S	Plans in Div
175	791 (3-RO)	353-165X	Plans in Div
192	879 (IV-RO)	728-029M	Plans in Div
193	801 (IV-RO)	731-819W	Plans in Div
199	955 (IV-RO)	352-052N	Plans in Div
201	844 (IV-RO)	728-287F	Plans in Div
233	862 (IV-RO)	726-825P	Plans in Div
239	228 (1-RO)	352-109M	Plans in Div
245	880 (IV-RO)	728-030G	Plans in Div
251	885 (IV-RO)	725-403T	Plans in Div
253	886 (IV-RO)	725-405G	Plans in Div
265	909 (IV-RO)	726-746M	Plans in Div
266	720 (3-RO)	727-608T	Plans in Div
272	589 (V-R)	351-566R	Plans in Div
276	857 (IV-RO)	726-763U	Plans in Div
281	593 (V-R)	727-450H	Plans in Div
286	411 (3-RO)	731-783R	Plans in Div
319	815 (IV-RO)	635-898X	Plans in Div
322	548 (V-R)	635-885W	Plans in Div
327	908 (IV-RO)	352-603U	Plans in Div
340	937 (IV-RO)	306-564H	Plans in Div
356	685 (3-RO)	725-280J	Plans in Div
363	848 (IV-RO)	726-750T	Plans in Div
405	892 (IV-RO)	725-429V	Plans in Div

U.S. DOT Ranking	Reference Number	Crossing ID Number	Status
432	949 (IV-RO)	352-240D	Plans in Div
447	577 (V-R)	725-422X	Plans in Div
477	722 (3-RO)	352-069S	Plans in Div
455	945 (IV-RO)	351-375F	Plans in Div
468	887 (IV-RO)	725-407V	Plans in Div
501	888 (IV-RO)	725-410D	Plans in Div
502	875 (IV-RO)	728-004S	Plans in Div
509	811 (IV-RO)	727-945J	Plans in Div
519	914 (IV-RO)	353-047V	Plans in Div
531	863 (IV-RO)	726-836C	Plans in Div
570	950 (IV-RO)	351-244C	Plans in Div
588	652 (3-RO)	352-170R	Plans in Div
593	338 (IV-R)	728-071L	Plans in Div
626	957 (IV-RO)	002-969T	Div Notified to Proceed with Plans 08-15-93
637	647 (3-RO)	731-852W	Plans in Div
668	948 (IV-RO)	728-167B	Plans in Div
672	946 (IV-RO)	351-345N	Plans in Div
679	873 (IV-RO)	727-996U	Plans in Div
708	495 (IV-R)	727-391H	Plans in Div
713	858 (IV-RO)	726-764B	Plans in Div
749	859 (IV-RO)	726-765H	Plans in Div
759	956 (IV-RO)	727-439H	Plans in Div
765	523 (IV-R)	352-982W	Plans in Div
770	920 (IV-RO)	352-319C	Plans in Div
789	849 (IV-RO)	726-751A	Plans in Div
812	872 (IV-RO)	727-995M	Plans in Div
841	893 (IV-RO)	725-430P	Plans in Div
850	845 (IV-RO)	726-736X	Plans in Div

U.S. DOT Ranking	Reference Number	Crossing ID Number	Status
906	596 (V-R)	851-279D	Plans in Div
925	579 (V-R)	725-440V	Plans in Div
934	860 (IV-RO)	726-771L	Plans in Div
940	953 (IV-RO)	727-587C	Plans in Div
944	536 (V-R)	727-853N	Plans in Div
960	846 (IV-RO)	726-746D	Plans in Div
1008	496 (IV-R)	727-381C	Plans in Div
1013	868 (IV-RO)	726-856N	Plans in Div
1056	900 (IV-RO)	726-114V	Plans in Div
1068	724 (3-RO)	731-850H	Plans in Div
1081	897 (IV-RO)	726-129K	Plans in Div
1083	695 (IV-RO)	352-804K	Hold
1101	869 (IV-RO)	726-846F	Plans in Div
1118	889 (IV-RO)	725-414F	Plans in Div
1171	578 (V-R)	725-428N	Plans in Div
1207	530 (V-R)	306-024M	Plans in Div
1213	853 (IV-RO)	727-082V Amtrak "D"	Plans in Div
1245	855 (IV-RO)	726-761F Amtrak "C"	Plans in Div
1360	895 (IV-RO)	725-439B	Plans in Div
1418	864 (IV-RO)	726-843M	Plans in Div
1462	796 (IV-RO)	639-542D	Plans in Div
1482	358 (V-R)	639-618G	Plans in Div
1623	518 (3-RO)	726-952R	Plans in Div
1689	513 (3-RO)	731-860N	Plans in Div
1906	894 (IV-RO)	725-431W	Plans in Div
2011	836 (IV-RO)	843-934N	Plans in Div
2014	529 (V-R)	727-282E	Plans in Div

U.S. DOT Ranking	Reference Number	Crossing ID Number	Status
2557	938 (IV-RO)	639-572V	Plans in Div
2178	861 (IV-RO)	726-773A Amtrak "D"	Plans in Div
2456	958 (IV-RO)	637-970T	Div notified to proceed with plans 08-15-93
3866	931 (IV-RO)	727-322A	Plans in Div
Not on Index	870 (IV-RO)	726-873E	Plans in Div
Not on Index	941 (IV-RO)	877-481U	Plans in Div
Not on Index	605 (V-R)	347-009X	Plans in Div

Appendix 11

Summary of Programmed Crossing Projects to or from the Railroads

U.S. DOT Ranking	Reference Number	Crossing ID Number	Status
9	912((IV-RO)	821-203Y	Agree to R.R. 7-21-93
10	572(V-R)	728-076L	Agree to R.R. 4-28-93
15	583(V-R)	726-016E	Agree from R.R. 21-1-93
18	520(IV-R)	352-067D	Agree to R.R. 11-12-93
45	582(V-R)	726-011V	Agree to R.R. 8-11-93
73	375(V-R)	726-127N	Agree from R.R. 11-12-93
105	585 (V-R)	726-123V	Agree from R.R. 11-12-93
106	896 (IV-RO)	726-014R	Agree to R.R. 11-1-93
114	604 (3-RO)	726-943S	Agree from R.R. 11-12-93
137	325 (V-R)	352-268V	Agree to R.R. 9-3-93
139	930 (IV-RO)	731-956D	Agree from R.R. 11-12-93
203	898 (IV-RO)	726-125H	Agree from R.R. 11-12-93
209	911 (IV-RO)	853-215E	Agree from R.R. 11-4-93
274	349 (V-R)	304-189D	Agree to R.R. 5-27-93
314	602 (V-R)	726-378R	Agree to R.R. 7-9-93
351	933 (IV-RO)	351-472P	Agree to R.R. 6-24-93
581	934 (IV-RO)	352-341P	Agree to R.R. 11-8-93
601	792 (3-RO)	351-965C	Agree from R.R.
646	537 (V-R)	726-116J	Agree from R.R. 11-12-93
673	487 (IV-R)	352-670N	Agree from R.R. 9-20-93
681	488 (IV-R)	352-669U	Agree from R.R. 9-20-93
689	354 (V-R)	726-009U	Agree from R.R. 12-1-93
715	580 (V-R)	725-442J	Agree from R.R. 12-1-93
821	600 (IV-RO)	903-934F	Agree to R.R. 11-23-93
982	207 (V-R)	304-228S	Agree to R.R. 5-27-93
995	867 (IV-RO)	726-853T	Agree from R.R. 11-12-93
1179	954 (IV-RO)	639-235E	Agree from R.R. 11-12-93

U.S. DOT Ranking	Reference Number	Crossing ID Number	Status
1346	542 (V-R)	667-469H	Agree from R.R. 12-01-93
1774	924 (IV-RO)	736-014T	Agree to R.R 04-30-93
1778	813 (IV-RO)	350-270N	Agree from R.R 11-08-93
2319	359 (V-R)	725-346G	Agree from R.R 11-12-93
Not on Index	590 (IV-R)	305-855L	Agree to R.R 1-19-93 (Row Portion authorized 05-05-93)
Not on Index	603 (V-R)	727-668C	R.R working up Plans

Appendix D - Summary of Programmed Crossing Projects With OE or Multi-Modal

U.S. DOT Ranking	Reference Number	Crossing ID Number	Status
7	601(V-R0)	351-369C	Plans Rec in Multi Trans
19	865(IV-RO)	726-849D	To O.E. 7-26-93
29	571(V-R)	726-872X	To O.E. 10-1-93
30	573(V-R)	725-396K	To O.E. 9-17-93
31	922(IV-RO)	727-710Y	To O.E. 10-18-93
51	41A(1R)	663-599R	To OE 6-10-92
119	947 (IV-RO)	831-160H	Plans in Multi Trans
205	232 (V-R)	727-663T	To O.E. 10-1-93
214	326 (IV-R)	725-401E	To O.E. 11-8-93
227	925 (IV-RO)	727-706J	To O.E. 10-12-93
303	575 (V-R)	725-400X	To O.E. 9-17-93
345	574 (V-R)	725-399F	To O.E. 10-18-93
411	906 (IV-RO)	853-220B	To O.E. 10-29-93
416	606 (3-RO)	725-392H	To O.E. 3-11-92
903	903 (IV-RO)	726-025D	To O.E. 7-10-93
907	401 (IV-R)	353-099M	Plans Rec in Multi Transp. 11-17-93
953	361 (IV-R)	728-033C	To O.E. 9-13-91
954	544 (V-R)	306-530N	Plans Rec in Multi Trans 11-19-93
965	486 (IV-R)	725-386E	Plans to O.E. 9-13-91
1218	576 (V-R)	725-402L	To O.E 9-17-93
1220	191 (II-RO)	352-513V	To O.E 12-16-93
1572	586 (V-R)	726-150R	To O.E 07-06-93
1620	901 (IV-RO)	726-034C	To O.E 07-19-93
1967	546 (V-R)	853-231N	To O.E 09-27-93