Development of an Industrial-Commercial Access Network: A Pennsylvania Pilot Study

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The Pennsylvania Department of Transportation (DOT) has conducted a pilot study to identify the Industrial-Commercial Access Network (I–CAN). This effort was undertaken in cooperation with a task force of government, business, and industry representatives. The Pennsylvania DOT has previously committed to the development and enhancement of an economic development highway system through the identification of the Priority Commercial Network and the Agri-Access Network. The I–CAN study took yet another step in examining the highways that provide access to industrial parks and complexes. The pilot study identified the I–CAN and obstructions to trucks on the network, reviewed and revised all networks as an integrated system, and evaluated the process used to develop a statewide study. The I–CAN and the other priority networks are valuable planning tools for developing transportation improvement programs linked to economic interests.

Pennsylvania's industry is vital to the economic well-being of the Commonwealth and all of its residents. Such important activity should be nurtured and enhanced in the interest of creating new jobs and protecting existing employment opportunities. In 1984, Pennsylvania ranked fifth in the nation in the number of new industrial facilities, exceeded only by the sunbelt states of Texas, Florida, California, and North Carolina. If Pennsylvania is to continue this trend and become the center of a modern American revolution designed to regain our national and international edge, the Pennsylvania transportation system must continue to be modernized to provide improved access to economic centers.

Approximately two-thirds of Pennsylvania's freight is carried by the trucking industry. With increasing demand on the transportation system, it is important that limited federal, state, and local resources be targeted to those highway and bridge improvements that support economic revitalization and community preservation. With the growing emphasis on our transportation system, the Pennsylvania Department of Transportation (DOT) launched the Industrial-Commercial Access Network (I–CAN) pilot study in the fall of 1985. The study was conducted in four Pennsylvania counties.

The I–CAN pilot study was a continuation of prior initiatives to develop a system of priority networks. Previously identified networks were the Priority Commercial Network (PCN) and the Agri-Access Network (AAN). The PCN includes intercity-Interstate highways carrying heavy volumes of trucks; the AAN consists of roadways serving rural communities and related agribusiness activities.

The work plan for the I–CAN pilot study was developed with four main objectives: (a) identify the essential industrial connectors and other important state and local roadways that are vital to the movement of raw materials and finished products; (b) identify roadway obstructions including weight restrictions and low overhead clearances that would require trucks to detour and take a route not in the typical path of travel; (c) undertake a network rationalization effort to review all the priority networks in the pilot counties as a total system rather than as stand-alone systems as they were developed; and (d) evaluate the findings, methodology, and criteria used in the pilot study to develop the appropriate process for a statewide study.

BACKGROUND

Prior Initiatives

Over the past 4 years, the Pennsylvania DOT has undertaken three major transportation initiatives that have improved Pennsylvania's infrastructure by removing obstructions to the movement of goods. These initiatives, which are important to commerce, include the Priority Commercial Network, the Agri-Access Network, and Billion Dollar Bridge Bill I.

Priority Commercial Network

In 1982, the Priority Commercial Network (PCN) was developed. This system of highways carries heavy volumes of trucks and serves as the economic backbone of the Commonwealth. The PCN represents approximately 12,000 mi of state highways that typically carry traffic of more than 500 trucks per day or serve as connector roads for regional industries such as coal. Included in the PCN are the Interstate system, the tandem-truck network, and the core coal haul network. The PCN was identified by the Pennsylvania DOT in cooperation with county and regional planning agencies and economic development authorities.

Billion Dollar Bridge Bill I

By enacting Billion Dollar Bridge Bill I, also in 1982, the Pennsylvania General Assembly and the Thornburgh Administration made a concerted effort to help resolve the Commonwealth's most critical bridge problems. The program includes

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TABLE 1 PILOT COUNTY COMPARISON DATA

	Bedford	Lycoming	Mercer	Montgomery	Total PA
Land area (square mile)	1,017	1,237	672	486	
Population	47,732	117,339	127,485	651,379	44,888,566
Percent Urban (%)	7.1	55.7	50.8	88.4	69.3
Density (pop/square mile)	46.9	94.8	198.5	1,340.2	264.8
Employment	17,800	49,000	44,400	298,600	5,252,000
Per Capita Income ($)	7,561	9,729	9,656	16,855	11,468
Highway Miles					
State	865	849	818	821	43,333
Local/other	978	1,320	1,158	2,249	71,532
Daily Vehicle Miles of travel (State Roads)	1,014,905	1,863,158	2,362,760	7,679,077	154,976,676
Highway Bridges (20 feet and greater)					
State	303	348	281	432	15,427
Local/other	142	115	177	251	6,822

Sources: Pennsylvania Statistical Abstract, 1985; PA County Books, Department of Commerce; Bureau of Employment Security, Department of Labor and Industry; Pennsylvania Mileage Summaries and Structure Inventory Record System, Pennsylvania Department of Transportation

979 projects at a total cost of $1.4 billion. The main funding sources include the Pennsylvania axle tax, federal critical bridge funds, and local funds. This is the largest bridge restoration and replacement program in the nation. As of June 30, 1986, 551 projects at a total cost of $773 million have gone to construction or have been completed. This program is helping to eliminate bridge impediments on our priority networks, ultimately saving millions of dollars in transportation cost. Elimination of weight restrictions on the PCN alone will save the trucking industry over $200 million annually in avoided detour costs when the program is completed. The program will also result in operational savings to many school districts and provide shorter and safer routes for emergency vehicles.

Agri-Access Network

In 1984, the Agri-Access Network (AAN) was developed. The AAN includes approximately 11,800 mi of rural roads that provide access to Pennsylvania's agricultural areas. The network includes 1,000 mi of locally owned roads. These roads provide key links between the farming communities or agribusiness establishments and the main commercial highways of the PCN. The AAN was identified through a cooperative effort among transportation planners, extension agents, farmers, agribusinesses, and local government representatives.

STUDY APPROACH

Task Force

The I–CAN task force, formed in the fall of 1985, consisted of representatives from government, business, and industrial organizations.

The task force was subdivided into a work committee and a steering committee. The work committee met more frequently throughout the study to review and comment on the technical procedures being applied as part of the pilot study. The steering committee concentrated on policy decisions and directed its attention towards applying the products of the study to the transportation decision-making process to enhance the Commonwealth's economic climate.

Pilot County Selections

A pilot study approach was selected by the I–CAN steering committee. The four pilot counties represent a mixture of economic, geographic, and transportation characteristics. Table 1 presents selected data to show the variation among the four counties. The location of the pilot counties is shown in Figure 1.

Bedford County represents a rural setting with lower than average levels of employment and per capita income. Lycoming and Mercer Counties are medium counties in most comparison areas. Each has an urbanized area within the county. Montgomery County, being within the Philadelphia market area, has a more diverse economy. It also represents a more heavily populated area with greater amounts of traffic.

Industrial-Commercial Involvement

Each county enlisted the assistance of local committees as appropriate for the local situation. These groups included such

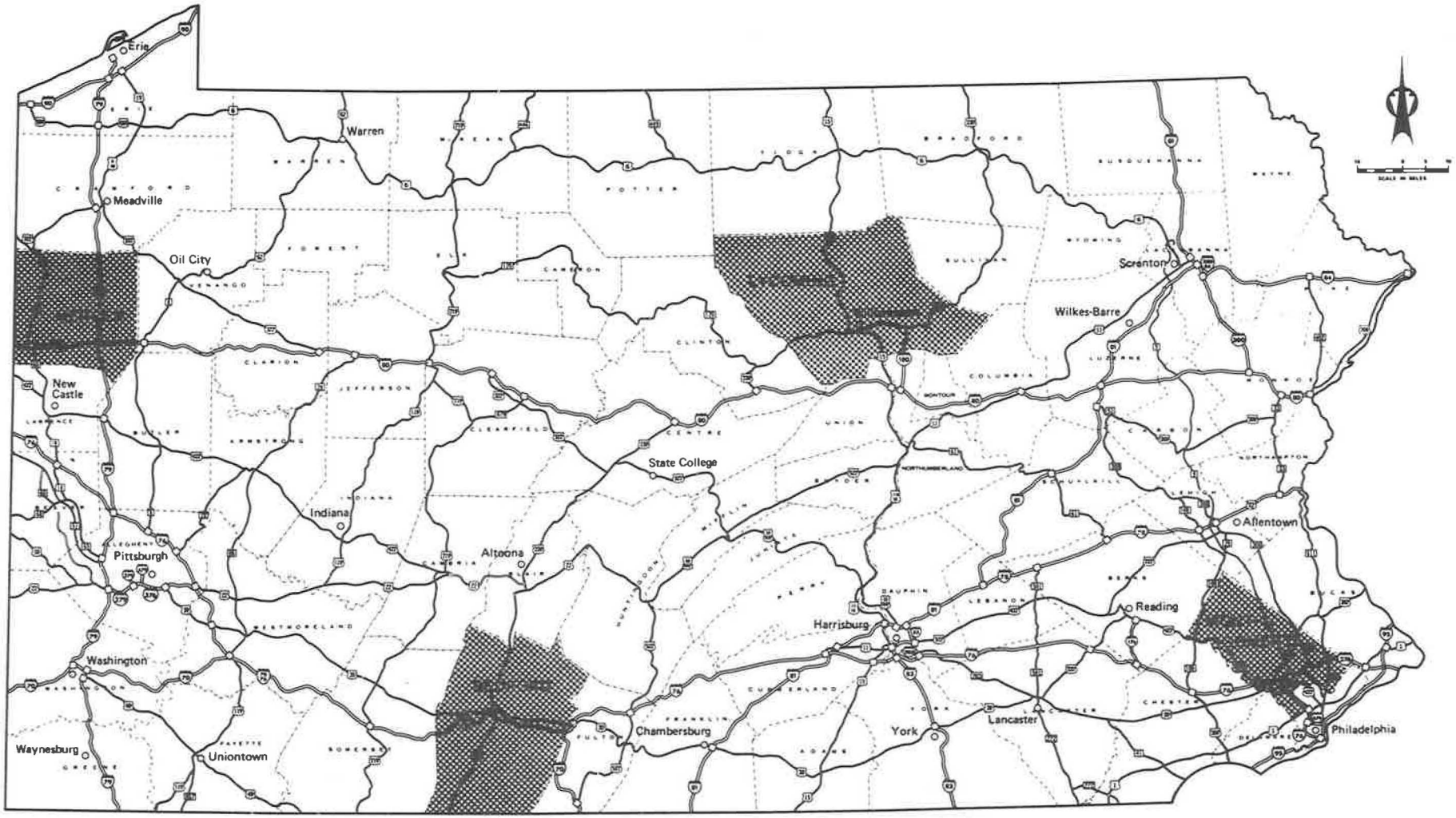

FIGURE 1 I–CAN pilot counties.

organizations as chambers of commerce, manufacturers associations, and trucking associations. The size of the groups varied with the complexity and composition of the local economy.

Generator Identification

One of the first tasks of the pilot study was to establish criteria and identify major industrial-commercial users. These were referred to as "major generators" throughout the study process. Each pilot county developed its own criteria to identify the major generators based upon methods or sources of information most appropriate for each unique county situation.

Survey questionnaires were developed in Lycoming and Montgomery Counties with the purpose of having potential major generators supply information regarding truck traffic and preferred routes. The survey questionnaire was distributed to the local manufacturing associations, members of the Pennsylvania Motor Truck Association, and the Pennsylvania Chamber of Commerce. Questionnaires were also sent to small-scale truck generators compiled from the Polk Directory and the Bell of Pennsylvania yellow pages. It was anticipated that the questionnaire would be the primary source of data, to be supplemented as needed. Unfortunately, the response rate was very low, prompting the counties to seek additional sources. These sources included

- Aerial photographs,
- Location maps of industrial parks and shopping centers, and
- Staff knowledge of specific areas within the county.

Bedford and Mercer Counties developed their preliminary list of major generators from a county industrial directory. The list was refined with the assistance of the local work committee in Mercer County and the staffs of the planning commission and the department's district office in Bedford County. Lycoming County also used a local work group that assisted in the identification of major generators.

The major generators were mapped and reviewed to determine the proximity to a previously identified priority network. Those that were served by the PCN were dropped from the list. The remaining list of major generators was further reviewed as part of the I–CAN identification.

Network Identification

A preliminary I–CAN was developed in each of the pilot counties that included roadways that provide access from the major generators to the PCN. Where the industrial generators coincided with the previously identified AAN, a dual identification was established. I–CAN roadways included

- Access roads to industrial parks or corridors of industrial-commercial activities;
- Access roads to significant mining, quarrying, and lumber operations;
- Bypasses and in-town through routes not on the PCN or AAN;
- Shortcuts used by truckers to minimize distance and travel time; and
- Access to office parks.

Sample truck volumes were collected to verify the I–CAN roadways. Field views were also conducted to refine the network. The Pennsylvania DOT's county maintenance managers were consulted to assist in finalizing the list of major generators and the I–CAN identification.

Roadway Obstructions

Roadway obstructions were identified, located, and mapped in each of the pilot counties. Obstructions were considered to be impediments that force the trucking industry to take lengthy detours and increase their time and operating cost. Obstructions identified included weight-restricted bridges, weight-restricted roadways, and low clearance postings. Other roadway deficiencies inventoried included narrow roadways and bridges, steep grades, and turning problems due to an acute angle. Sources of data included the Pennsylvania DOT's bridge and roadway databases, field views, and local knowledge.

Network Rationalization

Approximately every 2 years since 1982, the U.S. Department of Transportation, in cooperation with local governments, business, and industries, has identified separate networks including the PCN, the AAN, and the newly identified I–CAN. As part of the I–CAN pilot study, a network rationalization task was undertaken that included reviewing the function and interaction

TABLE 2 PILOT COUNTY NETWORK MILEAGE—BEFORE RATIONALIZATION

County	PCN	AAN	I-CAN		DUAL		Combined Mileage
			State	Local	State	Local	
Bedford	211	208	17	2	29	0	467
Lycoming	219	242	16	23	38	0	538
Mercer	225	301	4	2	44	0	576
Montgomery	356	100	43	27	4	0	530
TOTALS	1,011	851	80	54	115	0	2,111

of each of the priority networks to determine if any reclassifications, additions, or deletions should be considered. Some of the criteria used for reclassification were

- Truck volume counts,
- Field observations,
- Newly constructed roadways,
- Local knowledge,
- Functional use of the roadway, and
- Roadway conditions and adjacent land use.

The task was accomplished as a joint effort of the Pennsylvania DOT staff from the Bureau of Strategic Planning, district and county offices, along with county and regional planning representatives.

RESULTS

Major Generators

Major generators were the basis for the I–CAN identification. The methods used to complete this task varied between counties, and the results also varied. Agri-related generators that had been previously identified as part of the agri-access study and are served by the AAN were not considered.

The major generators identified in each of the pilot counties included 93 in Bedford County, 70 in Lycoming County, 117 in Mercer County, and 170 in Montgomery County. The major generators in Bedford County, being more rural in nature, consisted predominantly of light industry and sales and service. In Lycoming County, the majority of the major generators were light or medium manufacturing. In Mercer County, 70 percent of the major generators were located in the western third of the county, and the most prevalent type was manufacturing. In Montgomery County, the majority of the generators identified were industrial parks and shopping centers. Businesses and industries were considered based on estimated truck trips or clusters of establishments that produced a substantial aggregated amount of truck traffic.

Network Identification

The network identification in the pilot counties did not account for a large number of miles due to the nature of the roadways. The I–CAN accounted for 48 mi in Bedford County, 77 mi in Lycoming County, 50 mi in Mercer County, and 74 mi in Montgomery County. The I–CAN mileage in relation to the PCN and the AAN is presented in Table 2.

When considering the network mileage for each of the pilot counties, some interesting comparisons can be made. Bedford, Lycoming, and Mercer Counties are much more dependent on agriculture than is Montgomery County. As a result, only 4 mi of dual network were identified in Montgomery County; whereas Bedford, Lycoming, and Mercer Counties identified between 29 and 44 mi each. Montgomery County identified 70 mi of new I–CAN; whereas Bedford, Lycoming, and Mercer Counties each identified between 6 and 39 mi.

Truck volumes were one of the measurements used in identifying the I–CAN. As expected, truck volumes in Montgomery County were highest. Typical volumes in Montgomery County ranged between 150 and 500 trucks per day. In comparison, typical truck volumes in Bedford, Lycoming, and Mercer Counties ranged between 50 and 400 trucks per day.

Network Obstructions

Network obstructions were identified, located, and mapped. Bridge restrictions were found to be the primary obstruction to truck movements on the I–CAN. Throughout the four pilot counties, 19 obstructions were identified, 10 of which were posted bridges. Of the 10 posted bridges, 6 were currently programmed for repair or replacement as part of the Pennsylvania DOT's bridge program. One additional bridge was programmed for engineering only. Additional obstructions identified included light low-clearance postings and one weight-restricted roadway. The roadway obstructions identified in each county are summarized as follows:

County	*Weight-Restricted Bridges*	*Weight-Restricted Roadways*	*Low Overhead Clearance*
Bedford	2	1	3*
Lycoming	5	–	–
Mercer	3	–	2
Montgomery	–	–	3
Total	10	1	8*

*Includes directional structures under I–70.

The I–CAN and other priority networks provide valuable tools for concentrating improvement projects to benefit economic development. Eliminating weight-restricted bridges on priority networks was a primary goal when developing the program of projects for Billion Dollar Bridge Bills I and II. As shown in Table 3, there were 348 closed or weight-restricted bridges in the four pilot counties. Only 67 of these bridges were on priority networks. Many of these bridges were then being designed or constructed and others were included in the recently approved legislation for Billion Dollar Bridge Bill II.

Network Rationalization

The Pennsylvania DOT's goal was to develop an integrated system of economic development highways functioning during development as a total system instead of stand-alone networks. The network rationalization task included a review of each network and appropriate reclassification, additions, deletions, and, in some cases, total removal of a roadway from the priority network system.

Results of the network rationalization process are included in Table 4. A total of 155 mi were deleted from the PCN; 125 were reclassified to other networks, including 64 mi to I–CAN, 27 mi to AAN, and 34 mi to dual networks. Some of the network changes from PCN to I–CAN resulted from the construction of new bypass routes that diverted the through truck traffic around the downtown. Additional roadways were reclassified to the AAN or dual network due to low truck volumes and their function as access routes to agribusiness. Sixteen miles of roadway were added to the PCN and 30 mi of PCN were dropped from all networks due to low truck volumes or the roads not serving as an access route to a major economic center. Seventeen miles added to the AAN reflected changing needs to the agricultural community and provided continuity to adjacent county lines.

TABLE 3 WEIGHT-RESTRICTED OR CLOSED BRIDGES IN PILOT COUNTIES

	Total Bridges 20 Ft or Greater	Weight-Restricted/Closed Bridges PCN	AAN	I-CAN	Other	Total
Bedford	445	5	17	2	61	85
Lycoming	463	11	11	5	83	110
Mercer	458	0	4	3	68	75
Montgomery	683	4	5	0	69	78
Total	2,049	20	37	10	281	348

TABLE 4 PILOT COUNTY NETWORK RATIONALIZATION MILEAGE

Networks	Miles Bedford	Lycoming	Mercer	Montgomery	Totals
PCN to I-CAN	4.0	11.2	37.6	11.6	64.4
PCN to DUAL	2.4	15.8	8.5	--	26.7
PCN to AAN	--	26.5	--	7.6	34.1
PCN Removal from all Networks	--	1.0	9.2	19.7	29.9
Total Reduction in PCN	6.4	54.5	55.3	38.9	155.1
PCN Added	--	--	1.1	15.0	16.1
New AAN	2.6	6.5	--	7.5	16.6

TABLE 5 PILOT COUNTY MILEAGE—AFTER RATIONALIZATION

County	PCN	AAN	I-CAN State	I-CAN Local	DUAL State	DUAL Local	Combined Mileage
Bedford	205	211	21	2	31	0	470
Lycoming	164	276	25	25	54	0	544
Mercer	171	301	41	2	52	0	567
Montgomery	332	115	55	27	4	0	533
TOTALS	872	903	142	56	141	0	2,114

The network rationalization effort resulted in a realignment of the priority networks in each of the pilot counties that more accurately reflects the function of the roadway in relation to economic development. Table 5 reflects the change in mileage on each of the priority networks resulting from the network rationalization.

PRELIMINARY STATEWIDE NETWORK

While the Pennsylvania DOT and the four pilot counties were engaged in the I–CAN pilot study, several other events occurred that directly affected the priority network system.

The Pennsylvania DOT had engaged consulting engineers to bring all state and local bridges into compliance with the 2-year inspection cycle required by the National Bridge Inspection Standards (NBIS). The NBIS requires that all state and local bridges with a span of 20 ft or greater must be inspected on a 2-year cycle; that load ratings must be established for heavy vehicles; and that weight restrictions must be posted on bridges not able to carry legal loads. At the same time that the bridge inspections were being completed, the Pennsylvania DOT was preparing a legislative package for Billion Dollar Bridge Bill II. Candidates for inclusion in the legislation were bridges on the PCN, AAN, and I–CAN, which are presently posted or expected to be posted.

The PCN and AAN have been identified but the I–CAN identification was in the pilot study phase. In order to facilitate the development of Billion Dollar Bridge Bill II, the Pennsylvania DOT initiated the identification of a preliminary statewide I–CAN. The identification was completed as a joint effort between the Pennsylvania DOT's district office staffs and local planning commission staffs. The identification was completed over a very short period and represented only a cursory review.

Approximately 3,400 mi (2,000 mi of DUAL network) were identified as part of the process. The identification was preliminary and needed to be further refined through a more concentrated process as part of a statewide study that would build on the methodology developed as part of the pilot study.

Legislation for the bridge bill was signed into law by Governor Thornburgh on July 9, 1986. The program includes over 3,000 state and local bridges at a total cost of $1.6 billion (see Figure 2). The importance of the priority networks is reflected by the following numbers: 1,200 network bridges including 550 PCN bridges, 463 AAN bridges, and 187 I–CAN and DUAL-network bridges.

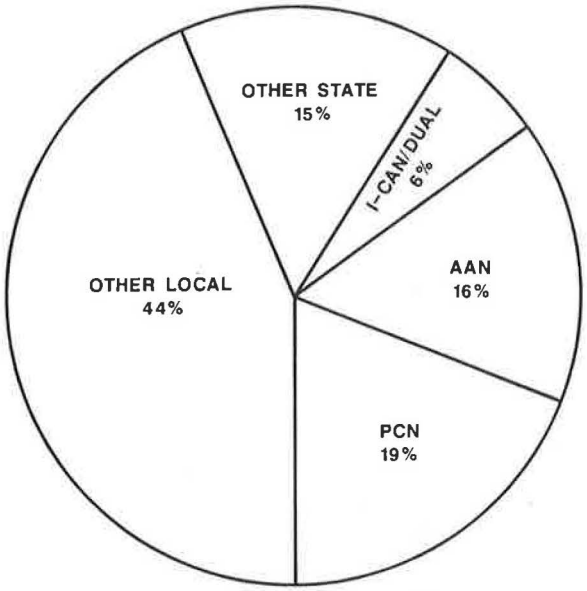

FIGURE 2 Billion Dollar Bridge Bill II, percent of bridges by network.

Of the 1,200 network bridges, 587 currently have weight restrictions. Additional bridges may require postings as a result of the biannual inspections for the NBIS.

FUTURE INITIATIVES

Statewide Study

The statewide I–CAN study was initiated in July 1986. The study was to build on the methodology and procedures developed as part of the pilot study. The preliminary I–CAN, identified to facilitate the development of Billion Dollar Bridge Bill II, was to be used as a base network. The study process was to be completed over a 1-year period. The Pennsylvania DOT's district offices were to serve as the lead agency in the rural counties, and the planing commission staffs were to serve as the lead agency in the areas where there was a metropolitan planning organization.

The work plan for the statewide study consisted of six tasks, including

Task 1—Establish work committee.
Task 2—Locate major generators.
Task 3—Review and develop I–CAN.
Task 4—Identify roadway obstructions.
Task 5—Rationalize all networks.
Task 6—Prepare final report.

The statewide study was to be conducted under the direction of the pilot study task force. The knowledge and experience gained by the work committee and the steering committee throughout the pilot study was to be a valuable resource in conducting and completing the study.

Transportation Improvement Programs

The Pennsylvania DOT develops a 12-year transportation program that outlines the capital improvements to be completed throughout the Commonwealth within the projected available resources. The Pennsylvania DOT is required to review, revise, adjust, and extend the program every even-numbered year. The priority networks are used extensively in identifying candidates, setting priorities, and selecting projects.

The Pennsylvania DOT also uses the networks in other planning areas. Each district engineer annually develops a 4-year business plan for the engineer's area of the state. Restoration and maintenance programs are developed by networks. Activities are catered to the specific needs of each network.

The priority network system has been identified as the collection of economically important roadways suitable for increased truck commerce of which important economic spinoffs are encouraged. By identifying deficiencies on these networks and then developing strategies to resolve these deficiencies, a transportation environment conducive to commerce is created. In this manner, the overall economic climate of Pennsylvania is enhanced.

The public and legislative acceptance of improvement programs is also advanced through the use of priority networks. The involvement of agricultural, industry, and other sectors in network identification provides for a better understanding of business needs. The improvement programs developed through use of priority networks are therefore more responsive to these needs.

CONCLUSION

The study demonstrated a cooperative spirit among the local business and industrial community, local planning agencies, and federal and state agencies in achieving a common goal. The study process proved to be effective in identifying those roadways used to transport commodities between the supplier and the consumer. Results are to be used in establishing priorities for roadway and bridge improvements by the Pennsylvania DOT and local governments. The pilot study has served as a testing ground to refine the criteria and methodology for a statewide network identification.

At the completion of the statewide network identification, efforts to refine these planning tools are to continue. A large investment in time and money has been made in developing these decision-making tools, and the changing needs of the business community must continue to be answered. The Pennsylvania DOT solicits the assistance of local government, business, and industry in developing monitoring and updating procedures to maintain a current priority network system.

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