

## HIGHWAY SAFETY IMPROVEMENT PROGRAM

### Local Road Accident Reduction Program

In 1985 ConnDOT implemented an "Off System" Local Road Accident Reduction Program in accordance with revisions made to the Hazard Elimination Program in the 1982 Surface Transportation Act. As the title suggests, improvements funded under this program had to address problems on roadways off the federal highway system. The introduction of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 brought major changes to the federal highway system. Under ISTEA, the term "Off Systems" was dropped from the name of the program and the components of the program were revised. The implementation of the Transportation Equity Act for the 21<sup>st</sup> Century (TEA-21) initiated additional changes to allow the use of Federal safety funds on any public roadway. The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU; Public Act 109-59) of 2005 established a new Highway Safety Improvement Program that was structured to make significant progress in reducing highway fatalities and serious injuries. Each state developed a Strategic Highway Safety Plan (SHSP) that involved a comprehensive, data driven approach to highway safety. As part of Connecticut's SHSP, the reduction of roadway departure accidents was established as an emphasis area. The latest transportation funding bill (MAP-21) requires each state to update its SHSP. Roadway departure will continue to be an emphasis area.

The addition of town roads to this program introduced new jurisdictions that include Regional Planning Organizations (RPO) as well as cities and towns. Local officials and RPO's should be aware of the extensive analyses that ConnDOT requires of itself and will require of those submitting projects to ConnDOT. Participants in the process will be made aware that improvements made under this program will be limited to low-cost improvements that can be expected to eliminate or reduce the severity of a hazardous location or will address lane departure accidents on a systematic basis.

It will be the responsibility of the town and/or Regional Planning Organization to identify "local road high frequency accident locations" or roadway sections exhibiting significant lane departure accident potential and recommend appropriate countermeasures for improvement. ConnDOT will have the responsibility of implementing the projects and administering the program to the extent funds are available. The following outlines the Planning, Implementation and Evaluation Components of the Program:

### Planning Component

#### I. Traffic Records

The Department of Transportation has a computer record for accidents on town roads. The accidents are referenced to local roads by mileage and street intersections. That referencing, permits the accident location to be defined as either at a particular intersection or between two specific and adjacent intersections. Numerous characteristics of an accident (e.g. time of day, weather conditions, etc.) are made part of an accident's record. This information will be made available to local authorities on a town-wide basis (upon request) to assist them in identifying problem areas. This data can be grouped by location and identified by segments.

Several communities maintain manual or computer accident record systems. ConnDOT maintains Average Daily Traffic (ADT) computer files for some, but not all, town roads. Therefore, statistical reports involving the intersection, roadway characteristics, traffic volume and accidents (accident rates, exposure information) are available for State highways, but not town roads. ADT data that is available for various town roads can be obtained by contacting the Department's Office of Coordination, Modeling and Crash Data.

## II. Identify "Problem" Locations

As previously noted, the town and/or RPO will have the responsibility of identifying "local road high frequency accident locations" or roadways exhibiting significant lane departure accident potential.

One goal of an identification process is to take an extensive mass of data and efficiently sort through it to obtain a list of locations or roadway sections that appear to have an abnormal accident history. The process utilized should identify promising candidates which would benefit the most from funds spent on improvements.

The most common techniques used are based upon:

1. Accident Number - locations with more than a predetermined number of accidents are classified as "high accident" locations.
2. Accident Severity - same as above, but fatal and injury accidents are given greater weight.
3. Accident Rate - accident numbers are divided by vehicle exposure (distance traveled and amount of traffic).
4. Number Rate - a combination of the number and rate techniques.
5. Number Quality Control - same as number technique but requires the number to be significantly above average.
6. Rate Quality Control - same as accident rate technique, but requires the rate to be significantly above average.

In addition, hazardous elements with accident potential such as fixed objects in or near the travel way, or curves experiencing run-off-the-road accidents, can be similarly identified.

It is recognized that the selection of an identification method depends upon the data base available, the statistical reports available, and skill level of the analyst. Note that this is merely a

preliminary sort process and yields a list of candidate locations to be studied further. The fact that a location is included or excluded from the list does not necessarily mean it is hazardous or not. The next step more clearly defines the nature and extent of an accident problem, if any, at a given location.

The Identification of “Problem” Locations step in the process, and others that follow, may be accomplished administratively in a number of different ways. These range from a town developing a town-wide list of candidate locations, to a Regional Planning Organization producing a priority listing of their most hazardous locations or roadway segments with significant lane departure accident potential. For administrative purposes, a regional listing method is preferred. The requirements, characteristics and capabilities of each town and their region ultimately can suggest a scheme that best meets the needs of each community individually and collectively.

### III. Determine Nature and Extent of Accident Problem (RPO and/or Town)

All readily available data, plans, reports, accident records, etc., are assembled and analyzed. That analytical process is enhanced if the statistics for a studied location can be compared to statistics for similar locations. The amount of statistical information available from ConnDOT describing "typical" locations is extensive for State highways but to a lesser degree for local roads.

The objective for this phase is to identify abnormal patterns of accidents and any conditions that could be changed to influence a reduction in those abnormal pattern(s). Many locations studied have random and/or normal patterns of accidents, none of which are susceptible to reduction through ordinary means and will be considered relatively normal in the final analysis. Other locations will have abnormal patterns that appear susceptible to reduction in frequency and/or severity. Potential solutions should be considered for those locations. The analysis must include identification of the root cause(s) of recognized problems and documentation of the problems and their causes.

#### IV. Develop Candidate Countermeasures

Countermeasures are those actions that will have a clear, direct and positive impact upon perceived problems. During the development of countermeasures, many aspects should be considered including, but not limited to, costs (preliminary engineering, ROW, utilities, construction costs, annual maintenance and operations costs), positive impacts, negative impacts and the service life of the improvement. It is important that these facets be realistically projected to avoid overly optimistic forecasts that could lead to the expenditure of resources and the advancement of some proposals that would ultimately not be approved for funding.

#### V. Select "Best" Solution

After weighing the facts assembled in the previous step, one alternative should be selected as the "best" solution; a solution that seems to be well worth the apparent cost. In some instances, all the potential solutions will appear to have a high costs and/or negative impact and the final determination may be that a reasonable solution is not feasible. The relative merit of a selected scheme is measured in greater depth during the succeeding step. The RPO and/or Town's Analyst must assess the cost of the proposal. Courses of action that result in high costs for paper work processing, in comparison to work accomplished, should be avoided. In the case of systematic improvements targeted to address roadway sections with significant lane departure accident potential, strategies should be uniformly applied over the entire study section. Some systematic countermeasures to consider include:

1. Improving curve signing and/or delineation.
2. Updating guide rail installations in areas of curvature to latest ConnDOT standards.
3. Adding pavement markings to previously unmarked roadways.
4. Increasing clear zones.
5. Installation of longitudinal rumble strips and stripes on two lane roads.
6. Installation of enhanced delineation and friction treatment for horizontal curves

The Local Road Accident Reduction Program is intended to fund low to moderate cost improvements that will address spot hazards as well as roadside elements that have lane departure accident potential. In order that the limited funds available can be used efficiently on a statewide basis, high cost projects with low benefits in comparison to costs should be funded through other programs.

Under the Local Road Accident Reduction program the Department plans to make construction funding available each fiscal year based on the availability of funds within the Highway Safety Improvement Program. The total cost of the project or roadway section that is selected for submission should be close to \$500,000. Any project or roadway section costing less than \$50,000 will not be considered under this program. The total estimated project cost, exclusive of design, which remains the responsibility of the City or Town, should include base construction cost, 25 percent for incidentals and 10 percent for contingencies. Included in the incidental costs is 10 percent for incidentals to construction by state forces. Municipalities will be responsible for 10 percent of the contract cost, and all cost for preliminary engineering or design and rights of way. In case the total estimated project cost does exceed \$ 500,000, the Department will still review the project and perform a benefit/cost computation to determine if the project is cost effective (higher benefit/cost ranking compared to other submissions). If the project is determined to be cost effective, the Department may consider funding the project under this program. It should be noted that any consultant utilized by a municipality or RPO in any aspect of this program (location identification, design, data collection, etc.) must be selected using a "Quality Based Selection" process in order to comply with Federal procurement requirements.

Project reports that meet the technical and administrative requirements of the safety program are to be forwarded to the Regional Planning Organizations. Each Regional Planning Organization will forward proper documentation for the top four locations or roadway sections on their implementation list to the ConnDOT, Division of Traffic Engineering. In those cases

where a town is not affiliated with a Planning Organization, each town may submit one candidate for consideration. The project report shall contain extensive documentation including, but not limited to, accident experience, collision diagrams, comparative accident data, a description of location including geometry, width, lane arrangement, sight lines, speeds, relevant peculiarities, etc., safety problem(s), reasons for those problem(s), recommended solution(s), and detailed itemized proposed project cost estimates. ConnDOT's subsequent project evaluation will be based upon this data. Detailed cost estimates should be as accurate as possible. Substantial cost estimate increases that occur during the design phase could disqualify improvements if those costs exceed the program guidelines. The report should also indicate the town's willingness to proceed with the project by providing a commitment from the town to fund their 10% share in the cost of the construction phase. A copy of all accident data should be retained by the town or Regional Planning Organization for future use during the Evaluation Component of the project.

## Implementation Component

### I. Priority Listing and Project Selection

Once the comprehensive reports are received by the Division of Traffic Engineering, the implementation component of the program will be jointly administered by Traffic Engineering and the Division of Highway Design.

The reports will be reviewed for accuracy and completeness and a "cost effective" evaluation will be performed by the Division of Traffic Engineering. The economic analysis will employ the benefit/cost (B/C) procedure. There are a number of techniques that enable a comparison of project costs to project benefits. In order that any given group of projects may be compared to each other, one technique will be used for all projects. Anticipated project benefits will be quantified and the anticipated benefits compared to the projected costs.

Projects with high costs compared to benefits may be considered ineffective from a safety point of view and would then be returned to the originator for reconsideration of scope and

source of funding. Projects that appear to be cost effective will be entered onto a "Local Road-Hazard Elimination List" in priority order of B/C ratio. Projects will be drawn from this list and initiated to the extent that funding is available within the Highway Safety Improvement Program.

## II. Project Design and Construction

A detailed description of each activity is contained in the Local Road Accident Reduction Program Component Flow Chart and Activity Assignment and the responsibilities of each office are noted. However, the following is a brief narrative of those activities:

The Division of Traffic Engineering will select the projects for implementation and prepare the necessary Recommended Project Memorandum (RPM) for construction. The Division of Highway Design will then administer the project once it has been initiated. All costs associated with design and rights of way will be the responsibility of the town or city. The Division of Highway Design will initiate the necessary agreement(s), act as liaison with the town and the Division of Traffic Engineering and other affected Department units, arrange for Plans, Specifications & Estimates (PS&E) approval and ensure that the Department's Capital Project Financing Office obtains authorization for construction from the Federal Highway Administration (FHWA).

The town will have the option of constructing the project with its own town forces or advertise the construction phase through its own advertising procedures in conformance with FHWA regulations. The construction phase of the project will be jointly administered by the Division of Highway Design and the Office of Construction, who will utilize other Department offices as required. The involvement by each office will depend largely on the method of construction the town chooses to pursue. Upon completion of construction, the project will be closed out by the appropriate administering office and the Division of Traffic Engineering will be advised of construction completion.



## Evaluation Component

Projects implemented under this program are added to ConnDOT's computer index file of safety improvement projects. Additional information is obtained and added to this index file so that when the project is completed and two years of "after" accident data becomes available, a statistical report can be prepared. All "before and after" evaluations and reports will be accomplished by the Division of Traffic Engineering. The Department's existing computer program will be utilized to evaluate a town road project. Accident data will not be adjusted for traffic volume for both periods (before and after) to a base year, as that data is not normally available for local roads. The following brief narrative describes activities to be employed in the evaluation process:

In order to judge the merits of an improvement and determine if its effectiveness in reducing accidents is significant, the CHI-Square Test with Yates correction will be employed. A 90 percent level of confidence to determine whether an accident reduction at a particular location is statistically significant will be used. An example of the CHI-Square Test with Yates correction follows:

$$CX = \frac{(|BAC - AAC| - 1)^2}{(BAC + AAC)}$$

CX = CHI Square Value

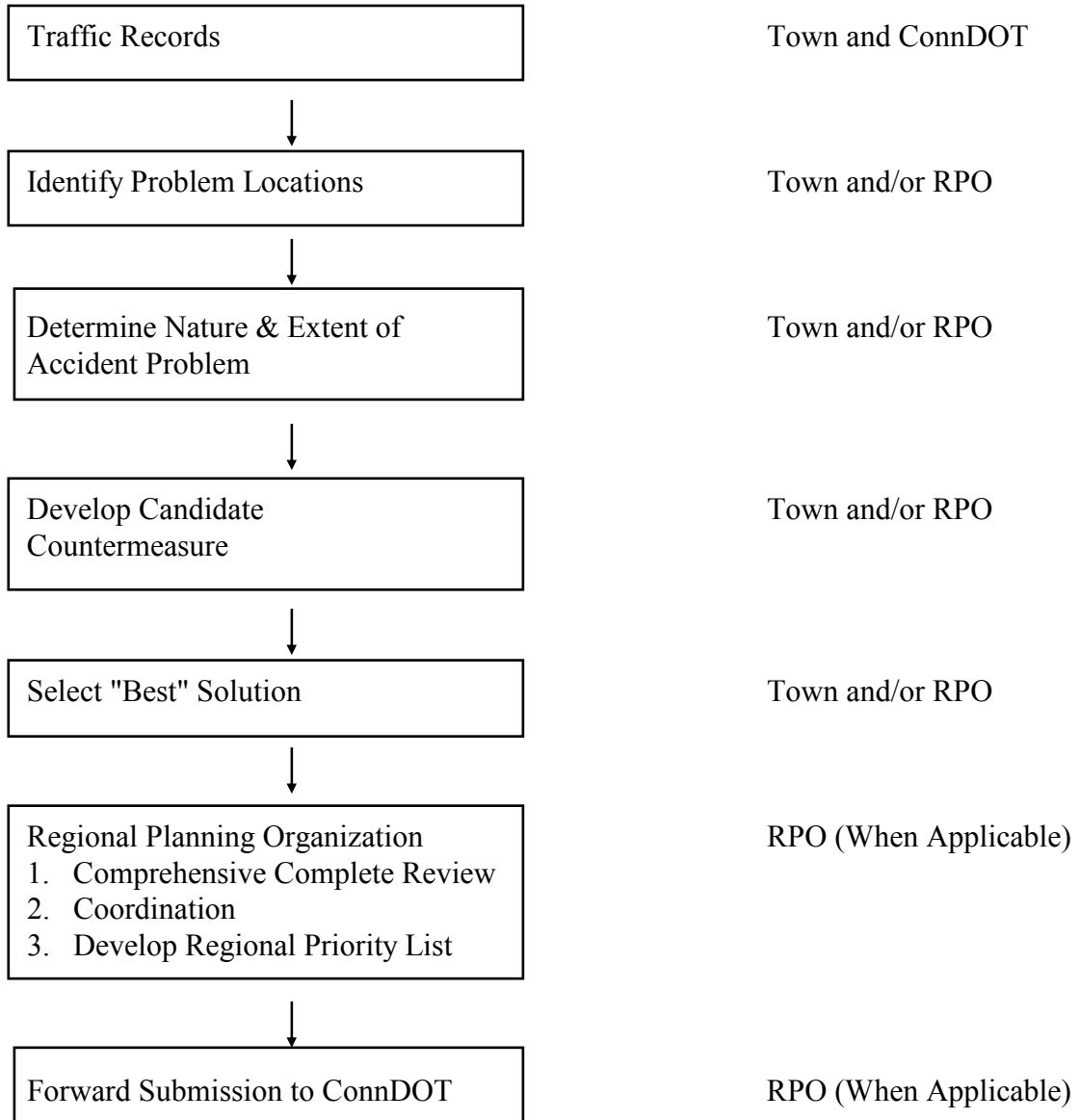
BAC = Before Accidents

AAC = After Accidents

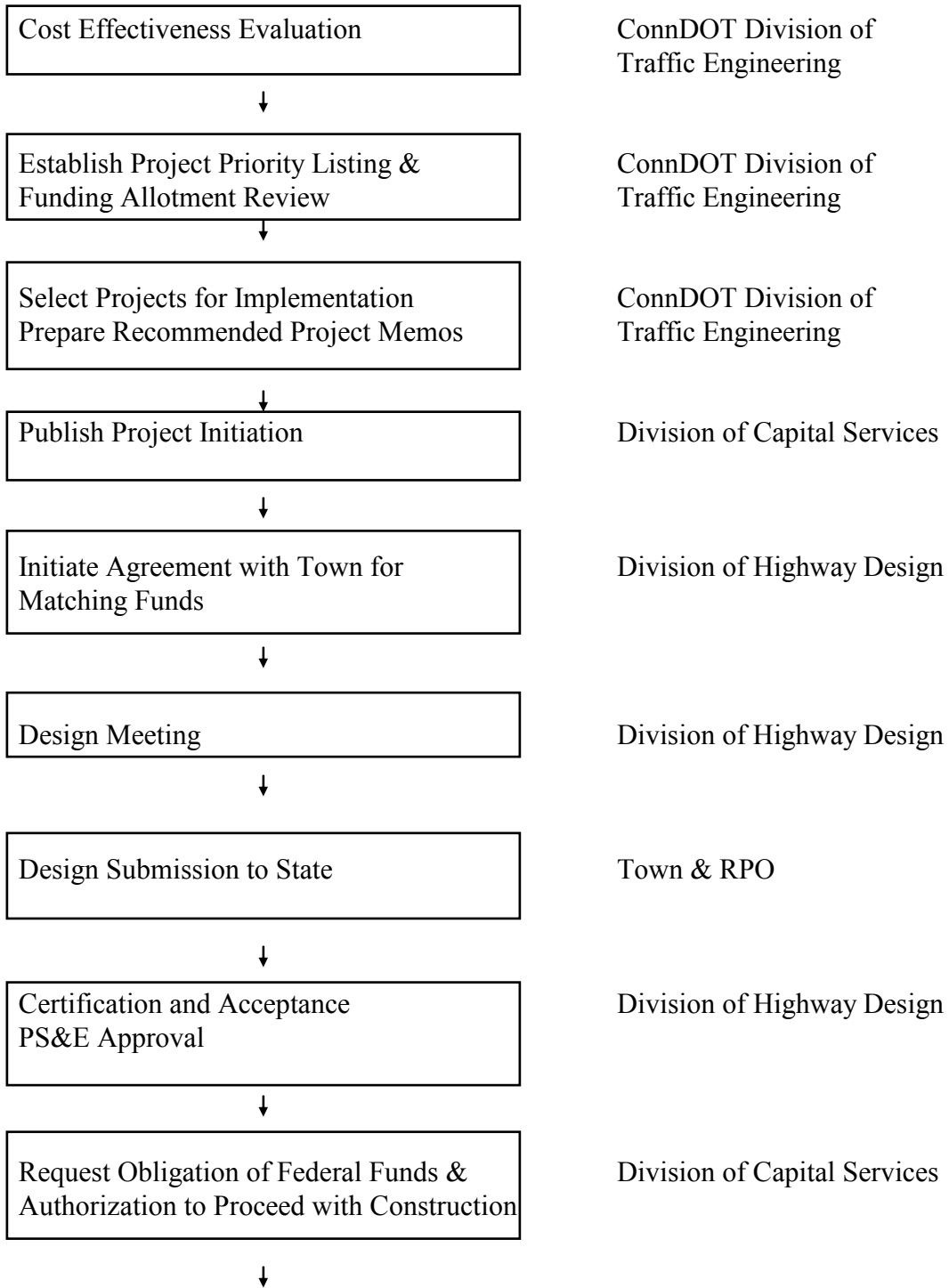
A Before and After study may be prepared, when two years of accident experience is available for the After period. The After period will not necessarily begin at the date the project is completed but will allow a sufficient time lapse, depending on the nature of the project, for traffic to adjust to the improvement. For the locations that have been evaluated, the Before and After report will be included in the Annual Safety Report to the FHWA.

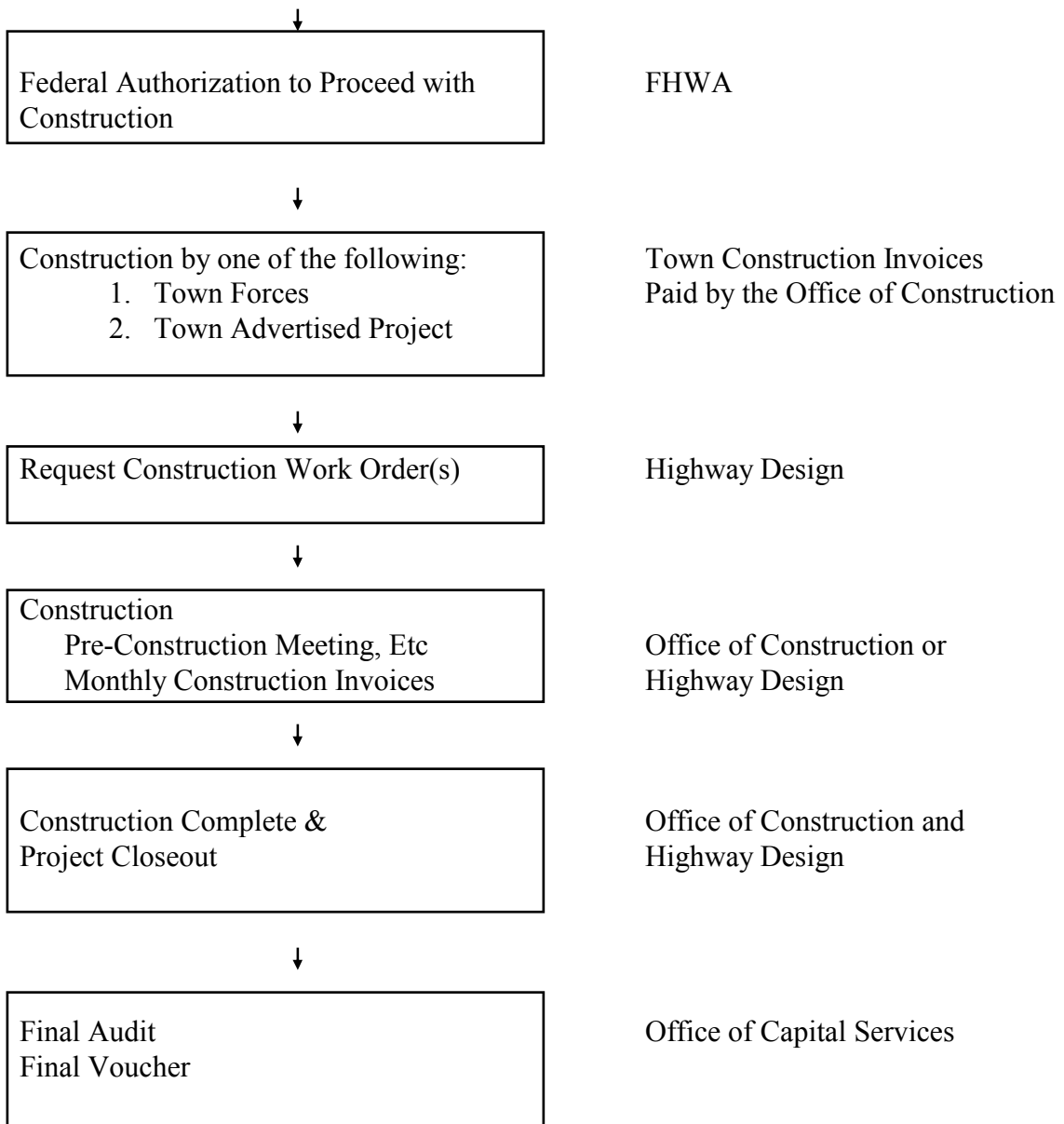
LOCAL ROAD ACCIDENT REDUCTION PROGRAM  
COMPONENT FLOW CHART AND ACTIVITY ASSIGNMENT

PLANNING COMPONENT



IMPLEMENTATION COMPONENT





EVALUTION COMPONENT

