III. PROJECT NEED

The principle project needs for this study are traffic congestion relief and traffic safety. These are the primary problems that are present on the existing regional and local roadway system. Without transportation improvements in the area both problems are expected to worsen in the future as demonstrated by the traffic projections and capacity analysis conducted recently.

Secondary project needs are based on the comprehensive planning and economic development goals for the area. This includes the development of open space and recreation facilities in the area as well as the AstraZeneca corporate expansion.

A. Definition of "No Degradation" Criteria

Due to the existing congestion problems in the study area, and the public's opposition to the extensive systems-type interchange (Alternative D1) proposed in the early 1990s, a "no degradation" approach to traffic capacity was developed. This means that no degradation from existing levels of service (LOS) would occur in the design year 2010.

The Department of Transportation and Project Coordinating Committee have defined the "no degradation" criteria as follows:

- At each major study area intersection, projected average intersection delays in 2010 would be no worse than 1999 existing average intersection delays.
- 1999 existing conditions would consider the roadway network prior to improvements made as part of the U.S. Route 202 safety Project.
- 2010 was selected as the design year, based on the full build-out schedule of AstraZeneca, the proposed duPont expansion, background growth and the widening of the Tyler McConnell Bridge.
- Only intersections currently operating at level of service F would be subject to the "no degradation" criteria. Other intersections would be subject to standard level of service standards for a highly developed urban area (assumed to be level of service E, based on existing levels of congestion at several study area intersections).

Average intersection delays were determined by using the methods of the 1997 Highway Capacity Manual, the nationwide standard for such analyses. Due to the unique development, traffic, and public involvement aspects of this project, average overall intersection delays were used with respect to level of service and "no degradation" criteria; the Department's volume-to-capacity ratio policy, which is specific to Delaware, was not utilized.

B. Traffic Congestion

There are several methods for quantifying traffic congestion; the one chosen for this study is based on the *1997 Highway Capacity Manual*. This nationally recognized standard for traffic operations analyses takes into consideration peak-hour turning movement volumes, peak-hour factors, heavy vehicle percentages, roadway geometry, vehicle arrival patterns, and signal phasings and timings. At signalized intersections, the results of the analysis include volume-to-capacity ratios, average delays, and levels of service for lanes, approaches, and the intersection as a whole. ***Table III-1*** shows level of service definitions based on delay. Peak-hour turning movement counts were conducted at study area intersections in 1999 and 2000. Based on these counts, the Department's regional traffic model, AstraZeneca's traffic impact study (TIS), and an origin-destination (O-D) study conducted in 1999, design year 2010 traffic projections were developed.

The 1999 existing and projected 2010 No-Build delays and levels of service at key study area intersections are shown in ***Table III-2***. All three major intersections on U.S. Route 202 operate at level of service F in the 1999 Existing scenario (prior to the safety improvement project). It is to these three intersections currently operating at level of service F in 1999 that the "no degradation" criteria principally applies. Particularly poor operations are found at the U.S. Route 202/Foulk Road/Rockland Road intersection, where delays range from 179 to 225 seconds per vehicle during peak hours. Field observations have confirmed the poor operating conditions at this intersection: peak-hour queue lengths typically extend in the southbound direction to, and sometimes through, the Augustine Cut-Off intersection and I-95 ramp area, while northbound queues typically extend through the Independence Mall intersection. Westbound Foulk Road traffic frequently backs up beyond the Weldin Road intersection.

The congestion problems indicated at the intersections, however, are not isolated to those intersections. In addition to vehicle queues extending toward and through nearby intersections, drivers attempt to avoid the congested conditions by taking alternate routes. Often these alternate routes may be through residential communities, with roadways and environments not designed for heavy non-local traffic. Many local residents have noted this "cut-through" traffic as a problem in their neighborhoods.

TABLE III-1
Level of Service Criteria for Signalized Intersections

Level of Service	Average Delay (seconds/vehicle)	Description
A	≤ 10	This level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	> 10 and ≤ 20	This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of average delay.
C	> 20 and ≤ 35	These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.
D	> 35 and ≤ 55	At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	> 55 and ≤ 80	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.
F	> 80	This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may be major contributing causes to such delay levels.

SOURCE: *1997 Highway Capacity Manual*, page 9-7 and Table 9-1.

Should no transportation improvements beyond the U.S. Route 202 Safety Project be undertaken, given the current development plans in the area, by 2010 traffic operations are projected to deteriorate substantially. Average peak-hour intersection delays at the intersections of U.S. Route 202/Delaware Route 141/Murphy Road, U.S. Route 202/Augustine Cut-Off, and Delaware Route 141/Childrens Drive are expected to triple, while average intersection delays at the worst intersection in the study area, U.S. Route 202/Foulk Road/Rockland Road, would be expected to double. The "cut-through" traffic problem in local residential neighborhoods would likely get worse as well.

TABLE III-2
Average Intersection Delays and Level of Service

Intersection	*1999 Existing Conditions*				*2010 No-Build Conditions*			
	Morning Peak Hour		*Afternoon Peak Hour*		*Morning Peak Hour*		*Afternoon Peak Hour*	
	Delay (sec/ veh)	*LOS*	*Delay (sec/ veh)*	*LOS*	*Delay (sec/ veh)*	*LOS*	*Delay (sec/ veh)*	*LOS*
U.S. Route 202 & Delaware Route 141 & Murphy Road	105	F	93	F	347	F	344	F
U.S. Route 202 & Foulk Road & Rockland Road	225	F	179	F	404	F	482	F
U.S. Route 202 & Augustine Cut-Off	70	E	92	F	188	F	301	F
Delaware Route 141 & Childrens Drive	34	C	37	D	92	F	106	F

C. Traffic Safety

State-reportable accident data for the three-year period of July 1996 through June 1999 was examined for major study area roadways. ***Table III-3*** shows the number of reported accidents that occurred on each major study area roadway within that time period. Because far more accidents occurred on U.S. Route 202 than on all of the other routes combined, and many of the accidents on other routes occurred at or near their intersection with U.S. Route 202, U.S. Route 202 intersection and mid-block accidents were the primary focus of this study.

TABLE III-3
Study Area Accidents

Study Area Roadway	Number of Accidents (7/96-6/99)
U.S. Route 202	854
Delaware Route 141 & Murphy Road	79
Foulk Road	76
Rockland Road	13
Augustine Cut-Off	15
Weldin Road	5
Broom Street	17

Table III-4 shows U.S. Route 202 intersection and mid-block accidents for the time period being examined. Although the number of accidents that occurred on most sections of U.S. Route 202 examined is high, many of the roadway safety problems from just north of Augustine Cut-Off through Delaware Route 141 are being addressed as part of the U.S. Route 202 Safety Improvement Project. Therefore, the primary high accident location that has yet to be addressed is the intersection of U.S. Route 202 and Augustine Cut-Off. Further details on the accidents that occurred during the time period examined are shown in ***Table III-5.***

TABLE III-4
U.S. Route 202 Accident Summary (7/96-6/99)

U.S. Route 202 at...	Number of Accidents	Injury Type Accidents	Property Damage Only Type Accidents
Delaware Route 141/Murphy Road Intersection	180	49	131
Between Delaware Route 141/Murphy Road and Foulk Road/Rockland Road	126	32	94
Foulk Road/Rockland Road Intersection	243	51	192
Between Foulk Road/Rockland Road and Augustine Cut-Off	155	54	101
Augustine Cut-Off Intersection	165	49	116
I-95 Ramp Area	25	6	19
Broom Street Intersection	48	20	28

TABLE III-5
U.S. Route 202 Augustine Cut-Off Intersection Accident Summary

			Direction		
	Total	**Percentage**	**U.S. Route 202 NB**	**U.S. Route 202 SB**	**Augustine Cut-Off EB**
Number of Accidents	165	100%	12	140	13
Injury Type	49	30%	3	43	3
Property Damage Only Type	116	70%	9	97	10
Collision Type:					
Head On	2	1%	0	2	0
Rear End	120	73%	5	110	5
Side Swipe	3	2%	1	2	0
Angle	33	20%	5	24	4
Other	7	4%	1	2	4

D. Project Purpose

In summary, the purpose of the Blue Ball Properties Area Transportation Improvement Project is to:

Decrease vehicular congestion within the study area, by:

- Meeting the "No Degradation" level of service criteria at all applicable study area intersections, and
- Meeting standard level of service criteria for highly developed urban areas at other major study area intersections.
- Improving the transportation safety within the study area.
- Providing adequate transportation facilities to support the planned study area economic and recreational development.
- Encouraging non-single occupancy vehicle trips by significantly improving transit in the region and developing transportation demand management strategies.
- Utilizing Intelligent Transportation Management System strategies to optimize traffic flow within the study area.