

**ROUTE 772  
REROUTING STUDY**

**WARWICK & PENN TOWNSHIPS  
MANHEIM & LITITZ BOROUGHS**

**LANCASTER COUNTY**

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**ELA GROUP, INC.  
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## **ROUTE 772 REROUTING STUDY**

### **I. REPORT OVERVIEW**

ELA Group was retained to study the Route 772 Corridor, between Main Street and High Street in Manheim Borough and Rothsville Road and Newport Road in Warwick Township. The study was prepared to evaluate the feasibility of rerouting Route 772 from its current alignment, shown in red on the enclosed map, to a proposed alignment, shown in blue on the enclosed map. Concerns about truck traffic and its current routing were raised at a Summit Meeting held by State Representative Roy Baldwin in 2001. Many business and local government leaders attended the Summit Meeting and expressed their concerns about issues with the current Route 772 alignment and truck traffic in general. In fact they made this one of the highest ranked issues in this district. Lancaster County Planning Commission then decided to pursue the issue and contracted ELA Group to prepare a preliminary evaluation of the current Route 772 corridor and the proposed corridor. The rerouting was suggested by ELA Group in their report dated 2002. The 2002 study was commissioned to address the deficiencies of the present Route 772 corridor which are caused by heavy traffic on narrow, unsafe roadways that pass through busy historic districts in two boroughs.

In September 2005 the Lancaster County Metropolitan Planning Organization (MPO) recommended to PennDOT and the Federal Highway Administration (FHWA) that the Route 772 corridor be upgraded to minor arterial status throughout the County including the study area.

The analysis for this report included performing traffic data collection of average daily traffic (ADT) volumes, vehicle classification, vehicle speeds, through-truck percentages, accident data, field reconnaissance to collect geometric data and observation of traffic patterns.

The results of the data collection show that traffic volumes are already higher on the proposed route verse the existing route. At the same time the crash histories indicate more accidents have occurred on the existing route verses the proposed route. This is an indication that there is more safety issues with the existing route than the proposed route.

As with the over all traffic volumes more truck traffic is also utilizing the proposed route verses the existing route. Although the percentage of track traffic is minimal on both routes, 1.0% - 2.3% on the existing verses 2.2% - 2.6% on the proposed route, we found that 95% of all trucks utilizing either route had origins or destinations within or close to the study area. It was also determined that many of the local companies that generate truck traffic encourage or require drivers to utilize the proposed route.

Our report concludes that Route 772 should be rerouted from its current alignment between Main Street in Manheim Borough to the intersection of Rothsville Road and Newport Road at the White Swan Restaurant in Warwick Township. The proposed alignment will include, beginning in Manheim Borough, High Street, Doe Run Road, Lincoln Road, Lincoln Avenue, Broad Street, Furnace Hills Pike, and Newport Road. Both routes are mapped in the exhibits at the end of this study the RED Route is the current route while the BLUE Route is the proposed route.

Our study will further recommend improvements to both the current route, if the proposed route is not approved, and the proposed route, which should be implemented to provide safe and efficient movement throughout the corridor. Due to the volumes that currently utilize both routes, these improvements are recommended regardless of whether or not Route 772 is rerouted.

## **II. LAND USE**

### **A. Existing Conditions**

Traffic Route 772 is a State Roadway that traverses Lancaster County in the east/west direction. Its western terminus is at Route 441 in the Borough of Marietta and its eastern terminus is at Route 30 in Village of Gap. The roadway meanders through both rural and urban areas including the Boroughs of Mount Joy, Manheim, and Lititz and the Villages of Sporting Hill, Brownstown, Leola, and Intercourse. It also runs through eight (8) different Townships along the way.

Roadway conditions along Route 772 vary greatly from narrow 9' lanes to 11' lanes. Some roadway sections have wide shoulders and others have no shoulders. Most of Route 772 travels through open farmland, however, it also travels through several pristine urban areas and towns including Manheim and Lititz Boroughs that include areas with historic significance.

### **B. Project Description**

The purpose of this study is to analyze the current Route 772 alignment from west of Manheim Borough to the intersection of Rothsville Road and Newport Road at the White Swan Restaurant in Warwick Township. Our study also analyzed High Street/Doe Run Road/Lincoln Road/Lincoln Avenue, Route 501 (Lincoln Avenue to Newport Road), Lexington Road (Newport Road to Doe Run Road) and Newport Road from Lexington Road to Rothsville Road at the White Swan Restaurant.

The results of our study are to determine whether the current route is adequate or if a new route would provide a better, safer, and more efficient alternative. The study will further recommend improvements to

both routes, existing and proposed, to improve the safety of all roadways within the study area.

### III. TRANSPORTATION SYSTEM

#### A. Road Network Description

Table 1 describes the road network within the study area. The table provides information on ownership, average daily traffic (ADT) volumes, and truck percentages (tractor-trailer trucks).

**TABLE 1  
EXISTING ROUTE ROAD NETWORK DESCRIPTION**

<u>ROAD</u>	<u>OWNER</u>	<u>ADT</u>	<u>TRUCKS*</u>
Fruitville Pike	SR 0772	5,883	1.8%
Temperance Hill Road	SR 0772	3,622	1.2%
Orange Street	SR 0772	6,093	1.0%
Rothsville Road	SR 0772	7,711	2.3%

\* Tractor-trailer trucks 1.6% average

**TABLE 2  
PROPOSED ROUTE ROAD NETWORK DESCRIPTION**

<u>ROAD</u>	<u>OWNER</u>	<u>ADT</u>	<u>TRUCKS*</u>
Doe Run Road	SR 4040	13,446	2.2%
Lincoln Avenue	SR 4040	4,278	2.6%
Furnace Hills Pike	SR 0501	15,056	3.2%
Newport Road East of Furnace Hills Pike	TWP	11,131	2.2%
Newport Road East of Clay Road	TWP	8,527	2.6%
Newport Road West of Furnace Hills Pike	SR 1037	5,458	1.5%
Lexington Road	TWP	3,082	2.9%

\* Tractor-trailer trucks 2.5% average

#### B. Accident Data

Crash data was collected from PennDOT on State Roads and from Warwick Township on Newport Road. Following is a list of high accident locations for both intersections and segments:

**Intersections**

1.	Newport Road & Brunnerville Road (Warwick Twp.) –	<b>20</b>
2.	Fruitville Pike & Oak Street (Penn Twp.) –	<b>18</b>
3.	Rothsville Road & Pierson Road (Warwick Twp.) -	<b>12</b>
5.	Broad Street & Orange Street (Lititz Borough) –	<b>11</b>
6.	Furnace Hills Pike & Newport Road (Warwick Twp.) –	<b>11</b>
7.	Newport Road & Clay Road. (Warwick Twp) –	<b>9</b>
8.	Orange Street & Spruce Street (Lititz Borough) –	<b>8</b>
9.	Orange Street & 2 <sup>nd</sup> Street (Lititz Borough) -	<b>8</b>
10.	Temperance Hill Rd. & Lexington Rd. (Warwick Twp.) –	<b>8</b>
11.	Doe Run Road & Lexington Road (Penn Township) –	<b>8</b>
12.	Doe Run Road & Penryn Road (Penn Twp.) –	<b>8</b>
13.	Fruitville Pike & Main Street (Manheim Borough) –	<b>8</b>

**Segments**

1.	Rothsville Road between Pierson Road and Newport Road (Keller's Mountain) -	<b>43</b>
2.	Furnace Hills Pike between Wynfield Drive & Newport Road (Warwick Twp.) -	<b>37</b>
3.	Doe Run Road between Penryn Road & Lexington Road (Penn Twp.) –	<b>26</b>
4.	Newport Road between Clay Road & Rothsville Road (Warwick Twp.) –	<b>26</b>
5.	High Street/Doe Run Road between Oak Street & Penryn Road (Manheim Borough/Penn Twp.) –	<b>16</b>
6.	Temperance Hill Road/Orange Street between Lexington Road. & 2 <sup>nd</sup> Avenue (Penn & Warwick Twps.) –	<b>14</b>
7.	Furnace Hills Pike Between Penryn Road & Lexington Road (Penn Twp.) –	<b>12</b>
8.	Main Street between Broad Street & Locust Street (Lititz Borough) –	<b>14</b>
9.	Main Street/Rothsville Road between Oak Street & Clay Road (Warwick Twp.) –	<b>12</b>

There are slightly more accidents on the existing route than the proposed route. Since there is more traffic on the proposed route than the existing route the accident rate is higher on the existing verses the proposed route. This is an indication there are more safety issues with the existing route than the proposed route.

### C. Existing Conditions

ELA Group, Inc. performed Automatic Traffic Recorder (ATR) counts at 11 locations to determine the average daily traffic (ADT) volumes, vehicle classification and speed on the surrounding roadways. Manual Turning Movement Counts (TMC) were also performed during the AM (7-9) and PM (4-6) peak periods at 14 intersections. The counts were performed during September and October of 2005. The enclosed Exhibits show the locations of the ATR and TMC counts as well as the ADT and peak hour volumes on the surrounding roadways and intersections. The traffic count data sheets for the counts can be found in the appendices.

The *existing traffic volumes* indicate there is already more traffic volume on the projected route than the existing route. This indicates that drivers have already determined that the proposed alignment is a more favorable route over the existing alignment. Based on this observation it is our opinion that the majority of drivers that would favor the proposed alignment are already driving on it. Therefore, an insignificant number of drivers will divert to the proposed alignment if and when the relocation is completed since they are already driving it. Lancaster County Planning Commission's Travel Demand Forecasting Model projects a modest diversion of 2-3% if the rerouting is implemented. We utilized a more conservative diversion of 25%. Either estimate results in minimal shifts of traffic between the current route and the proposed route.

A modified origin and destination study was performed to determine the *percentage of trucks* that were traveling through the study area and those that had either origins or destinations within the study area. Based on this study it was determined that the percentage of trucks traveling through the study area is less than 5% of the total vehicular volumes. The distribution is between 1% and 2.3% on the existing Route 772 and between 2.2% and 2.6% on the proposed Route 772. What this represents is that 95% of all tractor-trailer trucks traveling on either route were destined for locations within one of the study area municipalities.

The Lancaster County Planning Commission contacted several major truck carriers within the study area. The following table provides a summary of the information received from these companies.

**TABLE 3  
TRUCK UTILIZATION**

	Firm	# of Trks Per Day	Utilization of Route 772		Utilization Route			
			Red	Blue	222	501	72	283
1	Kreider	25	X	X	X	X	X	X
2	Auto Auction	100	X	X	X	X	X	X
3	Martin Block	5	X	X	X			X
4	Martin Pave	2	X	X	X			X
5	Martin Ready Mix	8	X	X	X	X	X	X
6	Oehme	30		X	X	X	X	X
7	Pfizer	130	X	X	X	X	X	X
8	Sauders	16		X		X		X
9	Summers	2	X	X	X	X	X	X
10	Wenger Feeds	25		X	X	X	X	X
11	Wilbur	10		X	X	X	X	X
	<b>TOTAL</b>	<b>353</b>	<b>7</b>	<b>10</b>	<b>10</b>	<b>9</b>	<b>8</b>	<b>11</b>

As seen in the above table there are several companies that already do not utilize the current Route 772 but do use the proposed route.

From this data it can be concluded that there will not be an overwhelming number of trucks changing routes between the existing and proposed alignment.

#### · Existing Corridor Description

Following is a description of the current Route 772 corridor starting at the western terminus (Manheim Borough) and moving eastward through Penn Township, Lititz Borough and Warwick Township.

Traffic Route 772 enters Manheim Borough and travels along High Street (east/west), which is the Borough Square between Charlotte Street and Main Street, to Main Street (Route 72) at which it proceeds north/south on Main Street between High Street and Fruitville Pike. High Street is considered a Minor Arterial according to the Lancaster County Functional Classification Map. This portion of High Street also travels through the Historic District of Manheim Borough. By rerouting Route 772 it removes the Traffic Route designation through the Historic District.

The intersection of High Street and Main Street is a very tight intersection with narrow travel lanes and minimal or no turning radii on any of the four

corners. These deficiencies cause major problems with larger trucks and buses traveling the Route 772 corridor or that must make a turn at this intersection. At a minimum, the radii on the southeast corner and the northwest corner of the intersection should be increased. In addition, the curb line on the south side of High Street, east of Main Street should be reconstructed to provide a better alignment with the eastbound through lane.

From High Street, Route 772 travels north/south along Main Street (Route 72) to Fruitville Pike. Main Street is a narrow roadway (10' lanes), with parking along the west side, which runs through the heart of Manheim Borough, which is part of the Borough's major business district, an area of historic significance, and a major pedestrian area. Main Street is considered a Principal Arterial according to the Lancaster County Functional Classification Map.

The intersection of Main Street and Fruitville Pike is an unsignalized intersection with no turning lanes on any of the approaches. The Borough has been pursuing the installation of a traffic signal and major geometric improvements at this intersection including left-turn lanes on Main Street. The Borough should continue to pursue these improvements regardless of any changes to the Route 772 corridor routing.

Another improvement, that pertains to Manheim Borough's traffic signal system that should be considered, is an upgrade to the coordination and interconnection of the traffic signals along the Main Street corridor. The current interconnect system should be upgraded to a closed loop, traffic responsive, coordinated system. This type of system will further improve the flow of traffic along the corridor by allowing a computer to modify the signal timings, offsets, and splits as necessary based on the volume of traffic entering the corridor.

From Main Street, Route 772 follows Fruitville Pike north/south to Temperance Hill Road. Fruitville Pike's cartway is 22' wide with shoulders of varying widths along both sides of the roadway. Along the way, on Fruitville Pike, there is a narrow bridge just east of Main Street, a dangerous intersection at Oak Street (inadequate sight distance), and hidden driveways and intersections, including the intersection with Sun Hill Road. There are also several sharp horizontal curves in this area along Fruitville Pike. This section of roadway was recently overlaid and is in excellent condition. Fruitville Pike is considered a collector roadway according to the Lancaster County Functional Classification Map.

At the intersection of Fruitville Pike and Temperance Hill Road, a southbound left-turn lane should be constructed on Fruitville Pike for turns onto Temperance Hill Road. A traffic signal should also be installed.

At the intersection of Fruitville Pike and Temperance Hill Road, Route 772 travels east/west along Temperance Hill Road until it becomes Orange Street as it approaches the Borough of Lititz. Temperance Hill Road has a cartway width of 23' with 3' shoulders along both sides. This section of roadway was recently overlaid and is in excellent condition. Temperance Hill Road is considered a collector roadway according to the Lancaster County Functional Classification Map.

At the intersection of Temperance Hill Road and Penryn Road there should be an eastbound left turn lane constructed on Temperance Hill Road for left turns onto Penryn Road. There is a sharp horizontal curve, approximately midway between Penryn Road and Lexington Road, that needs to be improved by constructing a larger center line radius on Temperance Hill Road. At the intersection of Temperance Hill Road and Lexington Road an east and westbound left turn lane should be constructed on Temperance Hill Road.

As Temperance Hill Road approaches Lititz Borough, it becomes Orange Street. Orange Street is a narrow roadway with 10' travel lanes and parking along one side and is within the Borough's Historic District. Orange Street passes-by the Warwick High School and Middle School and the Lititz Community Center and continues to be a collector roadway until it intersects Broad Street. Many pedestrians walk along and across Orange Street within this residential area of the Borough.

At the intersection of West Orange Street (Temperance Hill Road), Second Avenue and the access to Warwick Schools a traffic signal should be installed.

At the intersection of Broad Street and Orange Street, it is difficult for even passenger vehicles, let alone larger trucks and school buses, to make turns due to narrow travel lanes and minimal turning radii. The location of existing structures, some historic, at this intersection precludes any major or even minor roadway improvements without major demolition, which would be difficult if not impossible due to the historic nature of the area. This intersection is a major school crossing that requires a crossing guard for the safe passage of school students during the school year.

From the intersection of Broad Street (Route 501) and Orange Street, Route 772 follows Broad Street for one block in the north/south direction to Main Street. Broad Street is considerably wider than many of the other roadways within the corridor and is wide enough to provide parallel parking on both sides and a turn lanes at the intersections. Broad Street is within the heart of Lititz's Historic District and is a pristine area of the Borough that is visited by thousands of visitors annually. Many

pedestrians walk along and across Broad Street in this Block. Broad Street is considered a Principal Arterial according to the Lancaster County Functional Classification Map.

The intersection of Broad Street and Main Street and the intersection of Broad Street and Orange Street are the two worst intersections within the entire existing corridor for maneuvering large trucks and buses. A monument located in the middle of the Square, as well as minimal turning radii, limits the ability of larger vehicles to make turns at this intersection without running over curbs and at times damaging the monument. Also, many pedestrians utilize this intersection, which is not a good mix.

From the intersection of Broad Street and Main Street, which is the Square of Lititz, Route 772 proceeds east/west along Main Street. Main Street is in the Historic Downtown District of Lititz with many quaint shops and businesses that attract locals as well as tourists. Main Street is a very narrow street with a cartway width of 18' and parallel parking along both sides of the street. Since this is a business district and tourist destination, there is significant parking and unparking of vehicles along both sides of the street. Parking is compounded by the location of the post office at the intersection of Main Street and Cedar Street. Main Street and Cedar Street is also a major school crossing that requires a crossing guard to ensure the safe crossing of students. Main Street is considered a Minor Arterial according to the Lancaster County Functional Classification Map.

Main Street becomes Rothsville Road east of the Borough of Lititz and continues to run in the east/west direction. Rothsville Road's cartway width is 20' and has 3' shoulders on both sides. The road is in excellent condition having recently been resurfaced. A section of Rothsville Road, east of Pierson Road, has several severe horizontal curves where many accidents have occurred over the past several years. Many of the numerous intersections and driveways in this area have less than minimum safe stopping sight distances. Rothsville Road is a Minor Arterial according to the Lancaster County Functional Classification Map.

A traffic signal is recommended at the intersection of Rothsville Road and Clay Road and one will be required at the intersection of Rothsville Road and Pierson Road in the near future. In addition east and westbound left turn lanes should be constructed on Rothsville Road at each intersection.

The horizontal curvature and narrow roadway along Rothsville Road between Pierson Road and Newport Road should be improved. This would require widening the cartway and improving the horizontal curvature and cross slopes of the roadway.

## D. Proposed Conditions

### Proposed Corridor Description

If the proposed rerouting would be implemented it is our opinion that there would be very minimal redistribution of trips between the existing route and proposed route. Our analysis assumes a 25% redistribution, which we believe is very conservative. Based on estimates developed from the Lancaster County Planning Commission's Travel Demand Forecasting Model there will be a modest diversion of 2-3% if the rerouting is implemented. Either estimate results in minimal shifts of traffic between the current route and the proposed route. The following Table represents the results from the Travel Demand Forecasting Model analysis.

**TABLE 4  
TRAVEL DEMAND FORECASTING MODEL RESULTS**

<b>Average Daily Traffic Volumes (to nearest 100 vehicles)</b>			
<b>Doe Run Road (Between PA 72 &amp; Lexington Road)</b>			
	2005	2016	2016
	W/O Rerouting	W/O Rerouting	W/Rerouting
Westbound	6,400	7,700	8,200
Eastbound	7,100	8,600	9,100
Total	13,500	16,300	17,300
Truck %	2.2%	2.2%	2.2%
<b>Temperance Hill Road (Between Fruitville Pike &amp; West Orange Street)</b>			
	2005	2016	2016
	W/O Rerouting	W/O Rerouting	W/Rerouting
Westbound	1,800	2,200	1,700
Eastbound	1,800	2,200	1,700
Total	3,600	4,400	3,400
Truck %	1.2%	1.2%	1.2%
<b>Newport Road (Between PA 501 &amp; Laurie Lane)</b>			
	2005	2016	2016
	W/O Rerouting	W/O Rerouting	W/Rerouting
Westbound	5,600	6,700	7,900
Eastbound	5,600	6,700	7,800
Total	11,200	13,400	15,700
Truck %	2.2%	2.2%	2.2%
<b>Rothsville Road (Just west of Clay Road)</b>			
	2005	2016	2016
	W/O Rerouting	W/O Rerouting	W/Rerouting
Westbound	3,900	4,700	3,500
Eastbound	3,900	4,600	3,500
Total	7,700	9,300	7,000
Truck %	2.3%	2.3%	2.3%

Following is a description of the proposed Route 772 rerouting, which, starting at the western terminus, includes Doe Run Road, Lincoln Avenue, Lincoln Road, Furnace Hills Pike (Route 501) and Newport Road.

Route 772 enters Manheim Borough, from the west, on Manheim/Mount Joy Road, which becomes High Street within the Borough. At the intersection of High Street and Main Street, proposed Route 772 would continue straight on High Street east/west through the Borough.

Two of the corner radii (southeast and northwest) at the intersection of Main Street and High Street should be reconstructed to increase the turning radii. In addition, to provide a better alignment between the through lanes on High Street on either side of Main Street, the curb along the south side of High Street, east of Main Street, should be moved south.

High Street turns into Doe Run Road east of the Borough of Manheim. Doe Run Road has a 23' cartway and 3' shoulders on both sides. The road surface conditions are not as good as the current Route 772 corridor and would require base repair and overlay. Doe Run Road is considered a collector roadway according to the Lancaster County Functional Classification Map.

There are several intersections that will require improvements on Doe Run Road including the intersection of Doe Run Road and the Shopping Center, Doe Run Road and Penryn Road, Doe Run Road and Doe Run Elementary School, Doe Run Road and Elm Road, Doe Run road and the sharp horizontal curve just east of Elm Road, and Doe Run Road and Lexington Road Extension.

The intersection of Doe Run Road and the Shopping Center should be signalized with an eastbound left-turn lane constructed on Doe Run Road.

At the intersection of Doe Run Road and Penryn Road, eastbound and westbound left-turn lanes should be constructed on Doe Run Road and a new traffic signal installed.

At the intersection of Doe Run Road and the elementary School an eastbound left turn lane should be constructed.

At the intersection of Doe run Road and Elm Road an eastbound left turn lane should be constructed.

The sharp horizontal curve east of Elm Road should be realigned with a larger centerline radius.

At the intersection of Doe Run Road and Lexington Road Extension there should be an eastbound left turn lane constructed on Doe Run Road.

Doe Run Road becomes Lincoln Road and then Lincoln Avenue as it approaches Lititz Borough. Lincoln Road's cartway width is 23' with 7' shoulders on both sides. The roadway is in excellent condition. Lincoln Avenue's cartway is 42' with curbing and parking along both sides and it too is in excellent condition. Lincoln Road and Lincoln Avenue continue to be a collector roadway according to the Lancaster County Functional Classification Map.

At the intersection of Lincoln Avenue and Broad Street, the proposed Route 772 alignment would follow Broad Street/Furnace Hills Pike (Route 501) north/south towards Newport Road. The section of Route 501, within the Borough, has a cartway width of 30' with curbs along both sides, while the section of Route 501 in Warwick Township has a cartway width of 22' and shoulders of varying widths on each side. Route 501 is a principal arterial according to the Lancaster County Functional Classification Map.

Route 501 in Warwick Township is considerably wider than in the Borough; however there are numerous commercial and industrial driveways and intersections within this road segment that generates a substantial number of turning vehicles, many of which are tractor-trailer trucks. As land development projects are submitted to Warwick Township, the Township has been requiring widening along Route 501. However, there are several locations where the widening has not been completed. Widening along this segment of Route 501 should be completed so that a continuous center left-turn lane can be provided.

At the intersection of Furnace Hills Pike (Route 501) and Newport Road, the proposed alignment would follow Newport Road east/west to Rothsville Road at the White Swan Restaurant. The radius on the southeast corner of Route 501 and Newport Road will need to be enlarged to provide a larger turning radius for tractor-trailer trucks.

It should be noted that Newport Road, between Route 501 and Rothsville Road, is a Township Roadway that was at one time a PennDOT owned and maintained roadway. It was turned back from PADOT to Warwick Township several years ago.

Newport Road's cartway width is 22' with 1' shoulders on either side. If Newport Road is to become the designated Traffic Route, it should be widened to a minimum cartway width of 24' with 3' shoulders on each side.

At the intersection of Newport Road and Laurie Lane a westbound left turn lane should be constructed on Newport Road. Also, due to the drop-off along the south side of Newport Road along the Lititz Run Development and a drainage condition within the same area it is recommended to construct curbing along the south side of the roadway in this vicinity.

An eastbound and westbound left-turn lane should be constructed on Newport Road at the signalized intersection of Newport Road and Brunnerville Road. This will require the widening of a box culvert east of the intersection. It will also require replacing the traffic signal at the intersection.

An eastbound left turn lane should be constructed on Newport Road at Millway Road.

The Township, over the past several years, has expended significant sums of money to improve Newport Road. These improvements included realigning and widening a portion of the roadway between Route 501 and Brunnerville Road; signalizing and improving the intersection of Newport Road and Brunnerville Road; signalizing and improving the intersection of Newport Road and Clay Road; and constructing left turn lanes at several locations.

Since Newport Road is a Township Road, it would require their cooperation and approval prior to implementing the proposed Traffic Route realignment. Several options are available to help influence Warwick Township's decision to agree with the proposed Traffic Route realignment. These would include returning Newport Road back to PADOT, or constructing all or some of the recommended improvements to Newport Road with Warwick Township agreeing to allow the Traffic Route to utilize the roadway as a Township roadway.

The rerouting will also require all affected municipalities to approve the plan. If one or more municipalities decide to not approve the rerouting plan it will not move forward.

#### **E. Alternate Options**

Two alternate routes were analyzed as options for the realignment of Route 772. The first alternative would utilize Lexington Road between Doe Run Road and Newport Road. However, this alternate would require the intersection of Doe Run road and Lexington Road to be totally reconstructed so that Lexington Road is rerouted around the church and intersect Doe Run Road at a 90° angle. An eastbound left turn lane would be require on Doe Run Road at the relocated Lexington Road intersection.

At the intersection of Lexington Road and Newport Road the corner radius on the southeast corner would need to be improved and east and westbound left turn lanes would need to be constructed on Newport Road.

The second alternative was similar to the above routing only the route would utilize Memorial Road between Lexington Road and Newport Road. The intersection of Lexington Road and Memorial Road would require an increase in the turning radii to accommodate large vehicles. Also at the intersection of Newport Road and Memorial Road Memorial Road would need to be realigned to a 90° angle for either alternate 1 or 2.

The right-of-way acquisition and costs of implementing the improvements required for either of these alternatives precludes the use of either of these alternatives.

#### **F. Capacity Analysis**

Capacity analysis, as defined by the *Highway Capacity Manual*<sup>1</sup>, is a set of procedures used to estimate the traffic-carrying ability of a facility over a range of defined operational conditions. The capacity analysis uses levels of service (LOS) to describe the operational conditions. Level of service is a measure of the quality of operational conditions of a facility. A brief description of the various levels of service is presented below. Levels of service are assigned letter designations “A” to “F”, with “A” being the most desirable operating conditions. A level of service “D” is generally acceptable according to the Institute of Transportation Engineers standards.

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<sup>1</sup> Highway Capacity Manual, Transportation Research Board, National Research Council, Washington, DC, 2000.

**TABLE 5**  
**LEVEL OF SERVICE CHARACTERISTICS**

Level of Service (LOS)	Unsignalized Intersection		Signalized Intersection	
	Control Delay, sec/veh	Expected Delay to Minor Street Traffic	Control Delay, sec/veh	Expected Problems to Intersection
<b>A</b>	$\leq 10$	little or no delay	$\leq 10$	very low delay
<b>B</b>	$> 10$ and $\leq 15$	short traffic delays	$> 10$ and $\leq 20$	stable flow of traffic with minimal delay
<b>C</b>	$> 15$ and $\leq 25$	average traffic delays	$> 20$ and $\leq 35$	number of vehicles stopping is significant
<b>D</b>	$> 25$ and $\leq 35$	long traffic delays	$> 35$ and $\leq 55$	influence of congestion becomes more noticeable
<b>E</b>	$> 35$ and $\leq 50$	very long traffic delays	$> 55$ and $\leq 80$	limit of acceptable delay
<b>F</b>	$> 50$	extreme delays - usually warrants improvement to the intersection	$> 80$	over-saturated and unacceptable

**Level of Service A:** A condition of free flow with low traffic density and high maneuverability within the traffic stream. No vehicle waits longer than one signal indication.

**Level of Service B:** Stable flow of traffic with negligible impact from other vehicles in the traffic stream. On a rare occasion, drivers wait through more than one signal indication.

**Level of Service C:** Still in the zone of stable flow but ability to select operating speed and maneuverability is restricted. Intermittently drivers must wait through more than one signal indication and backups may develop behind left turning vehicles.

**Level of Service D:** Approaching instability; drivers are restricted in their freedom to change lanes. Delay of approaching vehicles may be substantial during peak hours.

**Level of Service E:** Traffic volumes are near or at capacity on the arterial. Long queues of vehicles may create lengthy delays, especially for left turning vehicles.

**Level of Service F:** Congested conditions of forced traffic flow where travel is slowed by stop and go conditions. Queued backups from locations downstream restrict or prevent movement of vehicles out of the approach, creating a storage area during part or all of the peak hour.

At an unsignalized intersection, capacity analysis is a study of the interaction between drivers on the minor street (the stop controlled street) and the drivers on the major street. To describe this interaction, both gap acceptance and empirical models have been developed. For each minor movement, the control delay is determined, and a level of service is assigned. The control delay is the total elapsed time from a vehicle joining the queue until its departure from its stopped position at the head of the queue. It includes the time to decelerate to a stop and accelerate to the free-flow speed.

For signalized intersections, capacity is evaluated in terms of the ratio of demand flow rate to the capacity of the intersection. The level of service is based on the control delay in seconds per vehicle. Control delay is defined as the portion of total delay attributed to traffic signal operation, and includes initial acceleration delay, queue move-up time, stopped delay, and final acceleration delay.

The capacity analyses were performed using the Federal Highway Administration's *Highway Capacity Software*<sup>2</sup>. Capacity analyses were performed for the AM and PM peak periods at several key intersections along both the proposed and existing Route 772 corridors to determine the effects on traffic flow of the proposed reroute.

The turning movement count data collected in 2005 was projected 11 years to 2016 using an annual growth rate of 1.72% from PennDOT's *2003 Pennsylvania Traffic Data*<sup>3</sup>. For the analyses with the rerouting, volumes along the existing corridor were decreased by 25% and those along the proposed route were increased by 25%. It is our opinion that a 25% is an over estimate, however, we used 25% to be conservative. The County's Travel Demand Forecasting Model suggests only a 2% diversion. Local traffic on both routes constitutes about 50% of the total volume and would be the least likely to shift routes with the rerouting implemented. The results of the capacity analyses can be found in the exhibits and in table form in the appendices.

#### **G. External Studies**

The Lancaster County Planning Commission and municipalities surrounding and including Manheim Borough are currently exploring options for creating a viable Route 772 bypass around Manheim Borough. A Route 772-bypass project around Manheim Borough is outside the scope of our study area and will have to be addressed in a future bypass study.

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<sup>2</sup> Highway Capacity Software, Release 4.1, Federal Highway Administration, Washington DC, 2001.

<sup>3</sup> 2003 Pennsylvania Traffic Data, Pennsylvania Department of Transportation, November 2003.

#### **IV. CONCLUSIONS AND RECOMMENDATIONS**

- A.** Based on our analyses, it is our opinion that the current Route 772, between Manheim Borough and the intersection of Rothsville Road and Newport Road in Warwick Township should be rerouted. The proposed alignment would be, west to east, High Street in Manheim Borough, Doe Run Road, Lincoln Road, Lincoln Avenue, Broad Street (Route 501), Furnace Hills Pike (Route 501), and Newport Road.
- B.** The existing traffic volumes indicate there is already a higher volume of traffic traveling along the projected alignment verses the current route. This indicates that drivers have already determined that the proposed route is a more favorable route over the existing route. Based on this observation it is our opinion that the majority of drivers that would favor the proposed route are already driving on it. Therefore, an insignificant number of drivers will divert to the proposed route if and when the relocation is completed since they are already driving it. The County's Travel Demand Forecasting Model suggests a 2% diversion. We utilized a more conservative estimate of 25% for diverted traffic. Either way the diversion of traffic will be very minimal.
- C.** There are slightly more accidents on the existing route than the proposed route. Since there is more traffic on the proposed route than the existing route the accident rate is higher on the existing route verses the proposed route. This is an indication there are more safety issues with the existing route than the proposed route.
- D.** Truck traffic is already higher on the proposed route verses the existing route. Many of the local companies that generate truck traffic currently do not utilize the existing route and either encourage or require drivers to utilize the proposed route.
- E.** Rerouting removes the Route 772 designation from two historic districts, South Main Street in Manheim Borough and East Orange Street, South Broad Street and Main Street in Lititz Borough.
- F.** Our recommendation to reroute was based on several conditions including:
1. The conflict between pedestrians, including several major school crossings, and vehicular traffic within both Lititz Borough and Manheim Borough.
  2. The use of streets within historic areas and main streets through historic districts and business districts. This occurs in both Manheim

Borough on Main Street and in Lititz Borough on West Orange Street  
Main Street and South Broad Street.

3. The use of narrow streets with 9' and 10' travel lanes, especially when they are located in the business and historic districts such as Main and Broad Streets in Lititz Borough and Main Street in Manheim Borough.
4. The use of roadways that do not have minimum safe stopping sight distances (SSSD) at intersections and driveways. Several of these areas occur along the existing alignment on Fruitville Pike at the intersections of Oak Street, Sumac Road and Sun Hill Road and on Rothsville Road between Pierson Road and Warwick Road.
5. Many local travelers, particularly truck drivers, currently use the proposed route in preference to the current Route 772 alignment due to the difficult turns and sight distances.
6. The use of roads that have an accident history, which includes one of the highest accident locations on Rothsville Road between Pierson Road and Warwick Road. The accident histories indicate that the current Route 772 alignment has more accidents than the proposed Route. Based on the accident histories and the existing traffic volumes the accident rate is higher on the current route versus the proposed route. This is an indication that the existing route is not as safe as the proposed route.

**G.** Following is a list of recommended improvements, along the proposed corridor that should be performed regardless of realignment of the Traffic Route:

1. **Main Street (Route 72) and High Street (Manheim Borough)** – Reconstruct southeast corner to align eastbound through lane. Move curb south; relocate utilities, traffic signal pole and inlet. There is a plan that has already been prepared for this intersection that was sponsored by the Auto Auction. (4 accidents)
2. **Doe Run Road and Shopping Center (Penn Township)** – Construct east and westbound left turn lane on Doe Run Road and install a traffic signal. (16 accidents)
3. **Doe Run Road and Penryn Road (Penn Township)** – Construct east and westbound left turn lane on Doe Run Road and install new traffic signal. (8 accidents)
4. **Doe Run Road and Doe Run Elementary School (Penn Township)** – Construct eastbound left turn lane on Doe Run Road.

5. **Doe Run Road and Elm Road** (Penn Township) – Construct an eastbound left turn lane on Doe Run Road.
6. **Doe Run Road at sharp horizontal curve and stream crossing** (Penn Township) – Realign roadway to increase horizontal curve and install new culvert. (26 accidents)
7. **Doe Run Road and Lexington Road Extended** (Penn Township) – Construct eastbound left turn lane on Doe Run Road. (8 accidents)
8. **Furnace Hills Pike (Route 501) between Wynfield Drive and Newport Road** (Warwick Township) – Construct a center left turn lane on Furnace Hills Pike. (37 accidents)
9. **Furnace Hills Pike (Route 501) and Newport Road** (Warwick Township) – Construct larger radius on the southeast corner and relocate traffic signal pole. (11 accidents)
10. **Newport Road and Laurie Lane** (Warwick Township) – Construct a westbound left turn lane on Newport Road. Construct curbing and storm drainage system along the south side of Newport Road. (0 accidents)
11. **Newport Road and Brunnerville Road** (Warwick Township) – Construct east and westbound left turn lane on Newport Road. Replace or lengthen culvert east of Brunnerville Road on Newport Road. (20 accidents)
12. **Newport Road and Millway Road** (Warwick Township) – Construct an eastbound left turn lane on Newport Road. (0 accidents)
13. **Newport Road between Rothsville Road and Millway Road** (Warwick Township) – Widen as necessary. (26 accidents)

#### **Alternate 1 (Lexington Road to Newport Road)**

1. **Doe Run Road and Lexington Road Extended** (Penn Township) – Relocate Lexington Road to the west to get around church. Totally reconstruct intersection to realign Lexington Road at a 90° angle to Doe Run Road. Construct left turn lane on Doe Run Road. (8 accidents)
2. **Newport Road and Lexington Road** (Penn Township) – Increase the corner radius on the southeast corner. Construct east and westbound left turn lane on Newport Road. (9 accidents)

3. **Newport Road and Memorial Road** (Warwick Township) – Realign intersection to a 90° intersection. Construct a westbound left turn lane on Newport Road. (3 accidents)
4. Widen **Lexington Road and Newport Road** as necessary (Penn & Warwick Townships). (17 accidents along Newport Road)

#### **Alternate 2 (Lexington Road to Memorial Road to Newport Road)**

1. **Lexington Road and Memorial Road** (Penn Township) – Increase the corner radii to accommodate larger vehicles.
2. **Memorial Road and Newport Road** (Warwick Township) – Realign intersection to a 90° intersection. Construct a westbound left turn lane on Newport Road.
3. **Doe Run Road and Lexington Road Extended** (Penn Township) – Relocate Lexington Road to the west to get around church. Totally reconstruct intersection to realign Lexington Road at a 90° angle to Doe Run Road. Construct left turn lane on Doe Run Road.
4. Widen **Lexington Road and Newport Road** as necessary (Penn & Warwick Townships)

**H.** Following is a list of recommended improvements, along the existing corridor that should be performed regardless of realignment of the Traffic Route:

1. **Main Street (Route 72) and High Street** (Manheim Borough) – Reconstruct southeast corner to align eastbound through lane. Move curb south; relocate utilities, traffic signal pole and inlet. There is a plan that we prepared for this intersection prepared for the Auto Auction. (4 accidents)
2. **Fruitville Pike and Lancaster Road** (Route 72) (Manheim Borough) – Construct north and southbound left turn lane on Route 72, which will require a new railroad grade crossing. Install a traffic signal with railroad preemption. And replace the bridge east of the intersection. (7 accidents)
3. **Fruitville Pike and Oak Street** (Penn Township) – Improve the safe stopping sight distance by bank removal. (18 accidents)

4. **Fruitville Pike and Temperance Hill Road** (Penn Township) – Construct an eastbound left turn lane on Fruitville Pike. Install a traffic signal. (5 accidents)
5. **Temperance Hill Road and Penryn Road** (Penn Township) – Construct an eastbound left turn lane. Install a traffic signal. (0 accidents)
6. **Temperance Hill Road Curve** (Penn Township) – Improve horizontal curve. (12 accidents)
7. **Temperance Hill Road and Lexington Road** (Penn Township) – Construct east and westbound left turn lane on Temperance Hill Road. (8 accidents)
8. **Second Avenue, Orange Street & Warwick School District Drive** (Warwick Township & Lititz Borough) – Install a traffic signal. (8 accidents)
9. **Main Street and Oak Street** (Lititz Borough) – Restripe all approaches to provide left turn lanes. Retime traffic signal. (0 accidents)
10. **Rothsville Road and Clay Road** (Warwick Township) – Construct eastbound left turn lane on Rothsville Road. Install a traffic signal. (5 accidents)
11. **Rothsville Road and Pierson Road** (Warwick Township) – Construct a westbound left turn lane. Install a traffic signal. (12 accidents)
12. **Rothsville Road between Pierson Road and Newport Road** (Warwick Township) – Improve horizontal alignment and cross slopes and widen as necessary. (43 accidents)

Based on the information and data that was collected for this study we would recommend the following improvements be completed as soon as possible:

**Proposed Route:**

1. Widen Furnace Hills Pike (Route 501) between Wynfield Drive and Newport Road to provide a center left turn lane.
2. Realign Doe Run Road at the sharp horizontal curve east of Elm Road.

3. Construct east and westbound left turn lane on Newport Road at Brunnerville Road.

**Existing Route:**

1. Improve horizontal alignment and cross slopes and widen Rothsville Road between Pierson road and Newport Road.
2. Improve the safe stopping sight distance at the intersection of Fruitville Pike and Oak Street.
3. Construct a westbound left turn lane and install a traffic signal at the intersection of Newport Road and Pierson Road.
4. Install a traffic signal at the intersection of Second Avenue, Orange Street and Warwick School District Drive.