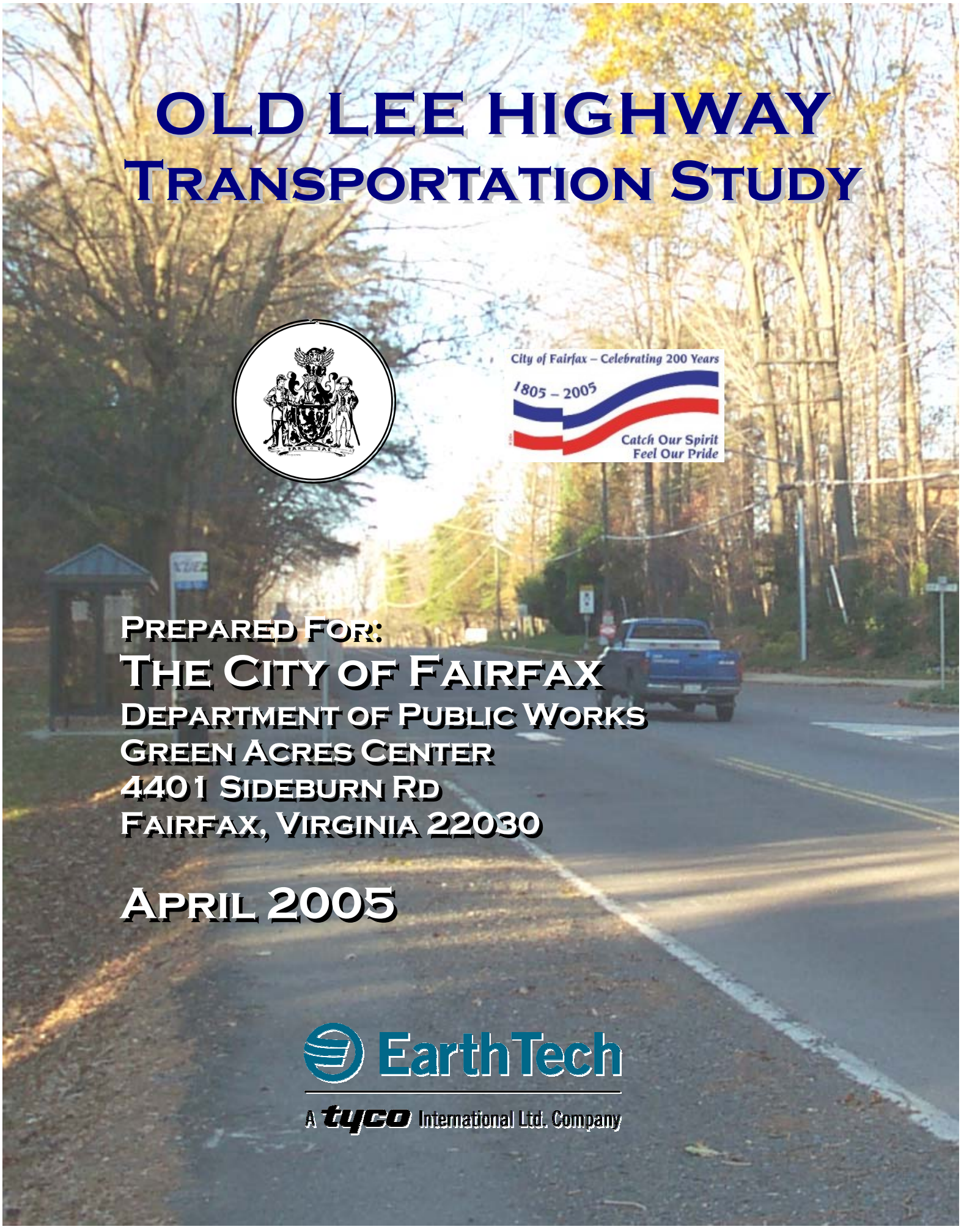
OLD LEE HIGHWAY
TRANSPORTATION STUDY



PREPARED FOR:

THE CITY OF FAIRFAX

DEPARTMENT OF PUBLIC WORKS
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EXECUTIVE SUMMARY

The purpose of this study is to examine geometric and operational issues along Old Lee Highway from Layton Hall Drive to Ridge Avenue, as well as to make recommendations for improving traffic operations, pedestrian and bicycle circulation, and safety. The recommendations to address issues identified are categorized by short term and long term improvements.

The existing roadway corridor is characterized by a single travel lane in each direction with occasional right turn lanes. The width of the paved surface varies widely, with inconsistent segments of shoulder, paved asphalt gutter or swales, and concrete curb and gutter. The excess pavement is a likely factor contributing to passing on the right and aggressive driving maneuvers. Elimination of the excess asphalt may curb such unsafe driving behavior. Sidewalks or walking trails are provided along a majority of the corridor, but are discontinuous and of varying width and pavement material. Pedestrians and bicyclists are underserved by the existing configuration due to the non-uniform sidewalk system, as well as a lack of crosswalks in higher-volume pedestrian areas.

Along many of the side streets, the stop bar is located a considerable distance back from the roadway, hindering sight distance. Speeding was observed and documented mainly in the off-peak and evening hours, especially on the east end of Old Lee Highway. During the peak hours, congestion can become problematic, with motorists on the side streets experience long delays when attempting to turn onto Old Lee Highway. Accident data showed that rear-end collisions were the most prominent type, with a large percentage occurring on the east section of Old Lee Highway. Finally, landscaping and general aesthetics could be greatly enhanced by an overall plan that visually reinforces the function of the roadway as a local residential collector road instead of a commuter arterial.

The following improvements were identified as potential mitigating strategies for the issues identified along Old Lee Highway:

Short Term Improvements

Pavement Width

The immediate problem of varying pavement width can be addressed in the short term by removing the excess pavement, replacing asphalt with grass, and grading the resulting unpaved areas to drain as they do at this time. In short, the removal of the excess pavement may not require immediate construction of curbs, gutters, inlets and sewers where they do not now exist. The expected benefits of selective pavement width reductions include:

- Improve sight distances in corridor by removing excess pavement, lowering the risk of vehicular and vehicle-pedestrian accidents;
- Lower top speeds by creating the appearance of a narrower roadway;
- Provide space for improved pedestrian and bicycle facilities;
- Create a visual appearance in keeping with the function of Old Lee Highway as a local road.

The exception to the two-lane cross section would be between Rebel Run and Great Oaks Drive, where the westbound direction would have a continuous curb lane for right turns.

Another improvement associated with the overall cross-section width includes a review and removal of existing vision obstructions (including vegetation) at intersections. For example, at the northeast corner of Heritage Lane, trees are blocking motorists' view of Old Lee Highway. Other intersections where improvements could increase sight distance include: Colony Road, Old Post Road, Parklane Road, Embassy Lane, Brookwood Drive, Queen Anne Drive, Cornell Road, and the entrances to Army-Navy Country Club.

Signage and Markings

For drivers who are less familiar with the corridor, additional warning and guidance measures may more effectively alert them to upcoming school zones and corresponding pedestrian traffic.

The current use of crossing guards for traffic control at the schools in the corridor provides a more flexible and responsive system than would an automated traffic control system. Given the widely varying conditions and hours of operation, it is recommended this practice continue indefinitely. One potential improvement that is suggested to supplement the existing traffic control and signage is installation of "SCHOOL" pavement markings in advance of the areas where school zone speed restrictions are in place.

Once the excess pavement widths are removed, the entire corridor should be restriped according to standard design regulations, with edge lines used in any areas that do not have existing curb and gutter. In addition, the stop bars for intersecting streets should be adjusted to reflect the changed width of pavement on Old Lee Highway, improving sight lines for those roadways.

Speed Enforcement

Based on data collection and field observations, the central and east portions of the roadway are more likely to experience higher speeds than the rest of the corridor. Rear-end collisions, which can often be attributed to a combination of speeding and maintaining poor following distance, were most prominent at Old Post Road (center of the corridor) and Rebel Run (east part of the corridor). Therefore, it is likely that additional speed enforcement in these areas could reduce the chances of rear accidents.

Other speed deterrents, such as portable radar speed indicator signs that show actual vehicle speeds, as well as continued selective focused enforcement by the police, could prove effective in reducing the likelihood of late night and off-peak speeding in the corridor.

Pedestrian and Bicycle Circulation

As an interim countermeasure, one recommended strategy is to provide connecting sidewalk segments where they are missing on the north side of Old Lee Highway. Specifically, along the segment fronted by the Arm-Navy Country Club, there is no dedicated area for pedestrians. The interim recommendation is for the sidewalk on the north side only, leaving the shared use path on the south side of the roadway for later implementation.

Additional improvements for pedestrian and bicycle circulation include the following:

- Implement new painted, ladder-striped crosswalks across Old Lee Highway near bus stops to improve pedestrian circulation. Per ADA requirements, some of the crosswalks may require installation of new or upgraded curb ramps to provide the adequate slope for wheelchairs. Suggested locations for new crosswalks include:
  - South of the Police Station's north driveway
  - Between either front driveway entrance for both Daniels' Run & Saint Leo School

- North of Heritage Lane
- North of Embassy Lane
- Between Brookwood and Queen Anne
- North of Great Oaks Way
- Across minor streets and school driveways to Old Lee Highway.

- Implement signage to warn motorists of the pedestrian Right-of-Way and potential fines for not yielding when a pedestrian is in the crosswalk. Also suggested is installation of a bollard-style warning sign placed 20 to 50 feet in front of each existing and new crosswalk.
- Improve the horizontal sight line distance on the existing multi-use pedestrian/bicycle path on the west side of Old Lee Highway (especially in the vicinity of Great Oaks Way), providing a safer condition.

Long Term Improvements

These improvements would all be in addition to the recommended interim improvements. Implementation of these recommendations would be anticipated over the course of the next 4-6 years.

Reconfiguration of Old Lee Highway

While removing the excess pavement from Old Lee Highway will provide an interim benefit, it is recommended that, ultimately, the roadway be milled and resurfaced as 28-foot wide cross-section, including one consistent 12-foot wide thru lane northbound, one consistent 12-foot wide thru lane southbound, two two-foot gutters, and two six-inch curbs to provide a more consistent cross-section and the necessary associated drainage system. This will include installation of about 41 new curb inlets and three new manholes along with about 4,500 feet of new storm drain pipe. The new storm drains and pipes will be connected to the existing storm drain system.

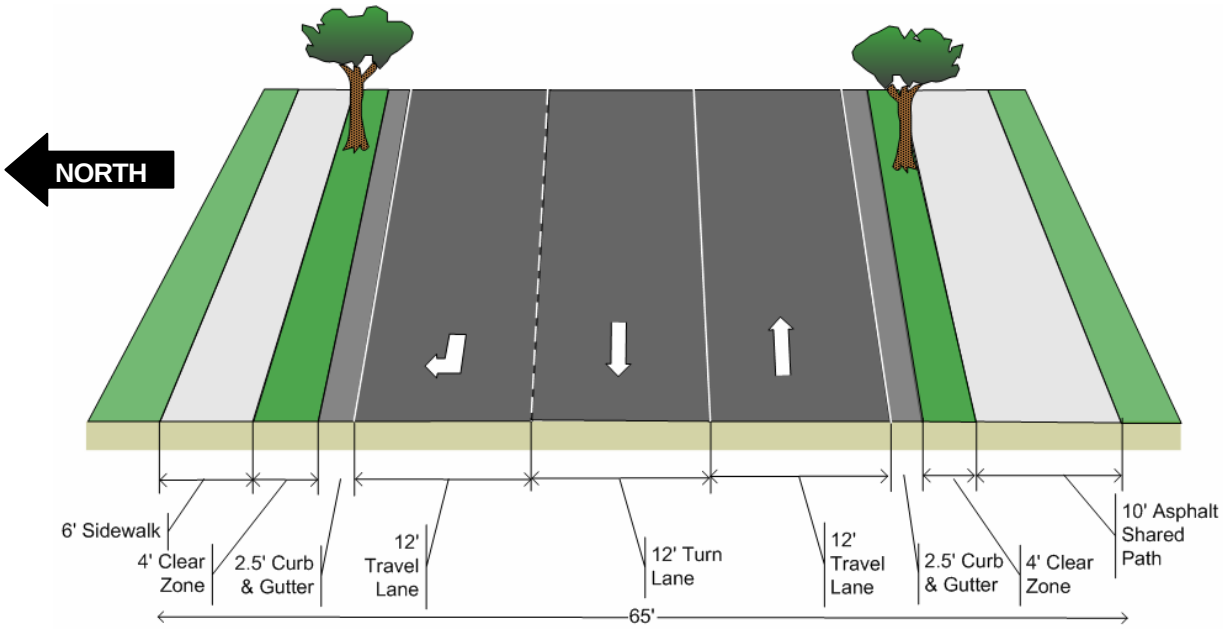

Figure ES-1 Recommended Typical Section with Outside Turn Lane

Figure ES-1 shows a dedicated right turn lane with the shared use path and sidewalk configurations. It would apply on Old Lee Highway at Queen Ann Drive (eastbound), Rebel Run (westbound), Great Oaks Drive (westbound), and Ridge Avenue (westbound).

Figure ES-2 shows a center turn lane configuration. This would apply on Old Lee Highway at Cornell Road (both east and westbound directions) and Rebel Run (eastbound to northbound).

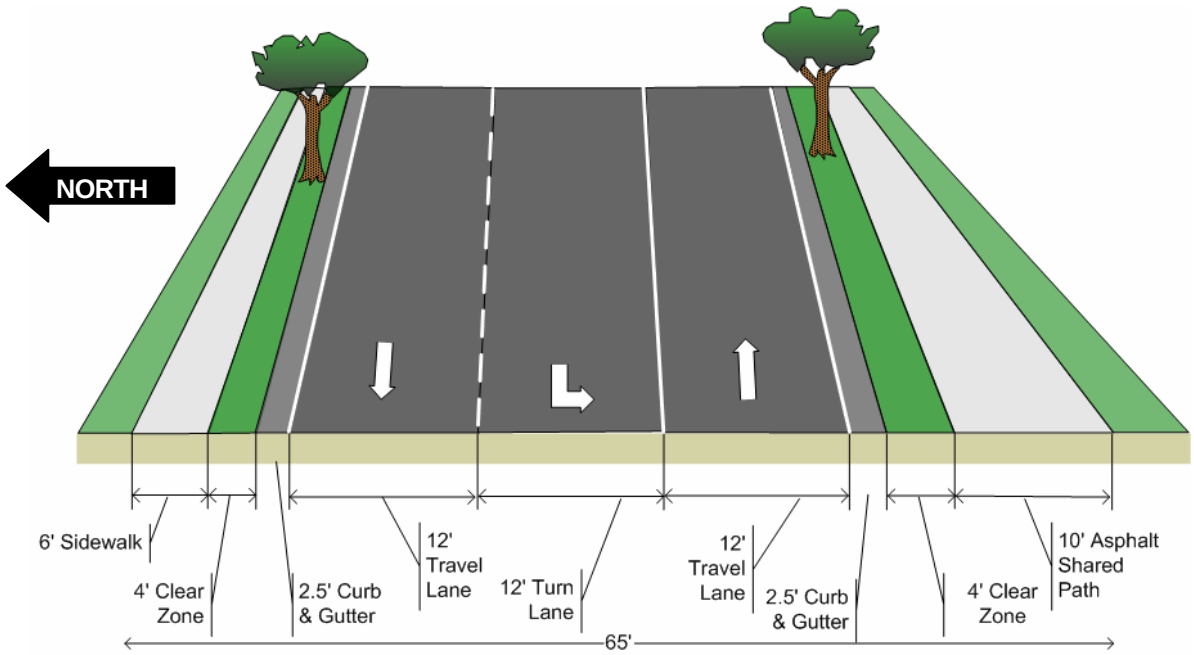

Figure ES-2 Recommended Typical Section with Center Turn Lane

Crosswalks

There are eight existing crosswalks across Old Lee Highway within the study area. An additional seven new crosswalks are recommended as short-term improvements. In addition, 23 new crosswalks are recommended to be delineated across the intersecting streets (there are currently only three existing 3 crosswalks across the side streets). The proposed crosswalk locations are shown in Appendix D.

Pedestrian and Bicycle Circulation

Development of a shared use path with a sidewalk on the south side of Old Lee Highway is recommended. This would provide a 10-foot shared-use path on the south side of Old Lee Highway and a sidewalk on the north side. The shared-use path would be continuous for the full length of Old Lee Highway in the study area, although it would be of reduced width at its eastern end due to topographic and right-of-way constraints. The sidewalk would be continuous from Army-Navy Country Club to the west end of the study area. Both would be designed with curb cuts and marked crossings. Where a 3.5 feet separation from the roadway is not possible, an aesthetically attractive barrier should be provided for the safety of the pedestrians.

Speed Enforcement and Safety

For longer term improvements that may reduce vehicles speeds and increase safety, traffic calming measures should be considered. Examples of devices that may be appropriate for the Old Lee Highway corridor include brick paver crosswalks, especially at the school zones or at locations where heavy pedestrian traffic is heavy (such as bus stops). These treatments enhance the presence of the crosswalk and have shown to be effective in reducing vehicles speeds and drawing motorist attention to pedestrians. In

addition, pedestrian refuge islands may also be used on segments of the roadway where it may be difficult for pedestrians to cross the entire roadway. These measures typically reduce vehicle speeds because they give the motorist the impression that the overall roadway width is narrowing. Small triangular islands may also be used to force vehicles in a right turn bay to turn right instead of using the lane to as a passing lane to speed by slower-moving or turning vehicles. If the decision is made to install traffic calming devices, a comprehensive traffic calming study should be preformed for the entire corridor.

Figure ES-3 provides a graphic summary of the recommended improvements.

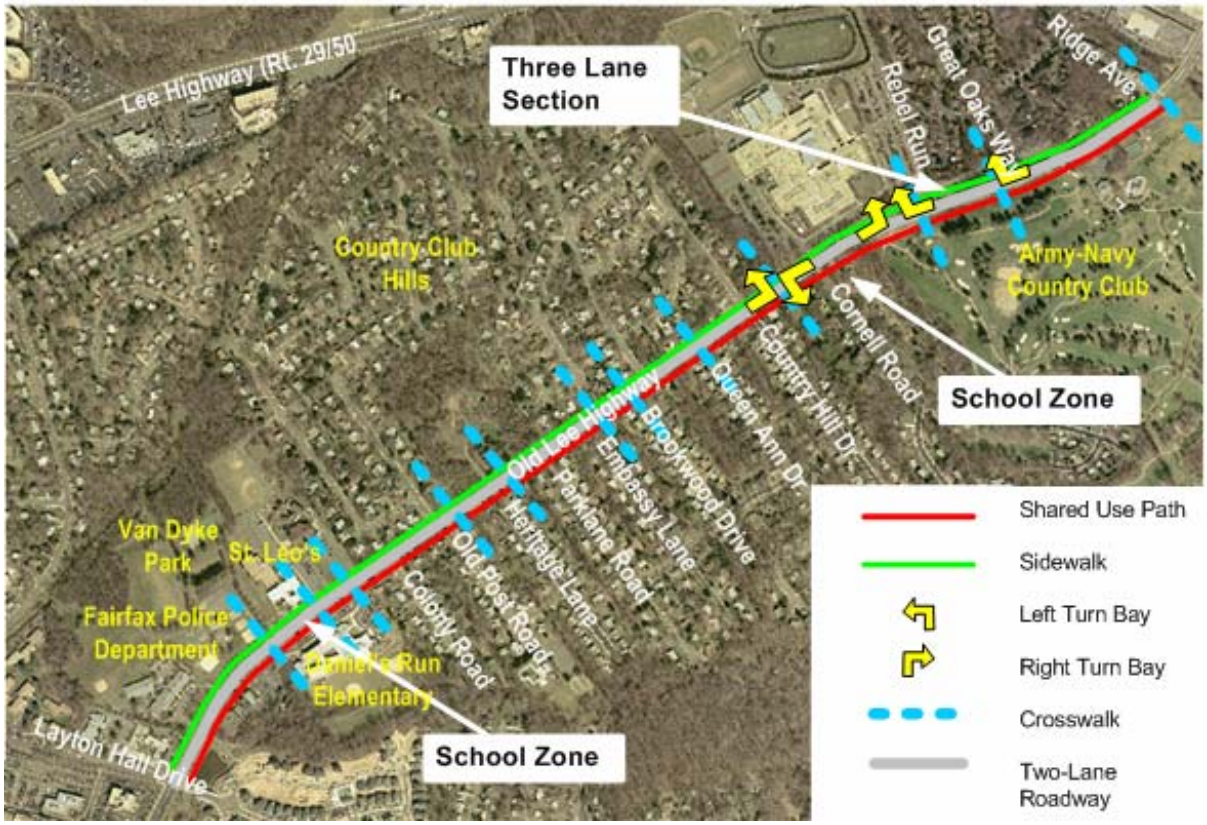

Figure ES-3 Summary of Recommended Improvements

Landscaping

In addition to the recommended functional improvements to Old Lee Highway it is suggested that its identity be redefined to match its function as a local roadway. One of the most attractive sections of Old Lee Highway is its east end where overhanging trees and its confined shoulders clearly convey the street as not being meant for heavy volumes of traffic. It is suggested that this condition be replicated to the degree feasible along its entire length. Specifically, narrowing of the pavement needed for the roadway and even adding continuous sidewalks and bike paths will leave unused right-of-way that should be used for planting of trees and landscaping to reinforce the function of Old Lee Highway as a local collector. This would have the effect of unifying the roadway that presently has segments that are not aesthetically in agreement.

Projected Costs

Order-of-magnitude quantities and associated costs were developed in order to establish a baseline for the potential cost of the proposed improvements. Work elements associated with both Short Term and Long Term Improvements are shown below.

The estimated cost to implement the **Short Term Improvements** is $934,670. This includes:

- Removal of excess pavement
- Backfill and lay sod where the excess pavement is removed
- Complete missing sections of north side sidewalk
- Painted striping in the roadway for new crosswalks across Old Lee Highway as well as across intersecting streets along the north side
- 10% mobilization
- 20% for engineering design and topographic survey
- 15% for construction engineering
- 25% contingency for Maintenance of Traffic, erosion and sediment control, permits, and other construction contingencies

The estimated cost to implement the **Long Term Improvements** is $3,139,830. This includes:

- New curb along portions of the roadway where the excess pavement is removed
- New curb along other portions of the roadway; e.g., the Blenheim House
- New shared use path along the south side of the roadway
- Painted striping for crosswalks for intersecting streets along the south side of Old Lee Highway, as well as for improved intersections where the shared used path ties in
- Plant trees and lay sod along Old Lee Highway
- Necessary utility relocation; e.g., poles on east side near ANCC
- 10% mobilization
- 10% for engineering design
- 15% for construction engineering
- 25% contingency for Maintenance of Traffic, erosion and sediment control, permits, and other construction contingencies

This construction cost estimate is based on 2005 unit prices and does not include administration costs incurred by the city or escalation.

OLD LEE HIGHWAY TRANSPORTATION STUDY
CITY OF FAIRFAX

INTRODUCTION

Study Purpose

This study is intended to evaluate the operational and geometric conditions of Old Lee Highway between Ridge Avenue and Layton Hall Drive. The primary objective of this evaluation was to preliminarily identify improvements for this corridor to improve traffic operations, pedestrian and bicycle circulation and safety. The recommendations of this study will be to reach consensus on the recommended improvements to be constructed, both short and long term.

Project Study Area

The study area extends along Old Lee Highway through central Fairfax from Ridge Avenue to Layton Hall Drive, as shown in Figure 1.

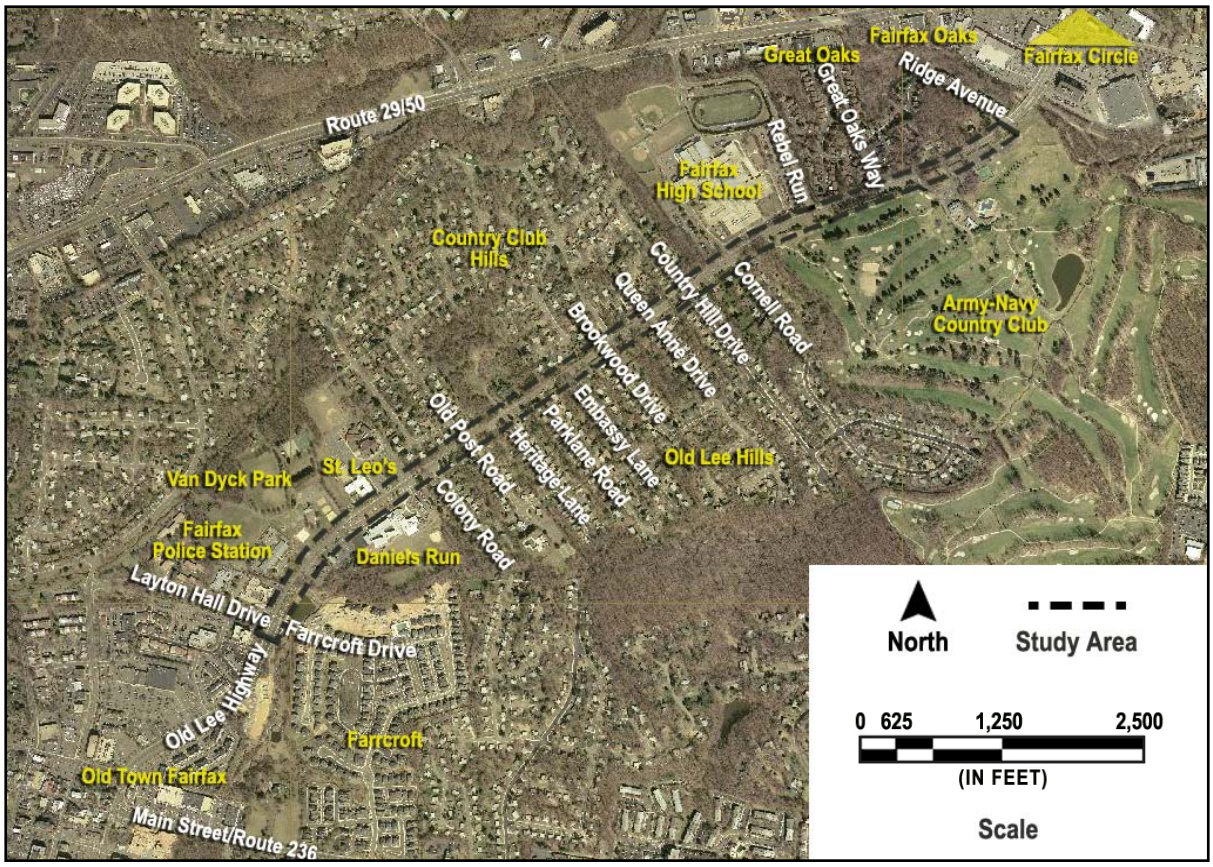

Figure 1 Old Lee Highway Study Area

Background

The City of Fairfax Draft Comprehensive Plan designates Old Lee Highway as an *Urban Collector Roadway*. In 1987, the designation of Old Lee Highway as Route 237, an Urban Minor Arterial, was transferred to Picket Road. An Urban Collector Roadway is defined by AASHTO as "providing both land access service and traffic circulation within residential neighborhoods".[1] This designation gave primary responsibility for access to Old Town Fairfax to Pickett and Chain Bridge Roads rather than Old Lee Highway. Furthermore, Old Lee Highway was once planned for expansion to four lanes, but is now designated to remain a two-lane facility under the City's Comprehensive Plan. A legacy of this change is the remaining excess pavement along the corridor, originally intended to serve two additional lanes of through traffic.

The Comprehensive Plan specifically states:

> *"Old Lee Highway currently exists as a two-lane road. Excess sections of pavement should be removed. It should remain in that configuration subject to safety improvements. Safety conditions of the sidewalks and trails along this roadway should be examined and improvements made where warranted. Access issues for local streets bordering on this section should be studied. Public transportation should be improved."*[2]

The Comprehensive Plan also indicates:

> *"At appropriate locations along the City's streets, the provision of sidewalks, trails, pedestrian signals and crosswalks will help facilitate the safe travel of pedestrians. It is especially critical to connect residential areas with one another and with public facilities, businesses and residents that residents need."*[3]

In the Fall of 2002, the Community Appearance Committee, a volunteer citizen group for the City of Fairfax, finalized a Citizen's Report for conceptual redesign of Old Lee Highway. The Report showed a typical cross section (Figure 2) of what the Committee perceived as the preferred scenario for the corridor.

The report recommended to:

- Reduce road width to consistent two lanes and add crosswalks in residential areas
- Reduce oversized intersections
- Add curb, gutter, and grass where gravel shoulders are in front of churches and the Army-Navy Country Club (ANCC)
- Add sidewalk, trail, or bike lane along ANCC
- Improve existing center islands

[1] *A Policy on Geometric Design of Highways and Streets 2001*, AASHTO. Fourth Edition. P. 12. An Urban Minor Arterial is defined by AASHTO as those 'serving local bus routes and providing intra-community continuity but not penetrating identifiable neighborhoods'. An Urban Minor Arterial serves principal arterials that "serve the centers of urbanized areas".
[2] *Draft Comprehensive Plan – City of Fairfax* (11-3-03); p. 129.
[3] *Draft Comprehensive Plan – City of Fairfax* (11-3-03); p. 121.

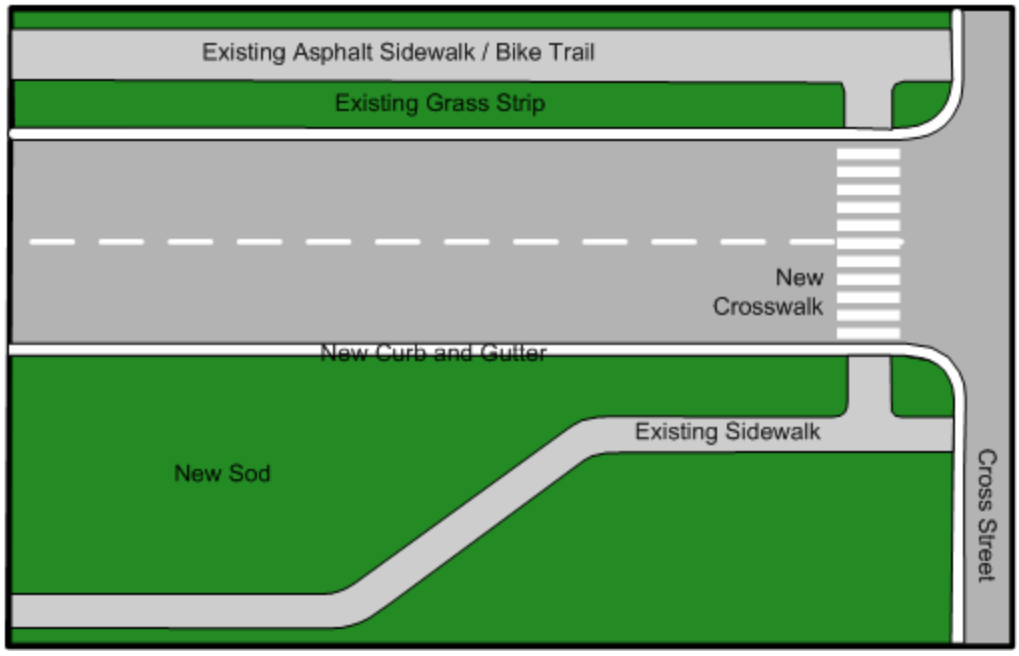

Figure 2 Citizen's Report Recommended Cross Section - Old Lee Highway

Table 1 compares the existing conditions with the proposed modifications, as recommended in the Citizen's Report.

Quality	Existing	Proposed
Consistent Cross-Section	No	Yes
Green Space Share	12%	47%
Overarching Trees	No	Yes
Landscaping	No	Yes
Traffic Speed	Current	Slower
Safety	Current	Better
Buildable in Small Stages	N/A	Yes
Comprehensive Plan Agreement	No	Yes
Cost	Maintenance	$285K

Table 1 Fall 2002 Citizen's Report Summary Table (Stage 1)

Methodology

This study began with a survey of existing conditions, a review of previous studies and data collection. Seven previous or on-going reports were reviewed for the "Old Lee Highway Preliminary Transportation Study".

- Traffic Impacts at the Entrance to Farrcroft Condominiums, Old Lee Highway (December 30, 1996)

- Traffic Impact Analysis – Layton Hall Elementary School (1998)
- Bikeway Program Review for the City of Fairfax (July 1980)
- Citizens' Report (Fall 2002)
- 2003 Draft Comprehensive Plan – City of Fairfax (2003)
- Historic Blenheim Master Plan (September 16, 2003)
- Northern Virginia Regional Bikeway and Trail Network Study: Final Draft Report (September 25, 2003)

Based on this information, an analysis was performed for crosswalks, roadway geometry, sight lines and observations of traffic conditions. A key factor in the analysis was determination of locations where accepted design standards or preferred practices are not being met. The results of the analysis were then used to identify the location and types of improvements that would be needed to improve conditions. These improvements were then documented and reviewed in a series of public meetings and consultations with stakeholders. The input received in these meetings was then used to evaluate the alternatives and identify those that appear most promising and desirable both for technical reasons and given public input. Those recommendations were then reviewed with Fairfax officials and finalized.

EXISTING CONDITIONS

Land Uses

The Old Lee Highway Study Area is a mixed-use corridor including five residential communities, three schools (Daniels Run Elementary School, St Leo the Great Catholic School, and Fairfax High School), the City of Fairfax Police Headquarters / John C. Wood Municipal Complex, Van Dyck Park, the Army–Navy Country Club, and three churches (Saint Leo the Great Catholic Church, the Northern Virginia Mennonite Church, and the Christian Science Facility). The dominant land use of the corridor is residential. The residential areas along Old Lee Highway are oriented to the cross streets of Old Lee Highway with only a few residences having direct access to that roadway. The nonresidential corridor uses do front on Old Lee Highway. With few exceptions, Old Lee Highway is the sole means of vehicular access to the uses in the corridor.

Streets and Traffic

Old Lee Highway, as its name implies, was once a major thoroughfare through Fairfax. With construction of Lee Highway, its function as a long-distance corridor was supplanted. Old Lee Highway is now classified an *Urban Collector Roadway*, the functions of which are:

> "The collector street system differs from the arterial systems in that facilities on this system penetrate neighborhoods and provide access to abutting land use.
>
> It distributes trips from the arterials through the area to the ultimate destination that may be a local or collector street.
>
> In some instances, a small amount of through traffic may, due to the design of the collector facility, find its way to the collector system."[4]

Intersections

Within the study area Old Lee Highway has the following 13 intersections:

1. Layton Hall Drive/Farrcroft Drive
2. Colony Road
3. Old Post Road
4. Heritage Lane
5. Parklane Road
6. Embassy Lane
7. Brookwood Drive
8. Queen Anne Drive
9. Country Hill Drive
10. Cornell Road
11. Rebel Run
12. Great Oaks Drive
13. Ridge Avenue

The minor approaches of these intersections are currently stop-controlled. Old Lee Highway is free-flow for the length of the study area.

The corridor has dedicated right turn lanes at four locations: Farrcroft Drive in the northbound direction, Ridge Avenue southbound, Great Oaks Drive southbound, and Rebel Run southbound. The corridor also has five left turn lanes: Layton Hall Drive northbound, at the

[4] *Fairfax City "Street Functional Classifications"*

south entrance to Fairfax High School, Rebel Run (the High School's north entrance) Cornell Road (southbound across from the High School) and Farrcroft Drive southbound.

Roadway Geometry

Old Lee Highway's pavement varies in width throughout the length of the study area. Figure 3 shows one of the areas where the pavement width substantially exceeds that needed for the vehicles.

Figure 4 summarizes the variation in pavement widths along the length of Old Lee Highway.

Figure 3 Old Lee Highway Looking East at Parklane Road

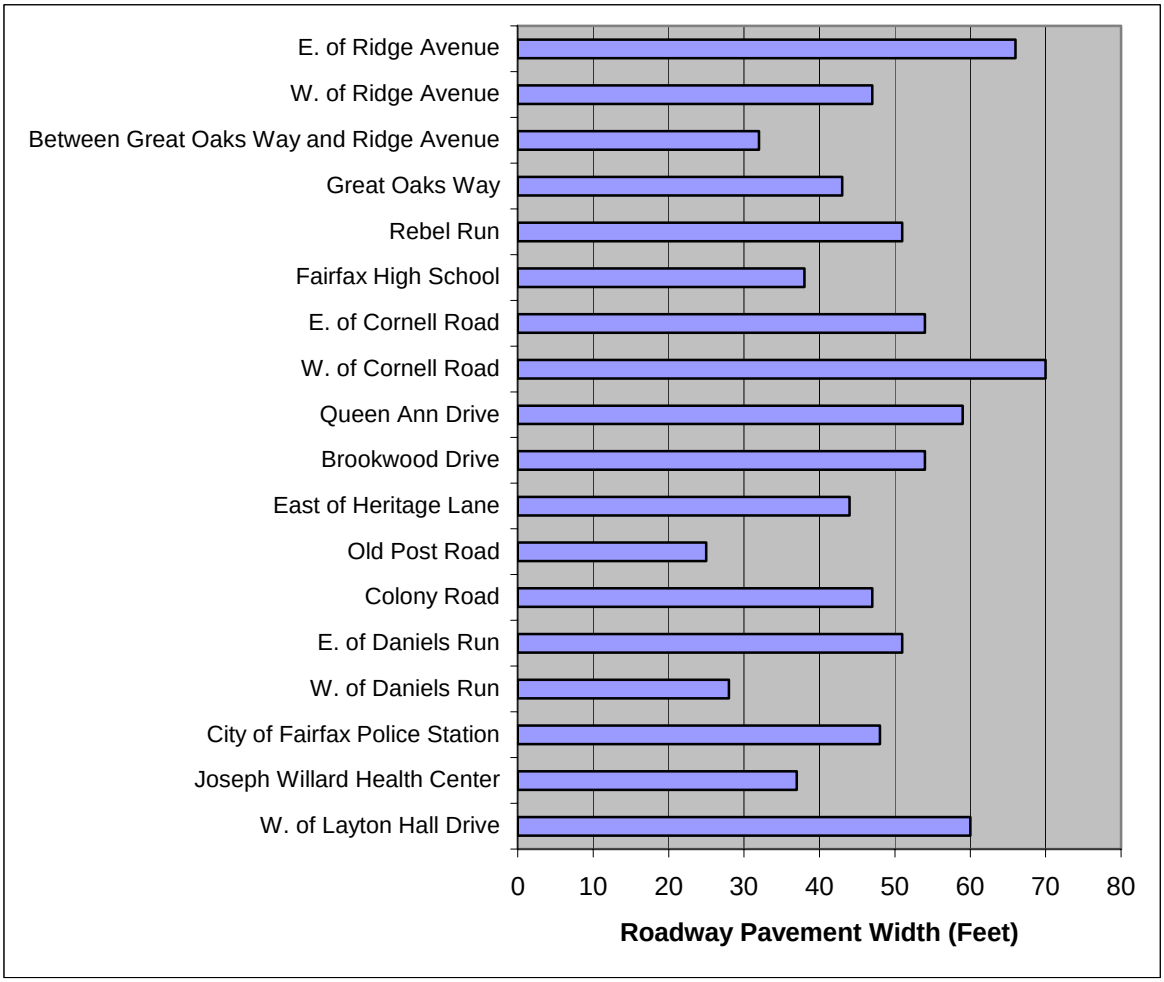

Figure 4 Old Lee Highway Pavement Widths

Traffic Volumes

Traffic counts on Old Lee Highway were performed in late 2003 and indicate a daily traffic volume of about 16,500 vehicles. The peaking pattern of traffic is typical, with an AM peak hour between 6 AM and 8 AM and a peak between 4 PM and 6 PM. The PM peak is about 16% higher than the AM, with about 1400 vehicles per hour at its crest versus 1200 in the AM. Given the low-density residential development of the corridor and the moderate intensity of the other uses in the corridor, Old Lee Highway accommodates a moderate to high percentage of through traffic. Appendix E provides summaries of the traffic counts used for this analysis.

Traffic Capacity Analysis

The existing traffic volumes at the intersections along Old Lee Highway were analyzed to determine traffic operational Levels of Service. Level of Service (LOS) is a quality measurement of traffic flow in terms of speed and travel time, freedom to maneuver, comfort, and convenience. There are six LOS designations, represented by the letters A through F, with LOS A representing the best operating conditions (free flow) and LOS F the worst (gridlock congestion). Table 2 provides the LOS ratings for unsignalized intersections, which are defined in terms of average vehicle delay (seconds per vehicles).

Level of Service	Average Delay
A	< 10
B	10 - 15
C	15 - 25
D	25 - 35
E	35 - 50
F	> 50

Table 2 Level of Service Measure

Table 3 summarizes the LOS results from this analysis for side street traffic attempting to enter the mainline. Intersections operating at LOS F on the minor approaches have been highlighted.

Intersection with Old Lee Highway	Level of Service		Approach Delay (Seconds/Vehicle)	
	AM	PM	AM	PM
Colony Road	D	E	26.1	36.5
Old Post Road	E	E	35.8	47.5
Heritage Lane	C	C	20.0	20.4
Parklane Road	C	C	24.8	24.3
Embassy Lane	C	D	24.5	25.4
Brookwood Drive	**E**	**F**	**44.9**	**53.4**
Queen Anne Drive	D	C	25.4	23.6
Country Hill Drive	**E**	**F**	**44.2**	**60.8**
Cornell Road	**F**	**F**	**63.3**	**56.5**
Rebel Run	**F**	**F**	**68.1**	**61.2**
Great Oaks Drive	C	C	21.0	15.5
Ridge Avenue	C	C	18.5	23.5

Table 3 Existing Levels of Service (2003)

While some of the intersections exhibit poor operational characteristics on the side streets during peak hours, the issues with delay and gaps are mainly confined to those periods. Field observations indicate Old Lee Highway flows freely during non-peak periods. The side street

volumes do not generally warrant installation of a traffic signal at this time, but may need to be re-examined in the future if and major land-use changes were to occur in the area.

Speed

The posted speed limit of Old Lee Highway is 30 mph. An analysis of data provided by the City of Fairfax Police Department indicates about 32 percent of the vehicles using Old Lee Highway exceed this posted limit by up to 10 mph and only 1 percent by more than 10 mph. The distribution of speeders varies significantly by time of day, with most speeding occurring between 8 PM and 5 AM. All speeders exceeding 40 mph (more than 10 mph over the limit) were recorded between 11 PM and 5 AM.

Accident Data

As part of the scope of this study, accident history was evaluated to determine if any trends were apparent on Old Lee Highway. Accident data was gathered from the City of Fairfax Police Department for the past five years, from 1999 to 2003. The most accidents were recorded on Rebel Run, followed by Old Post Road, then Brookwood Drive and Layton Hall Drive. In the five years examined, only one accident involved a bicyclist (relatively minor injuries were incurred and the bicyclist was faulted). No accidents involved pedestrians.

Most of the accidents (65%) involved rear-end collisions. The intersection with the most accidents, Old Post Road, had 18 collisions (of which 16 were rear-end collisions). This is almost double the number of accidents as the next intersection, Rebel Run with 10 accidents (of which 7 were rear-end collisions).

School Zones

There are three school zones along Old Lee Highway. Each location is marked with signing to indicate that the speed limit is reduced to 25 miles per hour during school hours. A crossing guard controls traffic at the crosswalk between Saint Leo the Great School and Daniels Run Elementary School to allow students to cross from the south or north side of the road. There is also a crossing guard who controls traffic at Fairfax High School for the crosswalk near the south end of the school. All of the school crosswalks are marked with school advanced warning signage and school crosswalk warning assemblies.

In the morning, each zone starts 40 minutes before and ends 30 minutes after school starts. In the afternoon, each zone starts 30 minutes before and ends 30 minutes after school let out for the day. Figure 5 indicates the periods that each school affects traffic Tuesdays through Fridays. On Mondays Daniels Run Elementary and Saint Leo the Great School let out at 1:20 pm and 12:30 pm, respectively.

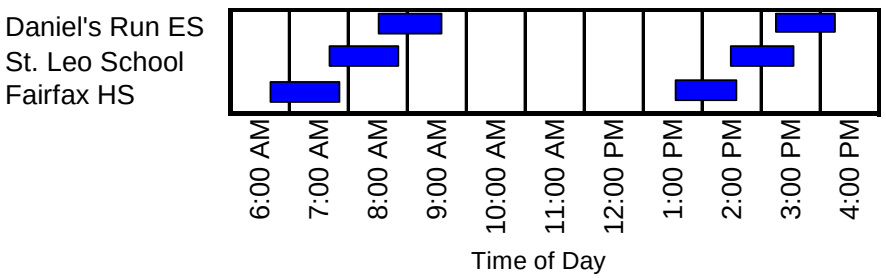

Figure 5 School Zone Times

Bus Stops

The City of Fairfax bus system, CUE, has 15 stops along Old Lee Highway, of which 4 have shelters. All of the paired stops (on opposite sides of the roadway) are near crosswalks. Those stops are at the following locations:

1.	Layton Hall Drive	Both sides
2.	Daniels Run Elementary/ Saint Leo the Great School	Both sides
3.	Blenheim Home / Heritage Lane	Both sides
4.	Embassy Lane	Eastbound side
5.	Brookwood Drive	Westbound side
6.	Queen Anne Drive	Eastbound side
7.	Fairfax High School / Cornell Drive	Both sides
8.	Great Oaks Drive/ Army-Navy Country Club	Both sides
9.	Ridge Avenue	Both sides

Bicycle and Pedestrian Circulation

The bike paths and sidewalks along Old Lee Highway are discontinuous and vary in width, design and alignment throughout the length of Old Lee Highway. There are eight marked crosswalks along Old Lee Highway, one of which, at Fairfax High School and Cornell Drive, is supplemented with lights and a manual switch. The crossing is marked with white pavement striping highlighted by flashing lights in the pavement and two flashing lighted crosswalk signs on either side of the crosswalk. The other crosswalks are also striped but are not illuminated or signed, except at the school crosswalks, as discussed above.

The crosswalks along Old Lee Highway vary in length due to the varying width of Old Lee Highway. Figure 6 graphically conveys the variation in crosswalk lengths.

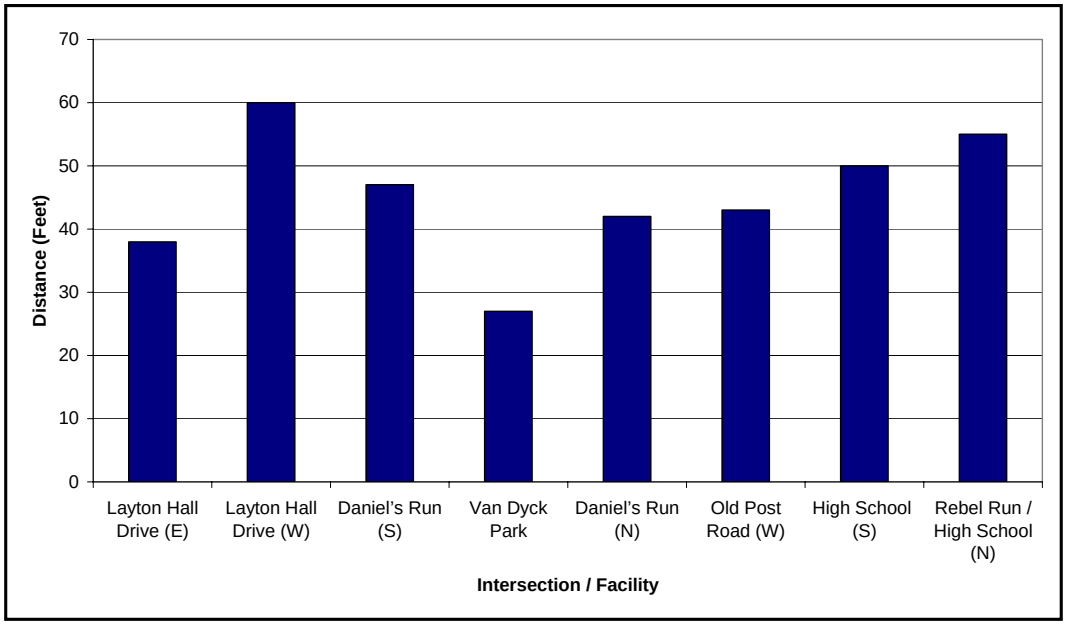

Figure 6 Crosswalk Lengths

Landscaping

The corridor varies substantially along its length in its visual/aesthetic character. Beginning in the vicinity of the Army/Navy Country Club the roadway is confined to a shallow valley with overarching trees providing a sense of confinement. This gives way to a more open cross section heading southwest, with Fairfax High School set below the grade of the roadway on the north side of the corridor. The middle section of the corridor is characterized by a series of cross streets to adjacent residential areas with smaller trees and varying pavement widths. At Saint Leo the Great School and Daniels Run Elementary School, the corridor opens up and flattens out, a condition that continues almost as far as Layton Hall Drive. The roadbed itself traverses a series of modest rises and dips along its length.

CORRIDOR ISSUES

This section addresses issues and concerns along the corridor that were observed and considered for potential mitigation or improvement. Potential alternatives that may be considered are briefly outlined, with more detailed discussion in *Findings and Recommendations*. The major corridor characteristics examined include traffic operations, sight distance, bicycle and pedestrian circulation, and landscaping.

Traffic Operations

The following are observed traffic conditions that warrant attention:

- Passing on the right in widened roadway segments,
- Speeding in late night and early morning hours
- Peak hour congestion
- Rear-end collisions

Passing on the Right

In selected locations, the existing roadway width encourages passing on the right to avoid stopping or slowing behind turning vehicles, as well as "shortcutting" of right-hand turns. This condition is undesirable and potentially unsafe. While having to wait behind a turning vehicle inconveniences those continuing on, passing on the right invites collisions with vehicles turning from the opposite direction or vehicles stopped on the minor approaches. Reductions in excess pavement width or intersection radii can reduce the opportunities for passing on the right.

Speeding in Late Night and Early Morning Hours

The combination of existing congestion along the corridor, as well as the location of the police department at the west end of the study area, appear to discourage speeding during daylight hours. However, the relatively quiet, uncongested, and straight two-lane roadway without stop signs or crossing signals may be contributing to speeding during late night and early morning hours. This does not appear to be a serious problem at this point, but measures to discourage speeding at any time in the corridor may be desirable, such as portable radar signs, increased police enforcement, and even traffic calming devices. These are discussed in more detail under *Findings and Recommendations*.

Peak Hour Congestion

The overlap of peak hours with school start and ending periods leads to stop-and-go traffic conditions in the vicinity of the schools. However, given the function of Old Lee Highway as a local road, this inconvenience is not necessarily undesirable from the perspective of discouraging through traffic and speeding. Therefore, while the observed levels of service during peak hours are low, they are not unacceptably so. Minor timing adjustments to signals just beyond the limits of the study area may be an option to help create gaps and break up the continuous flow of traffic through the study area.

Rear-End Collisions

Rear-end collisions make up the vast majority of the collisions (65%) that have occurred over the past five years on Old Lee Highway. This could be attributed to several factors, including motorists who fail to react when vehicles in front of them slow or stop to make a turn. Another potential issue could involve vehicles from the side streets accepting inadequate gaps to turn onto Old Lee Highway, causing a collision with conflicting traffic upstream of the intersection. Side street traffic may have restricted sight distance due to the location of the stop bar, or may risk making a more aggressive turn maneuvers because of the lack of adequate gaps in through traffic on Old Lee Highway. Measures which reduce peak-hour congestion may also help to reduce the potential for rear-end collisions. In addition, improvements for side-street sight distance (see below) may also help to reduce accident frequency.

Sight Distance

An analysis was made of the sight distance at intersections and for the approaches to crosswalks. This analysis concluded that for the posted speed limit there are no sight distance problems with the existing crosswalks. However, for motorists attempting to enter Old Lee Highway from side streets, the following intersections had potential sight distance issues:

• Colony Road	Looking east
• Old Post Road	From the north looking east and west
• Heritage Lane	Looking west
• Parklane Road	Looking east and west
• Embassy Lane	Looking east and west
• Brookwood Drive	North and south approaches looking east
• Queen Anne Drive	Looking west
• Cornell Road	Looking east
• Army-Navy Country Club west entrance	Looking east
• Army-Navy Country Club east exit	Looking west

Most of the sight distance problems are due to the location of the side street stop bars, which are offset considerably from the actual travel lanes due to the excess pavement width at many intersections. Motorists attempting to enter Old Lee Highway are forced to pull forward into the travelway of Old Lee Highway to see approaching traffic on that roadway. There are also problems created by vegetation, some of which could be alleviated by the narrowing of Old Lee Highway and the relocation of the intersecting streets stop lines. In other areas, the issue could be resolved by cutting back overgrowth.

Bicycle and Pedestrian Circulation

The discontinuous nature of the sidewalks / bikepaths along the corridor make non-motorized travel difficult; in some places, bicyclists and pedestrians must use the travelway of Old Lee Highway or cross it to continue. In addition, there are numerous locations where the width is too narrow for bicycles and pedestrians to use the pathway simultaneously. Finally, the locations of the existing paths vary, from directly adjacent to the curbside, to a substantial distance from the roadway. All of these conditions have resulted from the piecemeal manner in which the roadway and sidewalks / bikepaths were developed over time. These conditions make usage of

the pathways inconvenient and difficult. A more comprehensive approach to providing continuous facilities for non-motorized travel would improve circulation along Old Lee Highway.

The range of crosswalk lengths is a function of the roadway pavement widths. The problem created by the longer crosswalks is the tendency of pedestrians to enter the paved portion of the roadway outside the unmarked travel lanes to reduce the time needed to cross the roadway. The excess pavement invites pedestrians to stand where cars do not regularly travel, but which is paved as part of the roadway and is not protected from automobiles. A corridor-wide assessment of pavement widths is presented in the next section to assess locations where crosswalk distances may be reduced.

Landscaping

The study corridor includes several visually attractive areas, but its lack of curbs and gutters and its varying pavement widths do not visually reinforce the function of the roadway. There is no consistent sense of the character of the roadway due to these varying conditions, nor is its function as primarily a local road clearly conveyed by design or signage. The excessive pavement width of the roadway may convey a misleading message to motorists of a road meant to function as a minor arterial rather than a local collector. The following sections examine the potential measures the could be implemented to create a more consistent look for Old Lee Highway and to visually reinforce the function of the corridor.

POTENTIAL IMPROVEMENTS

Roadway Width

One potential improvement for the entire corridor would be to create a uniform two-lane cross section on Old Lee Highway. Figure 7 illustrates a potential typical cross-section for the corridor looking east. It shows the shared-use path south of the roadway and the sidewalk to the north, with two travel lanes, curb and gutter, and buffer space on either side of the roadway. In those areas where left and/or right turn lanes are provided, the cross-section would be appropriately adjusted (see figures under *Long Term Improvements*).

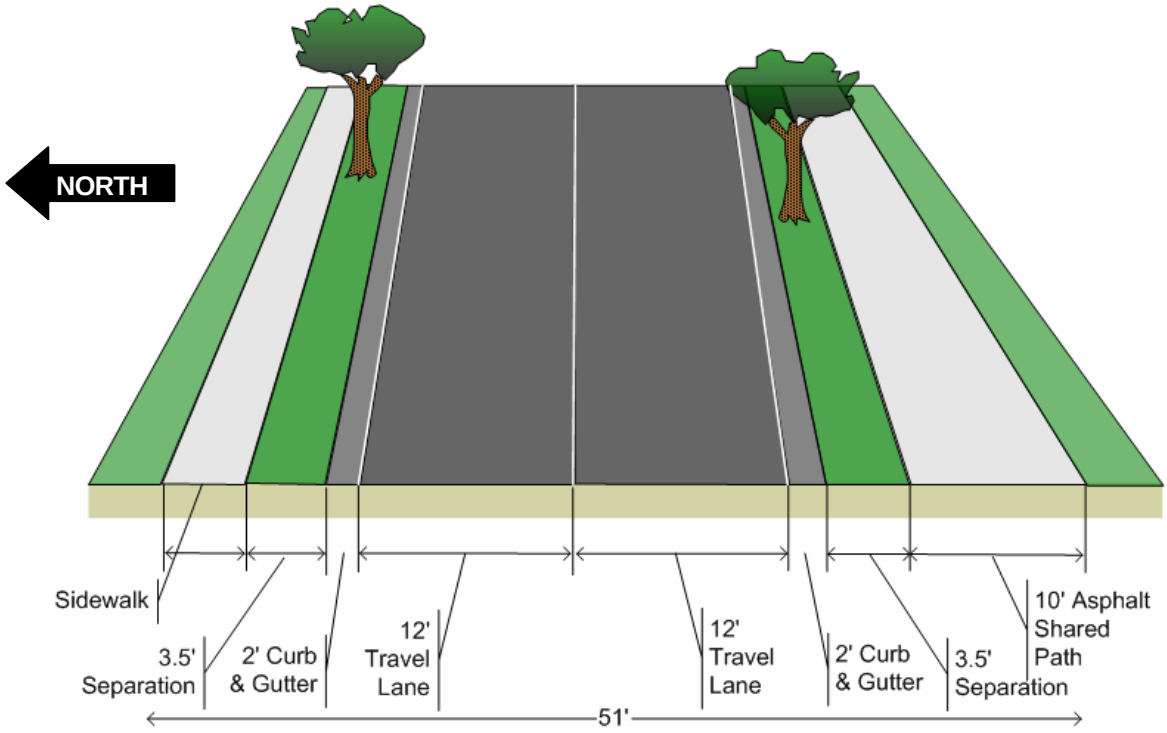

Figure 7 Typical Section without Turn Lane

School Zones

The two existing school zones (at Saint Leo the Great School / Daniels Run Elementary and at Fairfax High School) are currently posted at 25 miles per hour and experience significant pedestrian traffic at the crosswalks. Additional pavement markings may be considered to supplement the signage with the school zones along Old Lee Highway, as detailed in Section 7C.06 of the MUTCD[5]. These include "SCHOOL" pavement markings and "ladder-style" crosswalks with diagonal or longitudinal lines within the crosswalk, and other supplemental markings.

[5] *Manual on Uniform Traffic Control Devices, 2004 Edition.* FHWA. p. 7C-1-4.

Intersection Improvements

There are currently no signalized intersections within the study area where east-west traffic is forced to stop (other than at the crosswalks during school hours). Based upon an analysis of the traffic data available for the corridor study area and a review of traffic signal warrants outlined in the 2004 Edition of the MUTCD, none of the existing unsignalized intersections within the study area meet traffic signal warrants, with the possible exception of the Rebel Run intersection.

An analysis to determine whether a traffic signal may be warranted at this intersection was performed in the PM Peak Hour (the worst case). While this analysis concluded some of the criteria for installation of a new traffic signal at Rebel Run could be met, others did not. It is also possible that Old Lee Highway, once reconfigured, could see lower levels of through traffic, moderating conditions at Rebel Run. Given the limited traffic data and the unknown effect of the recommended improvements to Old Lee Highway on through traffic[6], a formal traffic signal study using more comprehensive traffic data is recommended prior to making a decision to signalize the intersection at Rebel Run.

One potential option to improve the gap availability on Old Lee Highway and reduce side street delay would be to retime the signals at either end of the corridor to meter through traffic within the study area. Signal splits and offsets could be carefully coordinated so as to create more organized platoons of east-west vehicles without creating undue delays and queues upstream or downstream of the study area. If this countermeasure fails to be effective due to ingress traffic from the side streets, additional gap strategies could include potential signal installation at Rebel Run or at one of the entrances to Daniels Run Elementary School (if warranted by future volumes) to break up the flow of continuous through traffic. Any potential modifications to the existing signal timings should implemented in a way such that adverse impacts to vehicle delay are minimized, if at all possible.

Bicycle and Pedestrian Improvements

A regional study of bikeways for Northern Virginia[7] identified the Old Lee Highway corridor as the corridor offering the greatest potential for latent demand bicycle usage because it could connect George Mason University to the Metro Station at Vienna. The total length of that bikeway would be 5 miles. Appendix A includes an excerpt of that report addressing the Old Lee Highway corridor.

The City of Fairfax's bike plan[8] identified Old Lee Highway from Van Dyke Park to Fairfax Circle as a safety concern, citing the discontinuity of the path and its failure to meet design criteria The plan recommended construction of a Class 1 bike path ("a completely separated paved path … for bicyclists and pedestrians.") from Layton Hall Drive to the Fairfax Circle area. This bikeway plan is currently being updated.

Based on recommended practices, there are three practical ways to accommodate bicycles and pedestrians in a roadway corridor in such a way that pedestrians and bicyclists are served by separate travelways:

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[6] Many of the measures recommended in this analysis could be classified as "traffic calming" measures. Any change in through traffic on Old Lee Highway will be a function of how well they work and conditions on Lee Highway (Route 29/50) and Pickett Road, parallel roadways designated for through traffic.

[7] *Northern Virginia Regional Bikeway and Trail Network Study, Final Report*, VDOT, 11/19/03, Appendix A, Demonstration Project Case Studies, p. 73 – 76.

[8] *Bikeway Program Review*, 1980 Bikeways Review Committee, July 1980, p. 4-5

1. Exclusive bikepath and exclusive sidewalks (not intended for joint usage of bikes and pedestrians) that are separated on both sides of the roadway;

2. A shared use path (bikepath/walkway) on one side of the road and a sidewalk on the other side of the street; or

3. Bike lanes in the roadway and sidewalks on either side of the roadway.

The relevant width requirements[9] for sidewalks, shared use bike/walkways and for exclusive bikeways are:

- Sidewalk (without provision for bicycles): 6 feet
- Shared Use Path: 10 feet
- Bike lane (in street, one on each side of roadway): 2 x 4 feet = 8 feet total
- Separation of sidewalk or bikeway from roadway: 3.5 feet. (If less, use protection to separate).

Given these dimensions, Table 4 summarizes the recommended space requirements for the three alternatives.

Option	1. Exclusive bikepath and sidewalks on both sides of the road	2. Shared use path on one side of the road and a sidewalk on the other.	3. Bike lanes in the roadway, sidewalks on either side.
Sidewalk width	6 feet x 2 = 12 feet	6 feet (exclusive)	6 feet x 2 = 12 feet
Bikeway/Bike lane width	10 feet	10 feet (shared)	4 feet x 2 = 8 feet
Clearances	Roadway to Paths (3.5 feet x 2) + Paths to Sidewalks (3 feet x 2) = 13 feet	3.5 feet x 2 = 7 feet	3.5 feet x 2 = 7 feet
Total Space Needed	35 feet	23 feet	27 feet

Table 4 Bikeway and Pedestrian Path Alternatives Widths

Of the options listed, the least right-of-way width is required by Option 2, the shared use path and single sidewalk. The shared use path with an exclusive sidewalk on the other side of Old Lee Highway would also offer safer operations for the bicycles than bike lanes in the roadway and would require less total width. The advantage of Option 1 is that exclusive facilities for pedestrians and bicyclists are provided on both sides of the roadway, reducing the potential for users to cross the roadway. Similarly, Option 3 provides exclusive facilities on both sides of the roadway, but the bike lanes are a component of the roadway, which can be less desirable for bicyclists.

[9] *Guide for the Development of Bicycle Facilities*,, AASHTO, 1999. *Designing Sidewalks and Trails for Access*, FHWA, 2001

PUBLIC INVOLVEMENT

Stakeholder Meetings

Two stakeholder meetings were held, one with a member of the City of Fairfax School Board, and the other with representatives from the Citizen's Appearance Committee, the City of Fairfax Transportation Department, the Department of Public Works, and the City of Fairfax Police Department's Crossing Guard Unit. These meetings were held to offer an opportunity for representatives of each stakeholder group to provide their input to the project and for the study team to collect data on the operating characteristics of each group.

Public Workshops

Two public workshops and one Final Project Meeting were held with the public. The first citizen workshop described the project scope and sought comments on community issues. The meeting was conducted as an informal workshop. At that meeting an aerial was displayed showing the project limits and focus areas for further study and discussion. A comment sheet was provided with questions and space for comment as a method to generate community feedback. Citizens were asked to complete their questionnaires and engage group facilitators in discussion concerning the project.

After conceptual design development for Old Lee Highway, a second citizen workshop was conducted to obtain feedback on the conceptual design. The meeting was conducted as an informal workshop. A comment sheet was provided with questions related to the conceptual design as a means of obtaining and recording community feedback.

Community Input

Table 5 summarizes the input received from the public and agencies over the course of this project. Appendix B provides meeting summaries for the public meetings.

Topic	Comment Summary
Congestion	Perception of heavy congestion on Old Lee Highway in peak periods.
Emergency response	Ability to service the corridor including emergency response, accident investigation and traffic enforcement stressed. Ability to use excess pavement to avoid blocking moving lanes during these activities cited.
	Noted demands from special events traffic such as for the Historic Blenheim Estate.
	Fire Department expressed concern about ability to traverse the corridor in rush periods, suggesting a middle or shoulder lane(s).
	Signal preemption of any new signals to allow emergency vehicles to override cited as desirable.
High speeds	Perceived as an enforcement problem on Old Lee Highway despite 292 speeding tickets being issued in 2003.
Landscaping	Cited as a priority. Previous proposal of a grassy median cited.
	Use of landscaping in areas of excess pavement recommended.
	Seen as potentially contributing to traffic calming.

Topic	Comment Summary
Multi-use path	Providing a narrowed path of 8 feet versus the recommended 10 feet was suggested to provide more green space.
Neighborhood Access	Difficulty exiting local streets to access Old Lee Highway, especially during rush periods.
	Particular difficulty making left turns onto Old Lee Highway
New Crosswalks	A desire for additional pedestrian crosswalks at Van Dyke Park and near bus stops.
Parking lot U-Turns	The north parking lot of Daniels Run Elementary was reported to be used for U-turns to avoid delays at the school, creating an unsafe condition.
Passing lanes	Addition of passing lanes near the elementary schools and Saint Leo the Great School Church were suggested to reduce congestion.
Passing on the right.	Perceived as unsafe condition resulting from excess pavement.
Pedestrian/Student Safety	Primary focus of public and school comments.
	Desire for better marking of crosswalks including signage.
Preservation of existing condition	Some citizens expressed a preference to leave the corridor unchanged.
Signals	Intelligent Traffic Lights (ITL's) to stop traffic on Old Lee Highway to permit left turns from cross streets that would activate only on demand for entry to Old Lee Highway.
Stop signs	Stop signs were seen as increasing congestion, especially during off-peak periods.
Traffic Signals	New signals at Brookwood and Old Post Road were suggested.
Turn lanes	Addition of left turn lanes at Daniels Run Elementary and Saint Leo the Great School were suggested.

Table 5 Summary of Public and Agency Comments

FINDINGS AND RECOMMENDATIONS

Short Term Improvements

Pavement Width

The immediate problem of varying pavement width can be addressed in the short term by removing the excess pavement, replacing asphalt with grass, and grading the resulting unpaved areas to drain as they do at this time. In short, the removal of the excess pavement may not require immediate construction of curbs, gutters, inlets and sewers where they do not now exist. A detailed topographical survey will be required to determine if there are areas where temporary or permanent drainage countermeasures are needed. However, if this approach is taken, the travelway and turn lanes must be clearly delineated, using appropriate pavement markings.

The expected benefits of selective pavement width reductions include:

- Improve sight distances in corridor by removing excess pavement, lowering the risk of vehicular and vehicle-pedestrian accidents;
- Lower top speeds by creating the appearance of a narrower roadway;
- Provide space for improved pedestrian and bicycle facilities;
- Create a visual appearance in keeping with the function of Old Lee Highway as a local road.

The exception to the two-lane cross section would be between Rebel Run and Great Oaks Drive, where the westbound direction would have a continuous curb lane for right turns.

Another improvement associated with the overall cross-section width includes a review and removal of existing vision obstructions (including vegetation) at intersections. For example, at the northeast corner of Heritage Lane, trees are blocking motorists' view of Old Lee Highway. Other intersections where improvements could increase sight distance include: Colony Road, Old Post Road, Parklane Road, Embassy Lane, Brookwood Drive, Queen Anne Drive, Cornell Road, and the entrances to Army-Navy Country Club.

Signage and Markings

The function of Old Lee Highway as a local road serving residential streets and schools is not clearly delineated. The roadway segment that is within the study area differs characteristically from the more commercialized areas just outside the project limits. Based on driver expectancy, non-local motorists may not anticipate the high-pedestrian-volume areas within the school zones. The issue is exacerbated by the slight horizontal curves in advance of the two school zones. Along the approaches to the school zones, a number of roadside elements visually compete for motorist attention, including existing signing. For drivers who are less familiar with the corridor, additional warning and guidance measures may more effectively alert them to upcoming school zones and corresponding pedestrian traffic.

The current use of crossing guards for traffic control at the schools in the corridor provides a more flexible and responsive system than would an automated traffic control system. Given the widely varying conditions and hours of operation, it is recommended this practice continue indefinitely. One potential improvement that is suggested to supplement the existing traffic control and signage is installation of "SCHOOL" pavement markings in advance of the areas where school zone speed restrictions are in place.

An additional issue is the weaving section created along the existing westbound auxiliary lane between Great Oaks Drive and Rebel Run, where citizens have voiced concerns that motorists do not merge or diverge appropriately. A potential improvement would be to modify the pavement markings to meet the MUTCD's standards and VDOT's Northern Virginia Guidelines for Pavement Markings. This will require the final 150 feet prior to Rebel Run to be a solid single white line. Two right turn arrows and an "ONLY" pavement marking should also be applied to the pavement within the final 150 feet. Signage posted adjacent to "ONLY" should include an R3-7 sign ("Right Lane Must Turn Right") The preceding 250 feet should be marked as dotted with a two foot line and 10 foot gap (puppy tracks). The remaining 150 should remain a single dashed line to allow merging for vehicles turning right from Great Oaks Drive.

Once the excess pavement widths are removed, the entire corridor should be restriped according to standard design regulations, with edge lines used in any areas that do not have existing curb and gutter. In addition, the stop bars for intersecting streets should be adjusted to reflect the changed width of pavement on Old Lee Highway, improving sight lines for those roadways.

Speed Enforcement

Based on the most recent speed data collected by the City of Fairfax Police Department, the frequency of speeding during off-peak hours and at night is higher. The presence of the police headquarters within the corridor doubtless moderates the tendency of those using Old Lee Highway at late night or early morning to speed on its west end. However, the central and east portions of the roadway are more likely to experience higher speeds. Rear-end collisions, which can often be attributed to a combination of speeding and maintaining poor following distance, were most prominent at Old Post Road (center of the corridor) and Rebel Run (east part of the corridor). Therefore, it is likely that additional speed enforcement in these areas could reduce the chances of rear accidents.

Other speed deterrents, such as portable radar speed indicator signs that show actual vehicle speeds, as well as continued selective focused enforcement by the police, could prove effective in reducing the likelihood of late night and off-peak speeding in the corridor. These countermeasures would be especially effective at the east end of the corridor, where there is less police presence.

Pedestrian and Bicycle Circulation

The greatest short-term problem with the sidewalk/bikeway system is that it lacks continuity. Therefore, as an interim countermeasure, one recommended strategy is to provide connecting sidewalk segments where they are missing on the north side of Old Lee Highway. Specifically, along the segment fronted by the Arm-Navy Country Club, there is no dedicated area for pedestrians. The interim recommendation is for the sidewalk on the north side only, leaving the shared use path on the south side of the roadway for later implementation.

Additional improvements for pedestrian and bicycle circulation include the following:

- Implement new painted, ladder-striped crosswalks across Old Lee Highway near bus stops to improve pedestrian circulation. Per ADA requirements, some of the crosswalks may require installation of new or upgraded curb ramps to provide the adequate slope for wheelchairs. Specific locations could be evaluated on a case-by-case following a topographical survey of existing conditions. Suggested locations for new crosswalks include:
  - South of the Police Station's north driveway
  - Between either front driveway entrance for both Daniels' Run and Saint Leo the Great School
  - North of Heritage Lane
  - North of Embassy Lane
  - Between Brookwood and Queen Anne
  - North of Great Oaks Way
  - Across minor streets and school driveways to Old Lee Highway.
- Implement signage to warn motorists of the pedestrian Right-of-Way and potential fines for not yielding when a pedestrian is in the crosswalk. Also suggested is installation of MUTCD sign R1-6 (Figure 8) placed 20 to 50 feet in front of each existing and new crosswalk.
- Improve the horizontal sight line distance on the existing multi-use pedestrian/bicycle path on the west side of Old Lee Highway (especially in the vicinity of Great Oaks Way), providing a safer condition.

Figure 8 Crosswalk Warning Sign

Long Term Improvements

These improvements would all be in addition to the recommended interim improvements. Implementation of these recommendations would be anticipated over the course of the next 4-6 years.

Reconfiguration of Old Lee Highway

While removing the excess pavement from Old Lee Highway will provide an interim benefit, it is recommended that, ultimately, the roadway be milled and resurfaced as 28-foot wide cross-section, including one consistent 12-foot wide thru lane northbound, one consistent 12-foot wide thru lane southbound, two two-foot gutters, and two six-inch curbs to provide a more consistent cross-section and the necessary associated drainage system. This will include installation of about 41 new curb inlets and three new manholes along with about 4,500 feet of new storm drain pipe. The new storm drains and pipes will be connected to the existing storm drain system.

Figure 9 shows a dedicated right turn lane with the shared use path and sidewalk configurations. It would apply on Old Lee Highway at Queen Ann Drive (eastbound), Rebel Run (westbound), Great Oaks Drive (westbound), and Ridge Avenue (westbound).

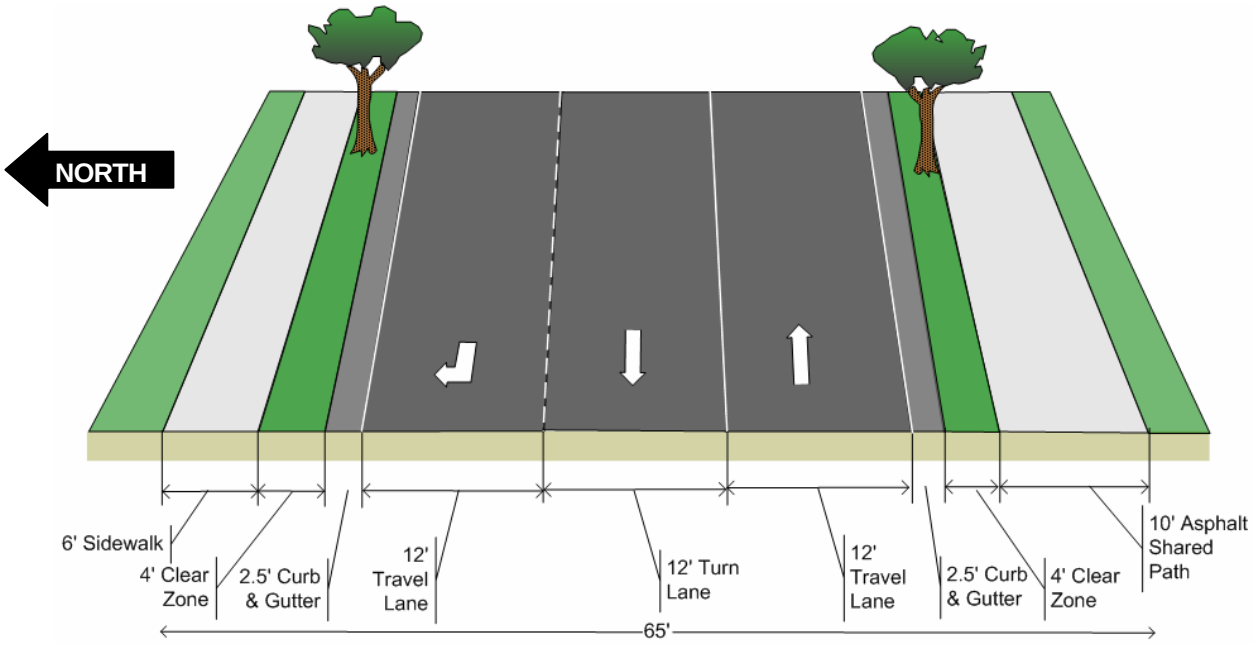


Figure 9 Recommended Typical Section with Outside Turn Lane

Figure 10 shows a center turn lane configuration. This would apply on Old Lee Highway at Cornell Road (both east and westbound directions) and Rebel Run (eastbound to northbound).

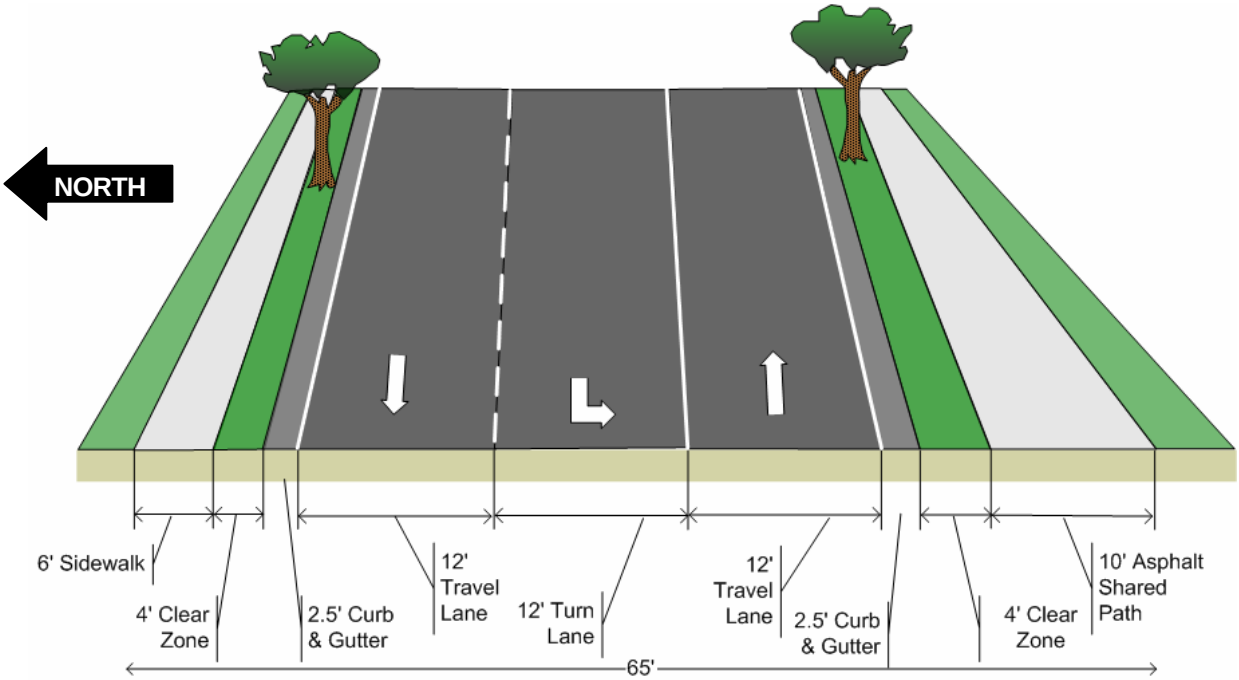


Figure 10 Recommended Typical Section with Center Turn Lane

Crosswalks

The recommended improvements to Old Lee Highway are not intended to result in increases in traffic on the roadway. In fact, the result of the recommended improvements should be a reduction of non-local traffic, based on the results of past improvement projects that are similar in nature to Old Lee Highway. Historically, average traffic speeds tend to decrease when pedestrian facilities (especially crosswalks) have a major presence in the overall character of the roadway, usually followed by a decrease in through traffic. Therefore, given the adequacy of the existing crosswalks, the only recommendation for those areas is that they be coordinated during the reconstruction of Old Lee Highway with curb cuts to comply with accessibility requirements.

There are eight existing crosswalks across Old Lee Highway within the study area. An additional seven new crosswalks are recommended as short-term improvements. In addition, 23 new crosswalks are recommended to be delineated across the intersecting streets (there are currently only three existing 3 crosswalks across the side streets). The proposed crosswalk locations are shown in Appendix D.

Pedestrian and Bicycle Circulation

Development of a shared use path with a sidewalk on the south side of Old Lee Highway is recommended. This would provide a 10-foot shared-use path on the south side of Old Lee Highway and a sidewalk on the north side. The shared-use path would be continuous for the full length of Old Lee Highway in the study area, although it would be of reduced width at its eastern end due to topographic and right-of-way constraints. The sidewalk would be continuous from Army-Navy Country Club to the west end of the study area. Both would be designed with curb cuts and marked crossings. Where a 3.5 feet separation from the roadway is not possible, an aesthetically attractive barrier should be provided for the safety of the pedestrians.

Speed Enforcement and Safety

For longer term improvements that may reduce vehicles speeds and increase safety, traffic calming measures should be considered. Examples of devices that may be appropriate for the Old Lee Highway corridor include brick paver crosswalks, especially at the school zones or at locations where heavy pedestrian traffic is heavy (such as bus stops). These treatments enhance the presence of the crosswalk and have shown to be effective in reducing vehicles speeds and drawing motorist attention to pedestrians. In addition, pedestrian refuge islands may also be used on segments of the roadway where it may be difficult for pedestrians to cross the entire roadway. These measures typically reduce vehicle speeds because they give the motorist the impression that the overall roadway width is narrowing. Small triangular islands may also be used to force vehicles in a right turn bay to turn right instead of using the lane to as a passing lane to speed by slower-moving or turning vehicles. If the decision is made to install traffic calming devices, a comprehensive traffic calming study should be preformed for the entire corridor.

Figure 11 provides a graphic summary of the recommended improvements.

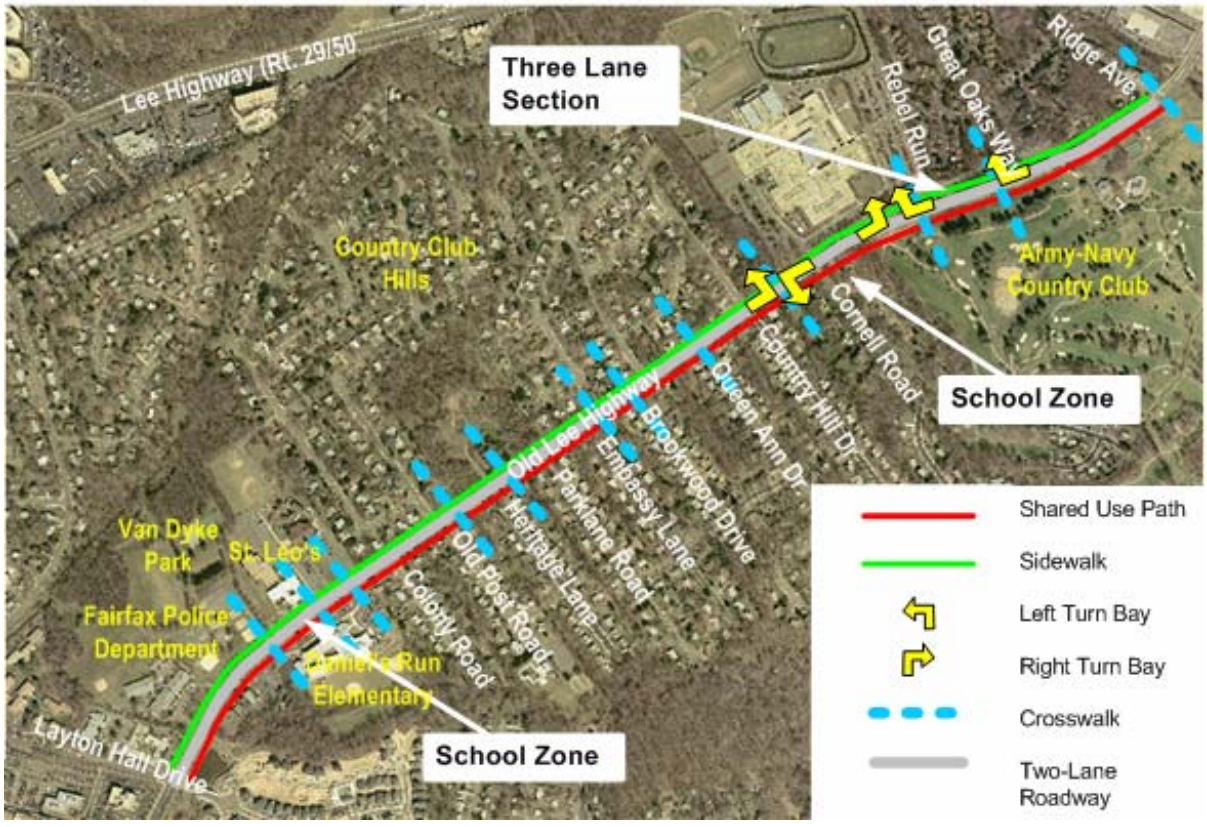


Figure 11 Summary of Recommended Improvements

Landscaping

In addition to the recommended functional improvements to Old Lee Highway it is suggested that its identity be redefined to match its function as a local roadway. One of the most attractive sections of Old Lee Highway is its east end where overhanging trees and its confined shoulders clearly convey the street as not being meant for heavy volumes of traffic. It is suggested that this condition be replicated to the degree feasible along its entire length. Specifically, narrowing of the pavement needed for the roadway and even adding continuous sidewalks and bike paths will leave unused right-of-way that should be used for planting of trees and landscaping to reinforce the function of Old Lee Highway as a local collector. This would have the effect of unifying the roadway that presently has segments that are not aesthetically in agreement.

Projected Costs

Order-of-magnitude quantities and associated costs were developed in order to establish a baseline for the potential cost of the proposed improvements. Work elements associated with both Short Term and Long Term Improvements are shown below.

The estimated cost to implement the **Short Term Improvements** is $934,670. This includes:

- Removal of excess pavement
- Backfill and lay sod where the excess pavement is removed
- Complete missing sections of north side sidewalk
- Painted striping in the roadway for new crosswalks across Old Lee Highway as well as across intersecting streets along the north side
- 10% mobilization
- 20% for engineering design and topographic survey
- 15% for construction engineering
- 25% contingency for Maintenance of Traffic, erosion and sediment control, permits, and other construction contingencies

The estimated cost to implement the **Long Term Improvements** is $3,139,830. This includes:

- New curb along portions of the roadway where the excess pavement is removed
- New curb along other portions of the roadway; e.g., the Blenheim House
- New shared use path along the south side of the roadway
- Painted striping for crosswalks for intersecting streets along the south side of Old Lee Highway, as well as for improved intersections where the shared used path ties in
- Plant trees and lay sod along Old Lee Highway
- Necessary utility relocation; e.g., poles on east side near ANCC
- 10% mobilization
- 10% for engineering design
- 15% for construction engineering
- 25% contingency for Maintenance of Traffic, erosion and sediment control, permits, and other construction contingencies

This construction cost estimate is based on 2005 unit prices and does not include administration costs incurred by the city or escalation. Major quantities and costs are broken out at the end of Appendix E, Supporting Information.

APPENDIX A – NORTHERN VA REGIONAL BIKEWAY AND TRAIL NETWORK STUDY

Northern Virginia Regional Bikeway and Trail Network Study, Final Report, VDOT, 11/19/03, Appendix A, Demonstration Project Case Studies, p. 73 – 76.

Northern Virginia Regional Bikeway & Trail Network Study

Vienna Metro to GMU Connection

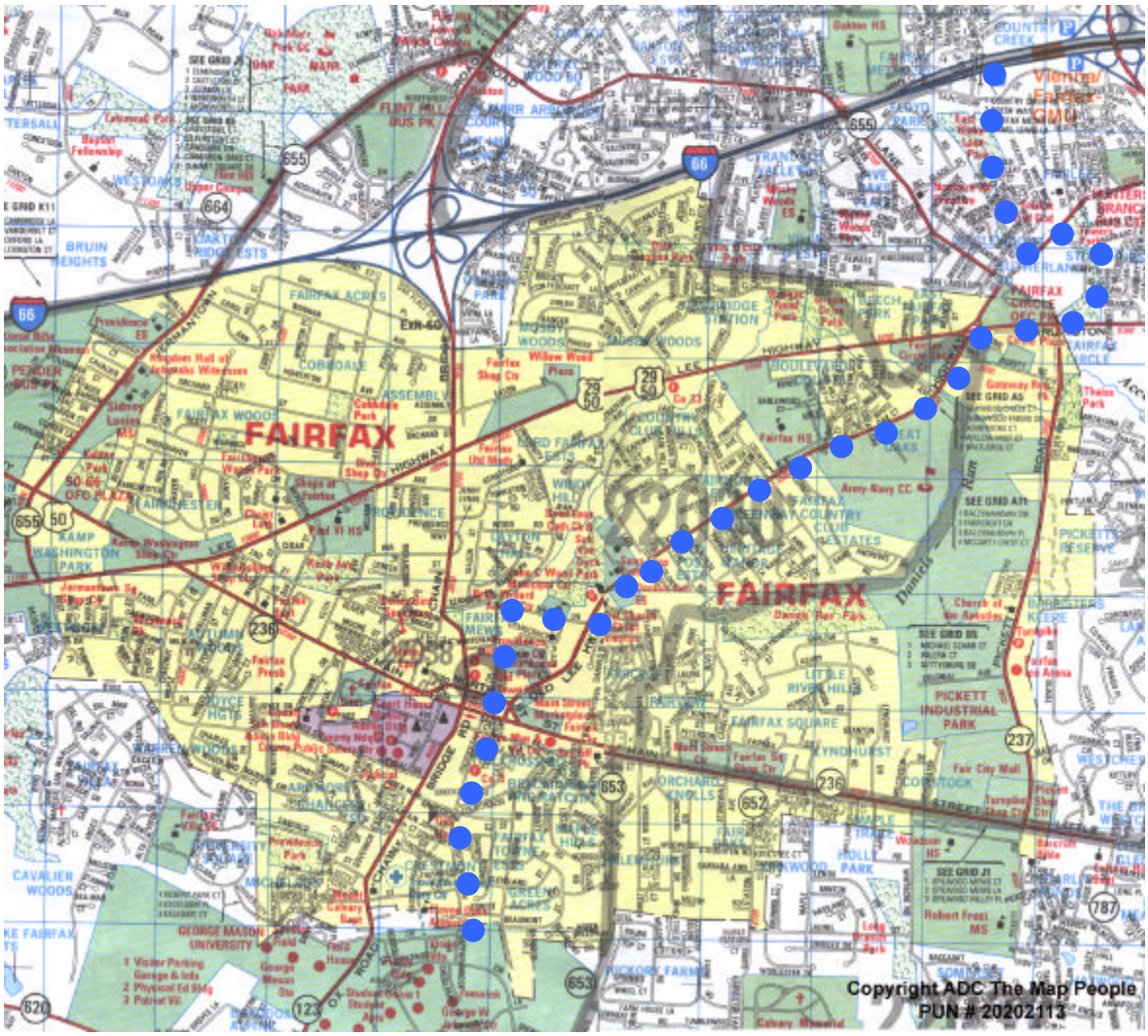
Via Old Lee Highway / University Drive

Fairfax County / City of Fairfax

Segment Length = Approximately 5 miles

Background

This study explores the feasibility of a more direct connection for bicyclists between the Vienna Metro and George Mason University (GMU) south of the City of Fairfax. GMU is located approximately 5 miles south of the Vienna Metro. This is an easy biking distance; however, there is no clear, direct connection along the local roads that pass through Fairfax County and the City of Fairfax.



Improved bicycling facilities along this corridor would enhance the connection between regional transit and the university, which has more than 21,000 students many of whom commute. This route would also pass through the east side of the City of Fairfax, serving the Historic Downtown

and the area near Fairfax High School. This corridor was ranked in the highest category for latent demand for bicycling in this jurisdiction. The following analysis recommends the most feasible routing for this bikeway, however a more detailed study will be needed in the future in order to address several implementation issues.

Existing Conditions

The City of Fairfax has suggested that the best connection between GMU and the Vienna Metro is via Old Lee Highway and University Drive. Based on the fieldwork conducted for this study, this route does appear to be the best alternative. This section therefore examines existing conditions along this proposed route.

From the Vienna Metro Station, the first portion of the route follows an existing trail segment from the west side of the Metro station through East Blake Lane Park to the edge of the city. This trail is in good condition for bicyclists.

From East Blake Lane Park, cyclists would follow Old Lee Highway between Arlington Boulevard and Layton Hall Drive. The land uses along this section are residential with schools, churches, police departments and other governmental uses. A shared use path exists along much of the northwest side of the road, however its width and condition vary considerably. At some points, the path is as narrow as four feet. In other areas, it is as wide as eight feet. The configuration of Old Lee Highway varies as well with travel lanes ranging from ten to fifteen feet. Shoulder widths vary and turn lanes are present at some intersections. Layton Hall Drive would provide the less than 0.5-mile connection to University Drive. Layton Hall Drive has 22-foot lanes and parking is permitted.

Path along Old Lee Highway near Daniels Run Elementary School

University Drive in downtown Fairfax looking south

Between Layton Hall Drive and GMU, University Drive is primarily a 4-lane undivided roadway with travel lanes ranging from ten to fourteen feet. Within the historic downtown area, the corridor is constrained by sidewalks, buildings and utilities. University Drive becomes

residential once past the downtown area and the travel lanes widen to 23 feet. On-street parking is permitted as shown in the following photo.

Recommended Improvements

A combination of shared use paths and bike lanes is recommended for this route. The existing pathway along Old Lee Highway should be widened and resurfaced and the remaining gaps should be completed along Old Lee Highway to Layton Hall Road in the City of Fairfax. To connect from Old Lee Highway to University Drive, bike lanes should be installed along Layton Hall Drive. Layton Hall Drive is 44 feet wide and thus provides adequate space to accommodate parking lanes and bike lanes on both sides A connection along Layton Hall Drive from Old Lee Highway to University Drive will provide two benefits: 1) enable bicyclists to avoid the complex intersection of North/Main and Old Lee Highway in the downtown area; and 2) provide access to the trail that runs through Van Dyck Park (beginning at the corner of Layton Hall Drive and University Drive).

From Layton Hall Drive, bike lanes should continue down University Drive through downtown Fairfax and toward GMU. A number of constraints exist along this section including constrained right-of-way, utilities, and narrow travel lanes. These constraints may necessitate a gap in the bike lanes for a couple of blocks near Main Street where bicyclists would share lanes with vehicles. If so, signage will be important to assisting bicyclists in finding where the bike lanes begin again. South of downtown to GMU, bike lanes are more feasible within the existing roadway.

Establishing a signage system for this entire route will be very important, especially on the northern end where bicyclists will need to enter the trail through the park. The goal of this signage should be to make it possible for people to bicycle between the Vienna Metro and GMU without a map.

Due to the variable roadway configuration and right-of-way constraints, a more detailed feasibility study of this corridor will be necessary to implement the recommended improvements.

University Drive near GMU

Current and Future Bicycle Level of Service Conditions

A Bicycle LOS analysis was not possible for this corridor due the wide variation in roadway cross-sections on the main roads and lack of AADT data for most sections.

Key Issues for Implementation

As mentioned above, a number of issues will need to be resolved in order to implement the shared use path and bike lane recommendations. A summary of these constraints is provided below.

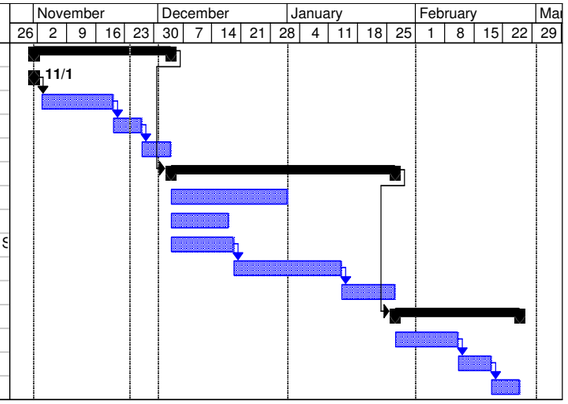
- A number of steep grades, utilities and right-of-way constraints exist along Old Lee Highway.
- Varying roadway configuration at the intersections along the route will impact bike lanes and the safety of shared use path crossings. Detailed design work will be necessary to address these issues.
- The narrow right-of-way and utilities in downtown Fairfax may limit the ability to install bike lanes for a short segment of the route.
- Clear signage will be critical to making this a user-friendly route.

APPENDIX B – PUBLIC INVOLVEMENT

Old Lee Highway Transportation Study:
Citizen Workshop 1

Project Scope / Timeline:

ID	WBS	Task Name
1	1	**Task I - Project Initiation**
2	1.1	Project Kick-off Meeting
3	1.2	Data Collection and Site Visit
4	1.3	Citizens Workshop
5	1.4	Stakeholder Meetings
6	2	**Task II - Preliminary Design**
7	2.1	Traffic Analysis
8	2.2	Hydraulic and Hydrologic Analysis
9	2.3	Preliminary Geometric Design/Typical S
10	2.4	Preliminary Plan Development
11	2.5	Citizens Workshop
12	3	**Task III - Final Documentation**
13	3.1	Final Preliminary Plan Development
14	3.2	Final Documentation
15	3.3	Public Meeting



Current Work Completed:

1. Project Kickoff Meeting	November 5
2. Turning movement counts on Old Lee Highway at 12 intersections	November 12 – 13
3. Traffic volume counts on Old Lee Highway	November 12 - 14
4. Site visit	November 20
5. Accident data collected	November 20
6. Two Stakeholder meetings:	
a. Schools	December 2
b. City Agencies (Fire, Police, etc.)	December 3
7. Public Workshop	December 4
8. Preliminary review of data collected	December 5
a. Accidents	
b. Current / Revised Comprehensive Plan	
c. Farcroft Development Plans	

Written Comments:

Written comments or questions should be sent to:

Mr. David Summers, PE
City Engineer
City Of Fairfax
10455 Armstrong Street
Fairfax, Virginia 22030

Thank you for your time and effort in this process! All comments are welcome.

Meeting Information:

Date:	December 4, 2003
Location:	City Hall, Room 306 City of Fairfax 10455 Armstrong Street Fairfax, VA 22030
Time:	7:30 PM – 9:30 PM
Mingle:	7:30 – 7:45
Introduction – Presentation:	7:45 – 8:15
Workshop Groups:	8:15 – 9:15
Questions:	9:15 – 9:30

Workshop Purpose:

To inform you, the public, on the project scope and discuss key community issues.

EARTH TECH
A Tyco Infrastructure Services Company

PROJECT HISTORY:

Citizens' Report, Fall 2002:

1. Study Purpose: To improve the safety and appearance of Old Lee Highway between Layton Hall Drive and Accotink Creek
2. Objectives:
   a. Consistent two-lane width from police station to high school with curbs
      - Shorter crosswalks (also more)
      - Prevents passing on right along sections of expansive pavement
      - Improves appearance of corridor
      - Traffic calming
      - Curbs prevent passing on shoulders while providing finished appearance
   b. Independent from above, consider measures to aid residents in safely leaving side streets, such as 25 mph speed limit and 4-way stop or traffic light.

Citizens' Report Suggested Roadway Section (vertical view):

CURRENT WORK:

Study Area:

- City of Fairfax near Old Town
- Old Lee Highway: Layton Hall Drive to Ridge Avenue
- 1.4 miles

Problem Identification:

Existing roadway is problematic due to inconsistent widths and inappropriate sections. The roadway is difficult to navigate on foot or on bicycle, having non-uniform sidewalks, trail widths, and lacking connection points.

Project Goals:

- To reduce and make uniform the width of Old Lee Highway between Ridge Avenue and Layton Hall Drive;
- To introduce pedestrian-friendly facilities; and
- Improve safety along a roadway bordered by mature, residential communities, schools and churches.

Objectives:

1. Improve safety, considering multi-modal aspects.
2. Make the number of vehicle travel lanes consistent.
3. Narrow Old Lee Highway by eliminating excessive pavement at many of the intersecting streets.
4. Implement traffic calming measures fitting to neighborhood.
5. Reduce outside neighborhood "through traffic".
6. Determine issues important to neighborhood.
7. Improve pedestrian and bicycle access.
8. Improve aesthetic quality of neighborhood.
9. Consider access for disabled.
10. Provide more green space.

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A Tyco Infrastructure Services Company

Please provide us comments and feedback for the following nine questions:

1. What is the most important issue for you in improving the streetscape of Old Lee Highway; for example, landscaping, reducing traffic, improving pedestrian access, improving safety, etc.?

2. What other objectives (besides those listed on the previous page) would you like to see fulfilled?

3. Do you use your car to access your neighborhood via Old Lee Highway?

4. Do you use your car on Old Lee Highway for any other purpose; for example, to get to a local business?

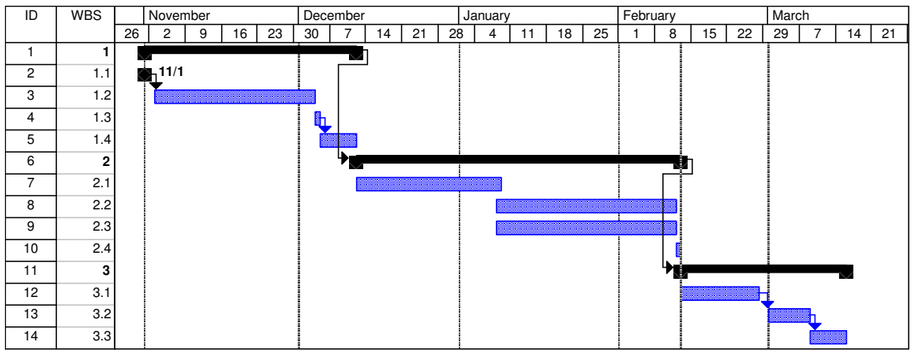
5. Do you currently access Old Lee Highway as a pedestrian or bike-rider? Please estimate share usage of Old Lee Highway for pedestrian (___%), bicycle (___%), and car (___%), bus (___%), summing to 100%.

6. If the roadway was improved for pedestrian or bicycle use, would use you it more in either of these cases? Please re-estimate share usage of Old Lee Highway for pedestrian (___%), bicycle (___%), and car (___%), summing to 100%, based on improvements.

7. What other site-specific improvements do you think are necessary; for example, marked pedestrian crossing?

8. Do you have any other comments?

Project Scope / Timeline:



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3. Traffic volume counts on Old Lee Highway	November 12 - 14
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5. Accident data collected	
6. Two Stakeholder meetings:	
a. Schools	December 2
b. City Agencies (Fire, Police, etc.)	December 3
7. Public Workshop 1	December 4
8. **Preliminary review of data collected**	**December 5 – 31**
9. Preliminary Design	January 1 – February 11
10. Stormwater Runoff Analysis	January 1 – February 11
11. Public Workshop 2	February 12

Written Comments:

Written comments or questions should be sent to:

Mr. David Summers, PE
City Engineer
City Of Fairfax
10455 Armstrong Street
Fairfax, Virginia 22030

Thank you for your time and effort in this process! All comments are welcome.

Old Lee Highway Transportation Study:
Citizen Workshop 2

Meeting Information:

Date: February 12, 2004

Location: City Hall, Room 306
City of Fairfax
10455 Armstrong Street
Fairfax, VA 22030

Time:

Mingle:	7:30 – 7:45
Introduction – Presentation:	7:45 – 8:00
Review & Discuss Conceptual Designs:	8:00 – 9:00
Final Draft Conceptual Design:	9:00 – 9:30

Workshop Purpose:

To discuss Conceptual Scenarios and reach consensus on a Preferred Scenario.

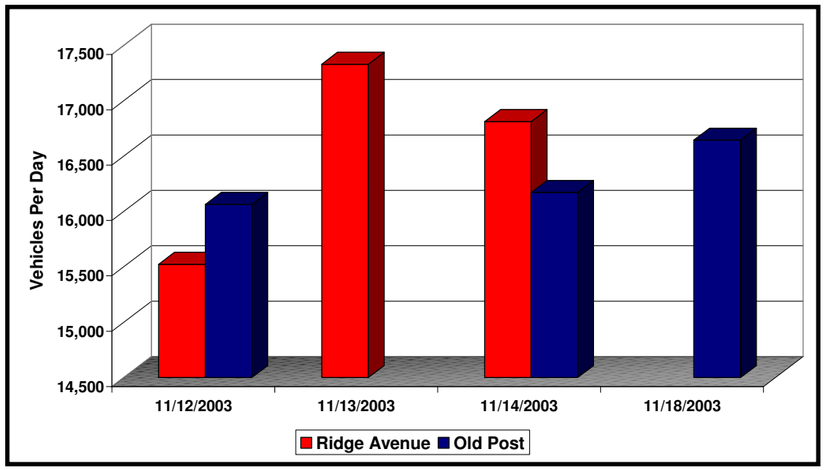
EARTH TECH
A Tyco Infrastructure Services Company

DATA COLLECTED / INFORMATION REVIEWED:

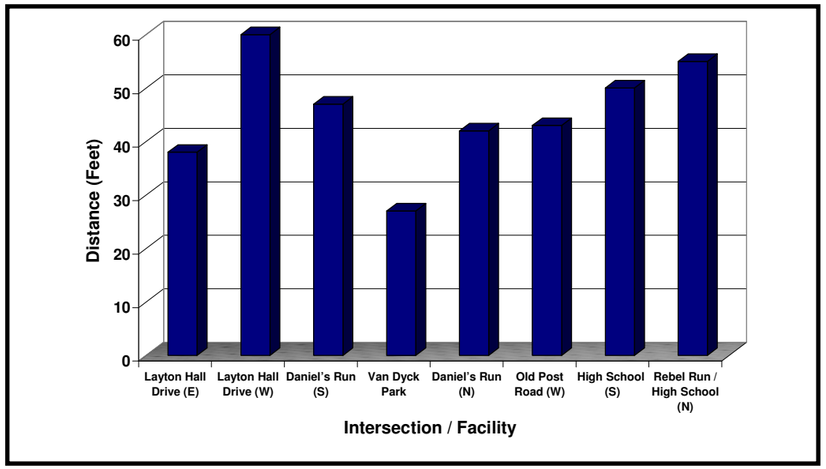
Questionnaire's Primary Reponses:

- Reduce traffic volumes / congestion
- Remove expansive pavement
- Better / marked crosswalks
- More traffic enforcement
- Landscaping

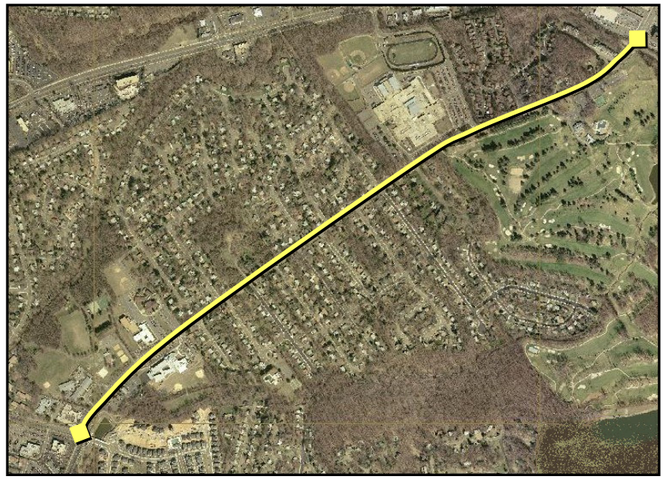
Daily Volume Counts:



Crosswalk Distances:



PROJECT OVERVIEW:



Study Area:

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8. Improve aesthetic quality of neighborhood.
9. Consider access for disabled.
10. Provide more green space.

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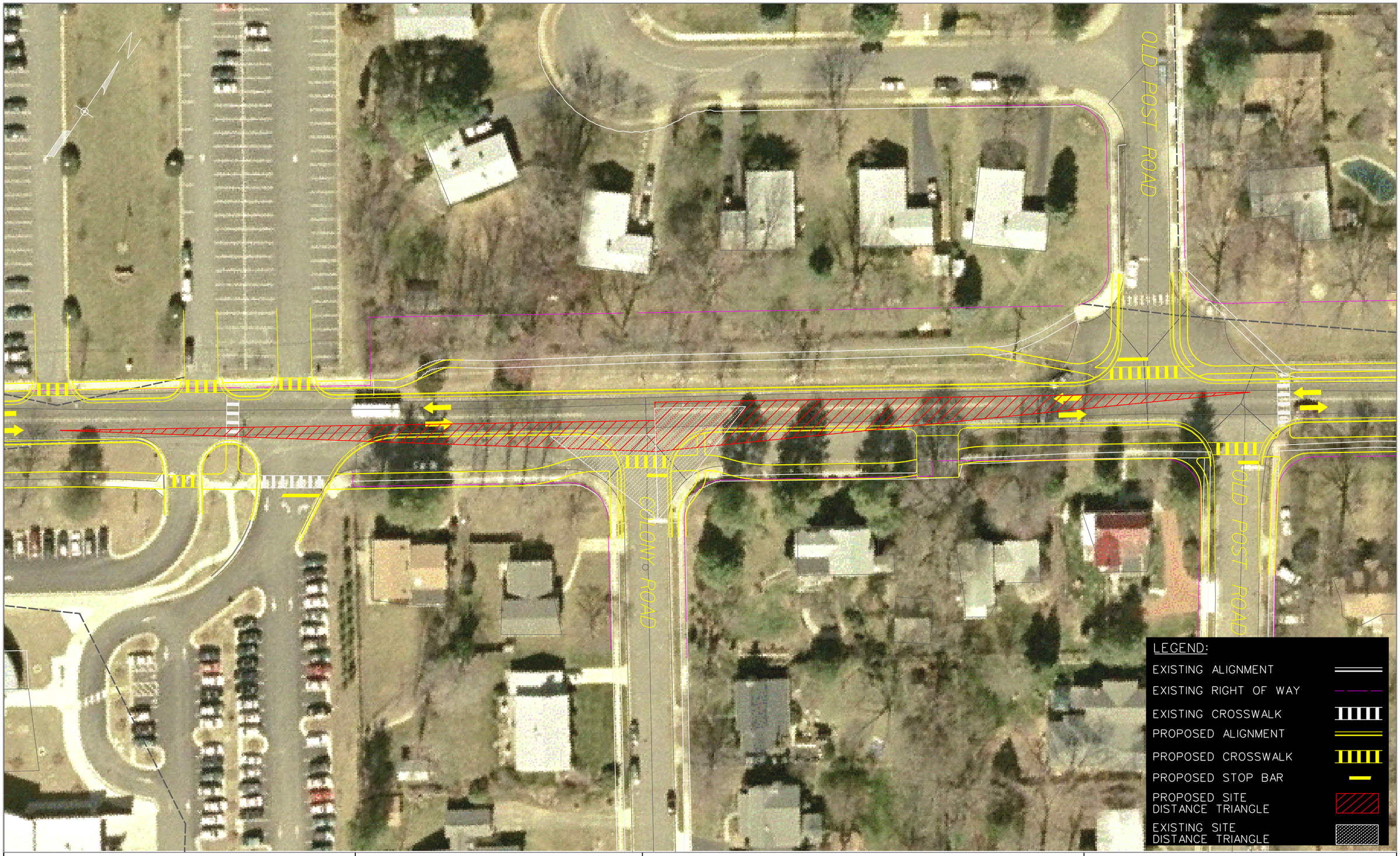
APPENDIX C – SIGHT DISTANCE ANALYSIS



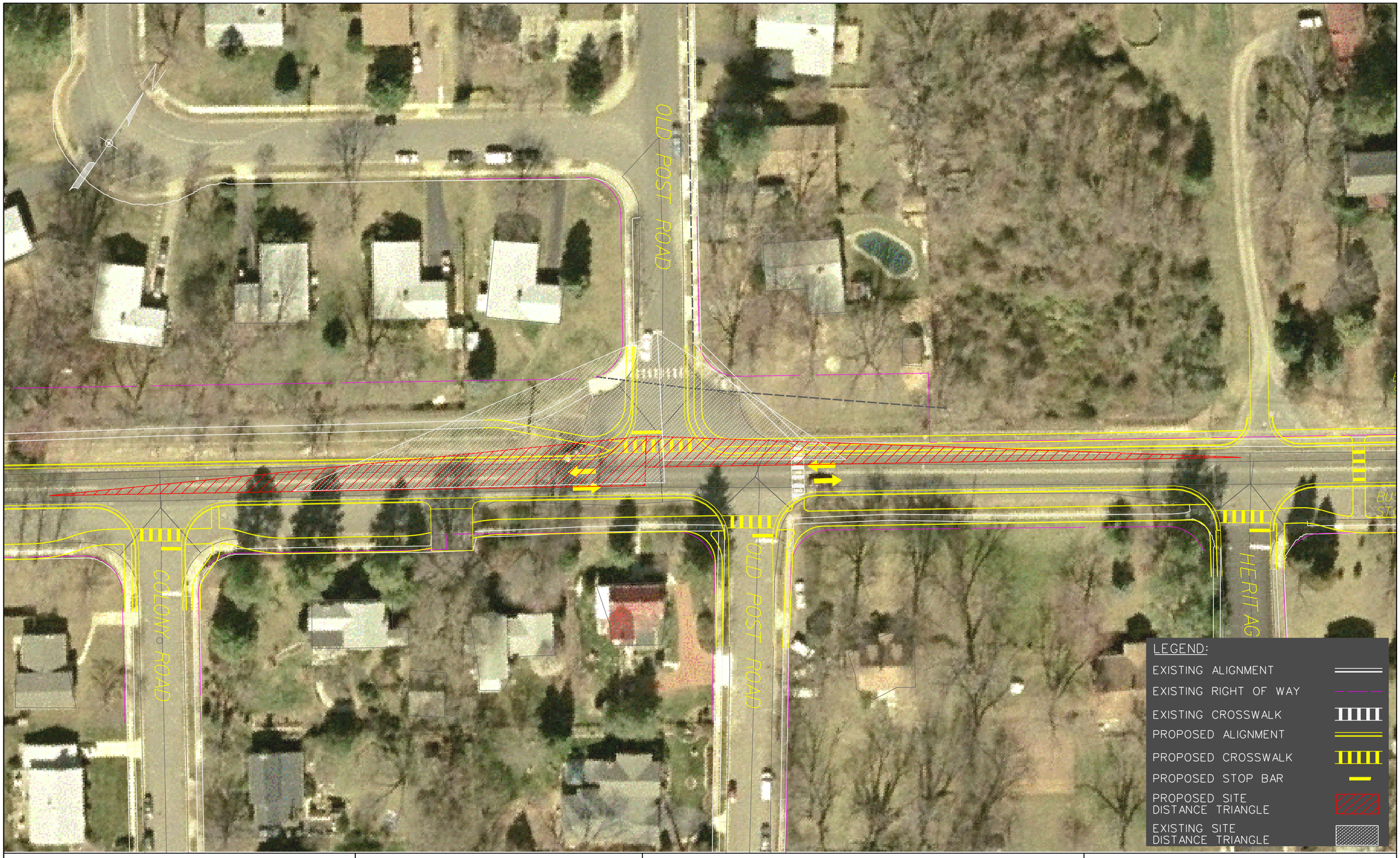
EARTH TECH
675 N. Washington St., Ste. 300
Alexandria, VA 22314

OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

COLONY ROAD SITE DISTANCE ISSUES



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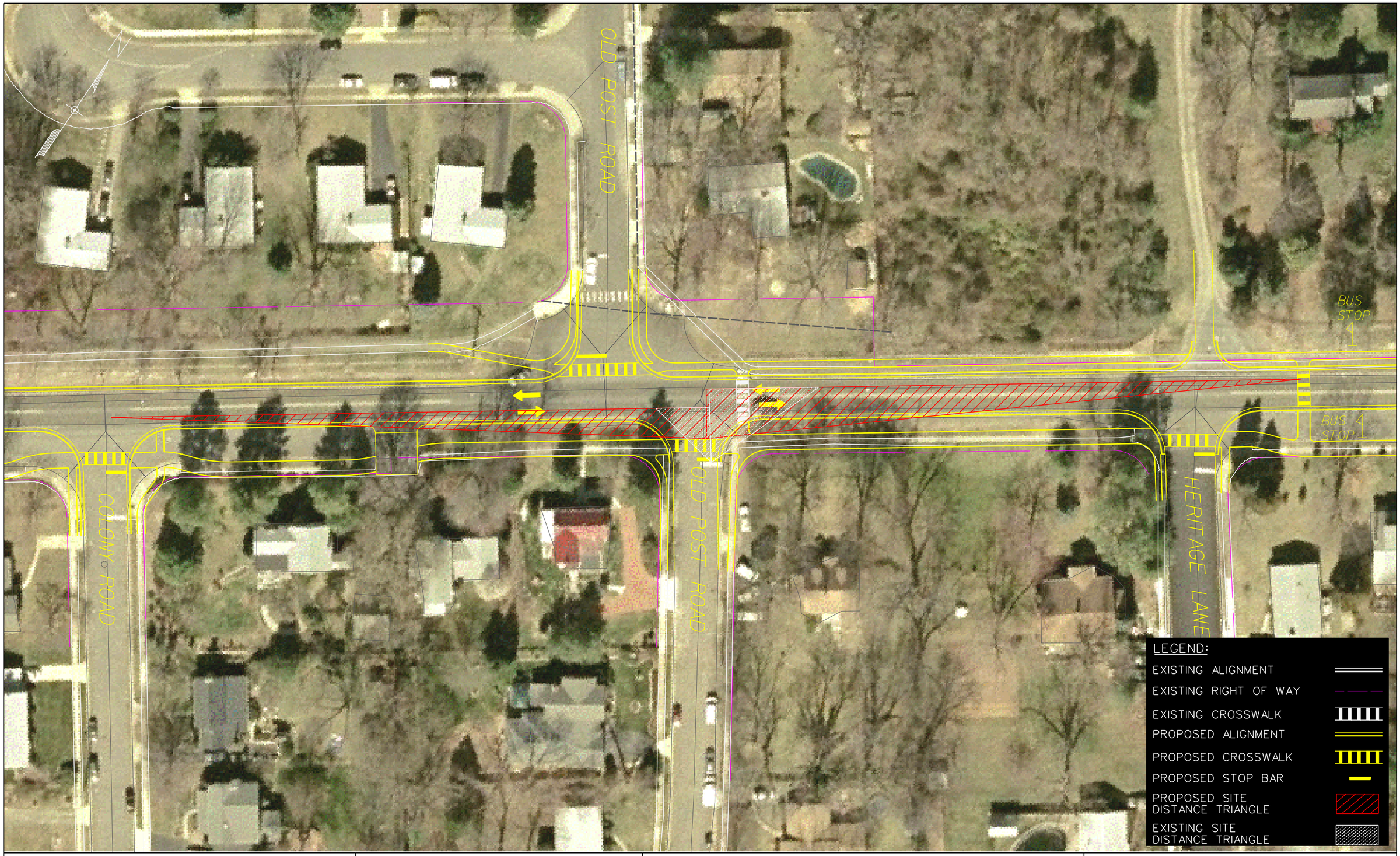
675 N. Washington St., Ste. 300
Alexandria, VA 22314

OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

OLD POST ROAD (N.) SITE DISTANCE ISSUES



EARTH TECH
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OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

OLD POST ROAD (S.) SITE DISTANCE ISSUES

EARTH TECH
675 N. Washington St., Ste. 300
Alexandria, VA 22314

OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

HERITAGE LANE SITE DISTANCE ISSUES

BUS STOP

BUS STOP

BUS STOP

OL

HERITAGE LANE

PARKLANE ROAD

EMBASSY LANE

LEGEND:

EXISTING ALIGNMENT

EXISTING RIGHT OF WAY

EXISTING CROSSWALK

PROPOSED ALIGNMENT

PROPOSED CROSSWALK

PROPOSED STOP BAR

PROPOSED SITE DISTANCE TRIANGLE

EXISTING SITE DISTANCE TRIANGLE

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OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

PARKLANE ROAD
SITE DISTANCE ISSUES

N

BUS STOP

BUS STOP

OLD LEE HIGHWAY

PARKLANE ROAD

EMBASSY LANE

BROOKWOOD DRIVE

BROOKWOOD DRIVE

LEGEND:

EXISTING ALIGNMENT

EXISTING RIGHT OF WAY

EXISTING CROSSWALK

PROPOSED ALIGNMENT

PROPOSED CROSSWALK

PROPOSED STOP BAR

PROPOSED SITE DISTANCE TRIANGLE

EXISTING SITE DISTANCE TRIANGLE

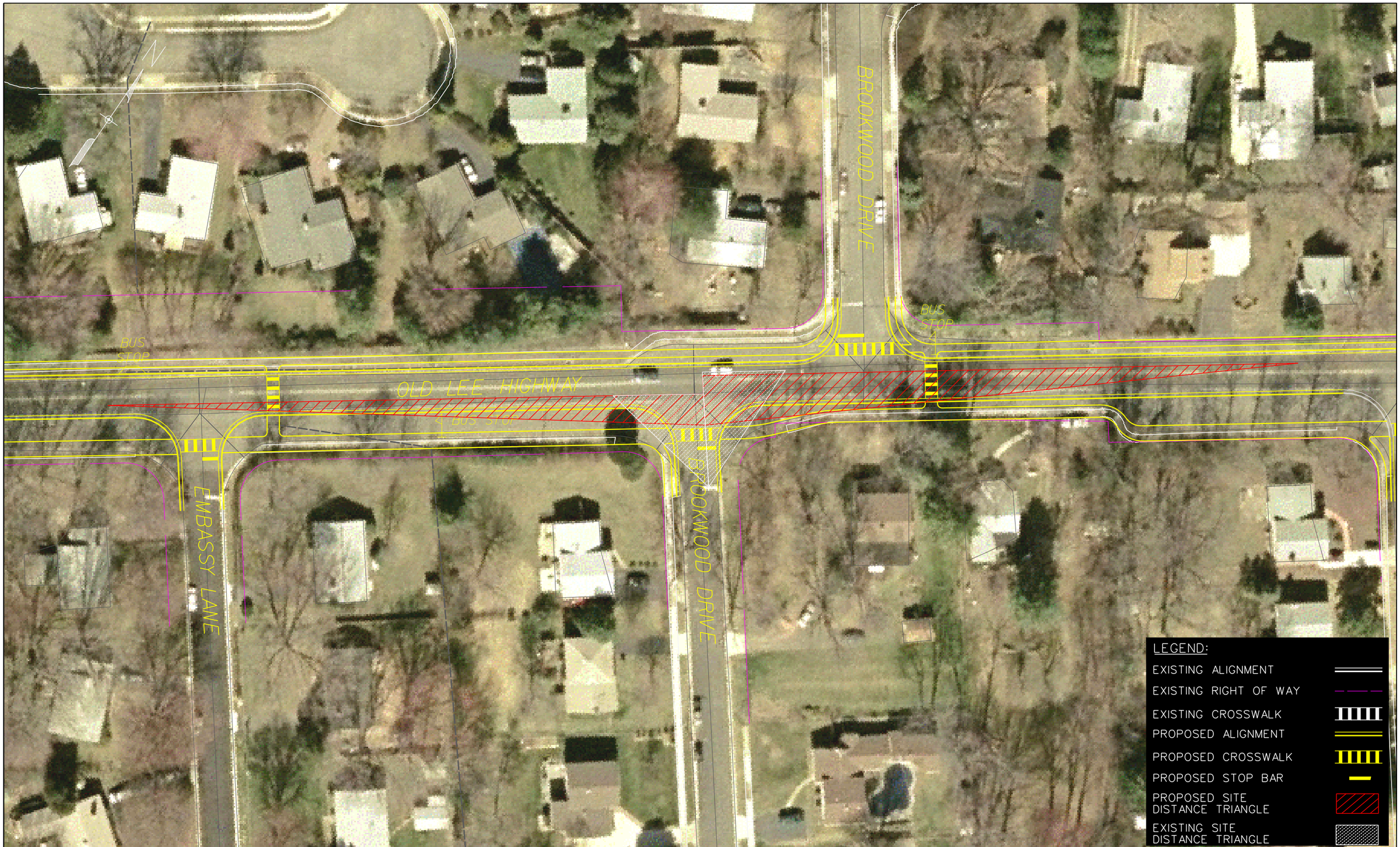
EARTH TECH
675 N. Washington St., Ste. 300
Alexandria, VA 22314

OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

EMBASSY LANE SITE DISTANCE ISSUES



EARTH TECH
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OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

BROOKWOOD DRIVE (S.) SITE DISTANCE ISSUES

EARTH TECH
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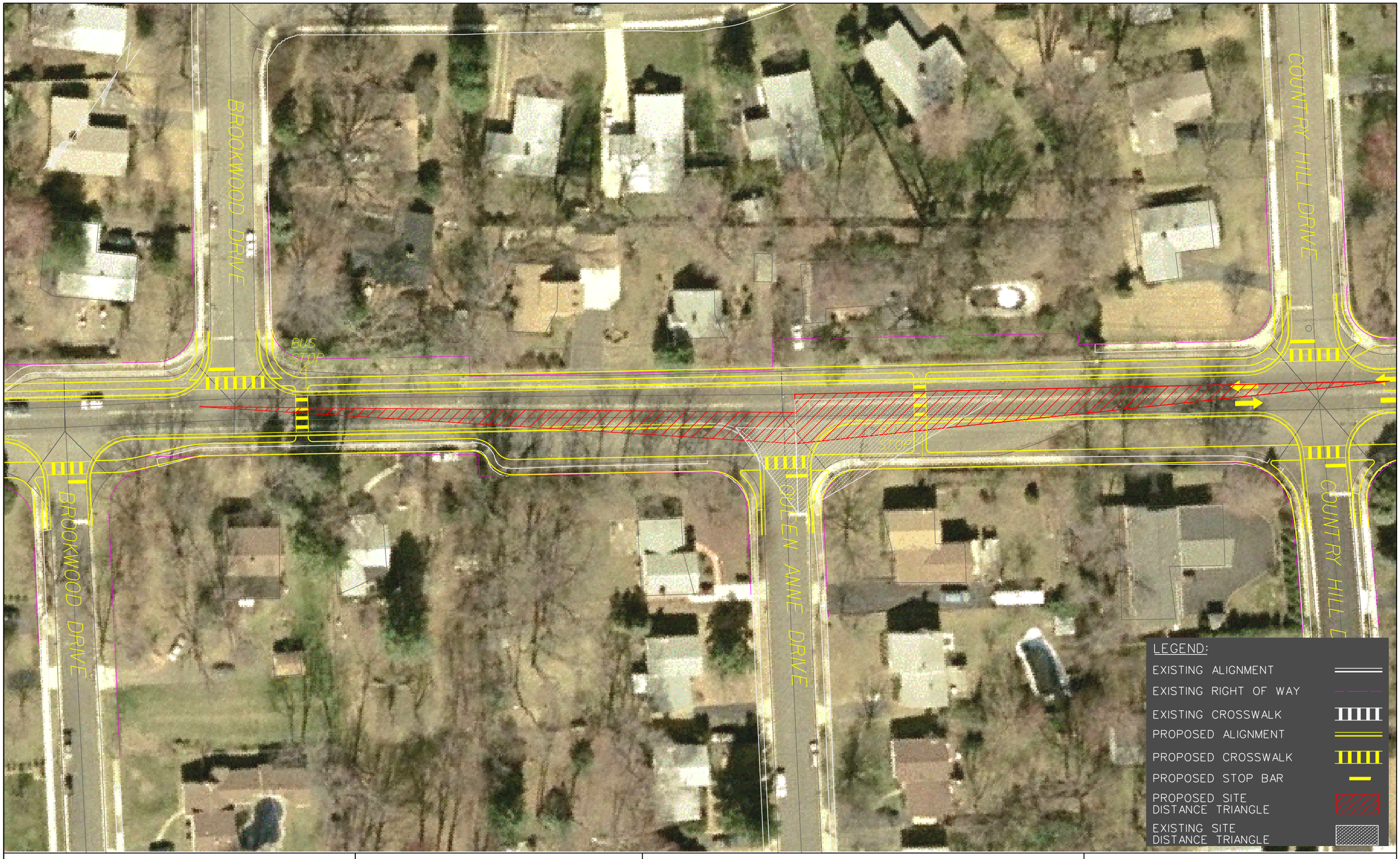
Alexandria, VA 22314

OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

BROOKWOOD DRIVE (N.) SITE DISTANCE ISSUES



EARTH TECH
675 N. Washington St., Ste. 300
Alexandria, VA 22314

OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

QUEEN ANNE DRIVE SITE DISTANCE ISSUES

COUNTRY HILL DRIVE

BUS STOP

BUS STOP

QUEEN ANNE DRIVE

COUNTRY HILL DRIVE

CORNELL ROAD

LEGEND:

EXISTING ALIGNMENT

EXISTING RIGHT OF WAY

EXISTING CROSSWALK

PROPOSED ALIGNMENT

PROPOSED CROSSWALK

PROPOSED STOP BAR

PROPOSED SITE DISTANCE TRIANGLE

EXISTING SITE DISTANCE TRIANGLE

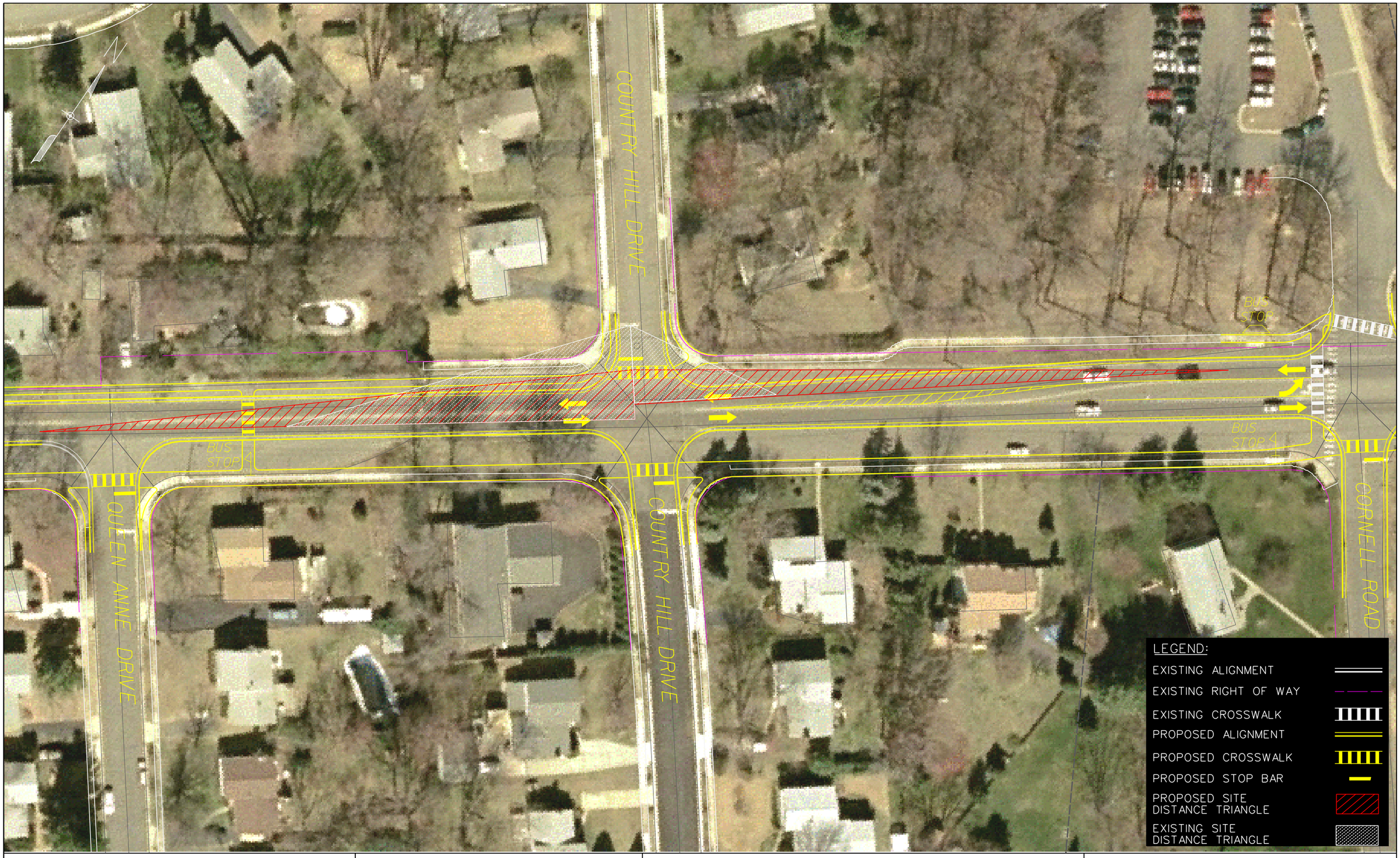
EARTH TECH
675 N. Washington St., Ste. 300
Alexandria, VA 22314

OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

COUNTRY HILL DRIVE (S.) SITE DISTANCE ISSUES



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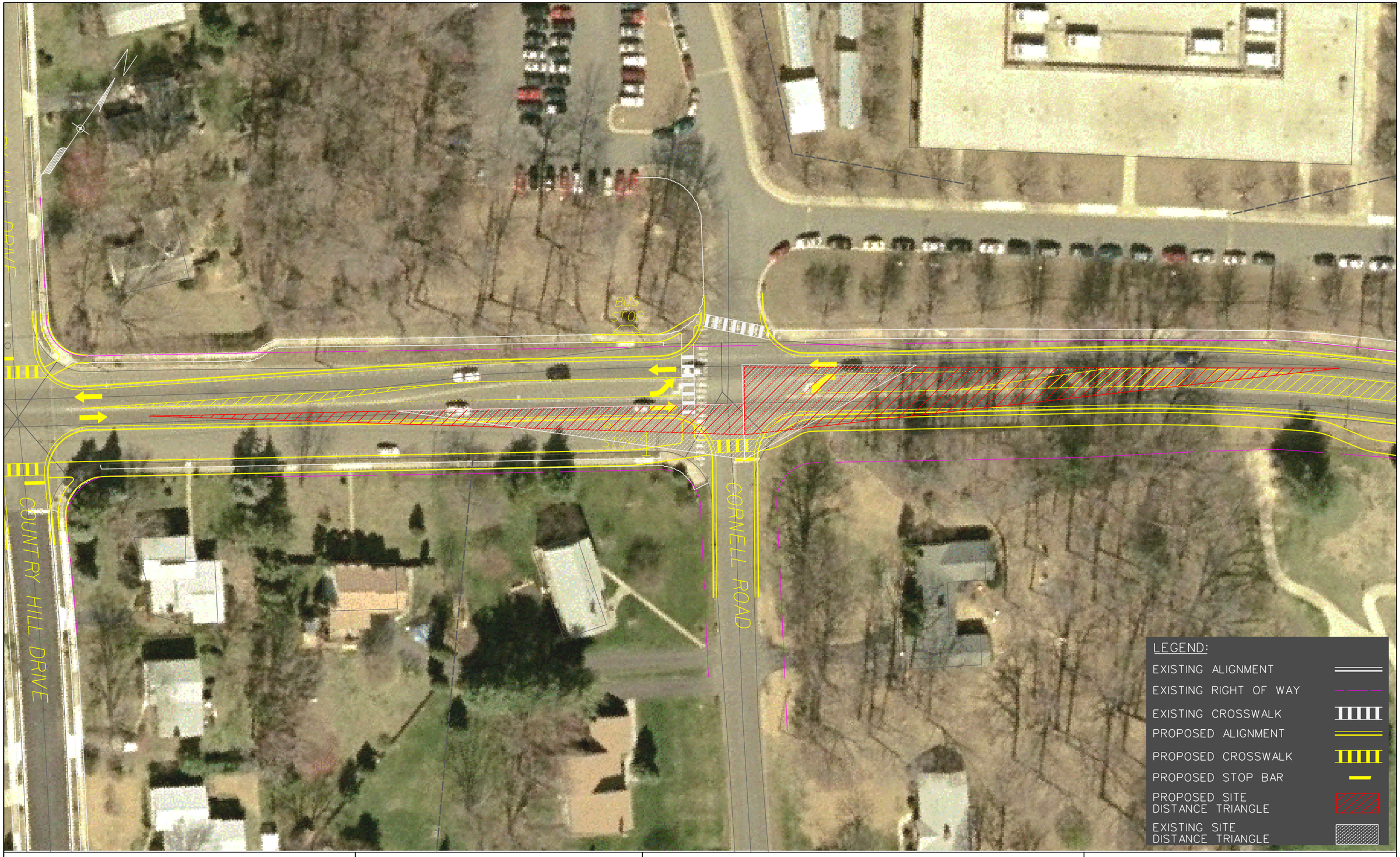
COUNTRY HILL DRIVE (N.) SITE DISTANCE ISSUES



EARTH TECH
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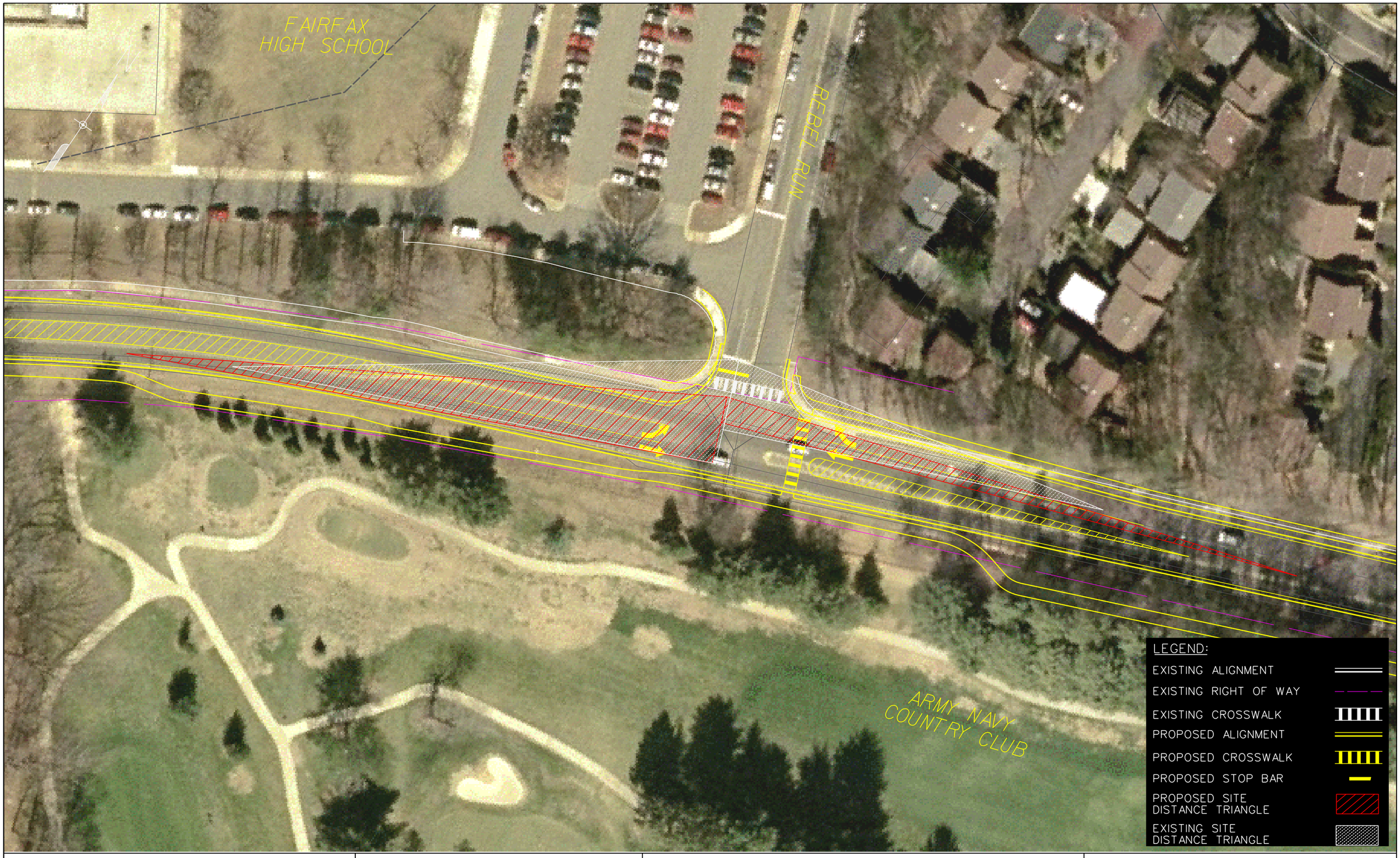
OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

CORNELL ROAD SITE DISTANCE ISSUES



EARTH TECH
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Alexandria, VA 22314

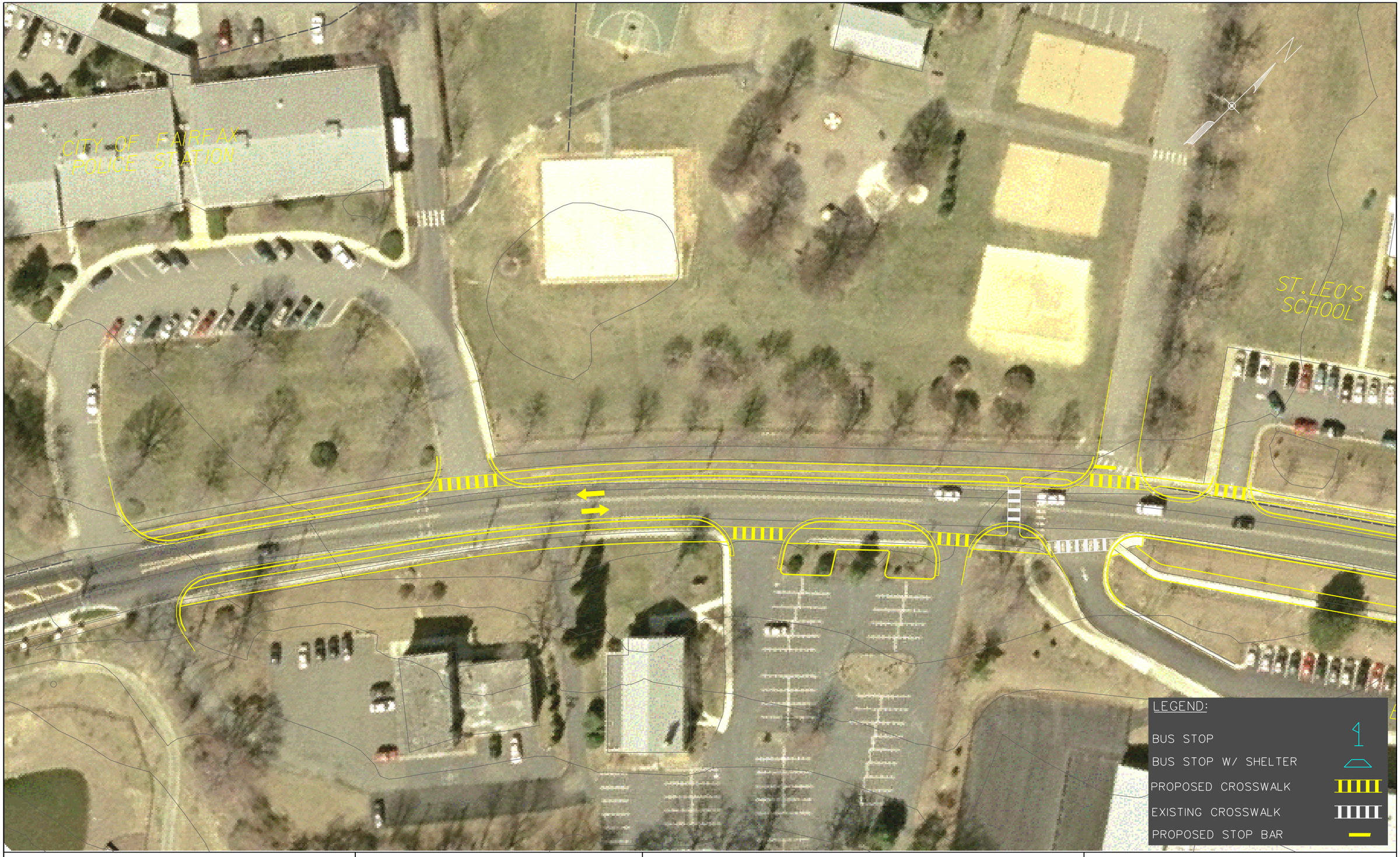
OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

REBEL RUN
SITE DISTANCE ISSUES

APPENDIX D – OLD LEE HIGHWAY RECOMMENDED DESIGN DRAWINGS



EARTH TECH
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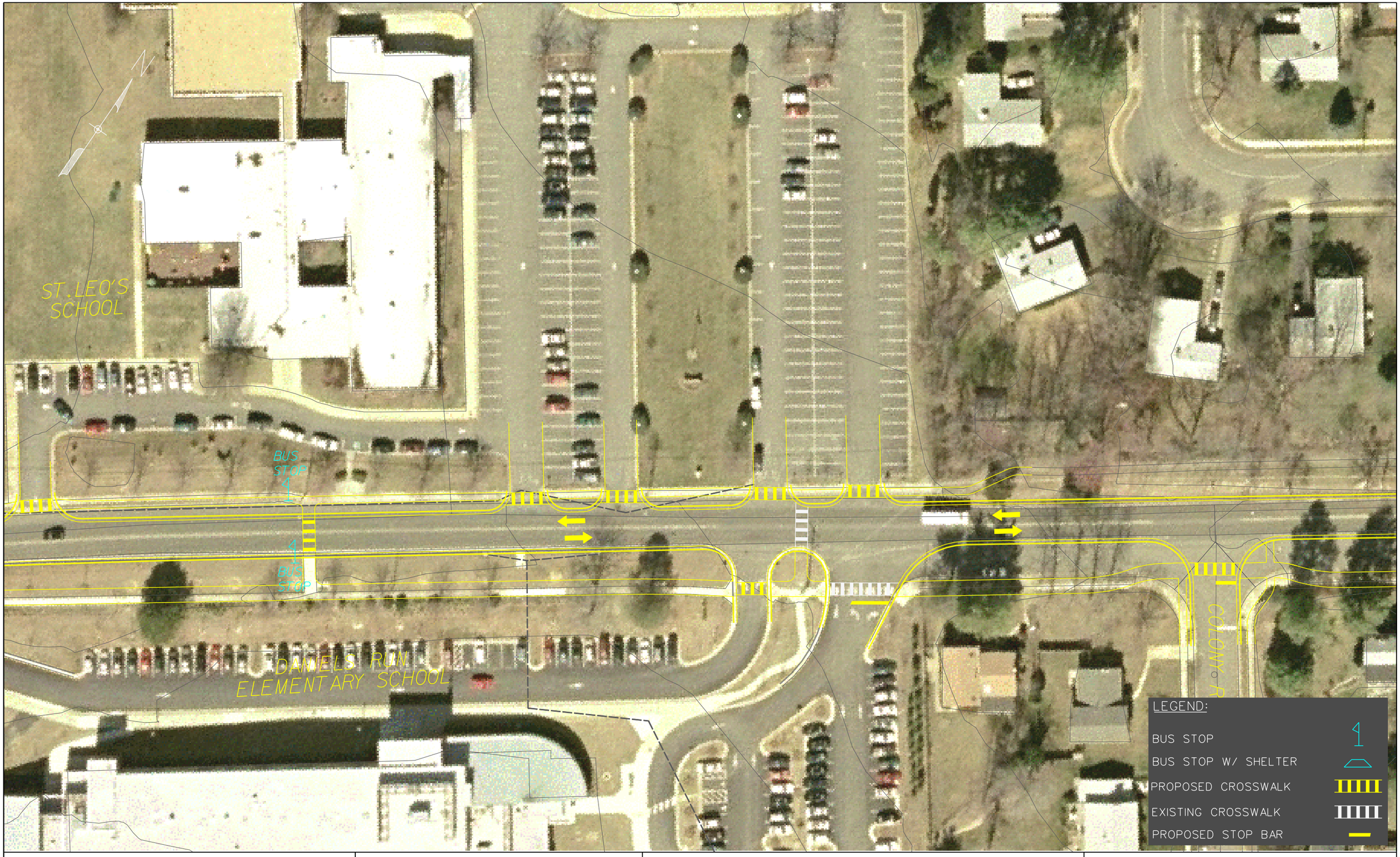
Alexandria, VA 22314

OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

RECOMMENDED SCENARIO



EARTH TECH
675 N. Washington St., Ste. 300
Alexandria, VA 22314

OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

RECOMMENDED SCENARIO

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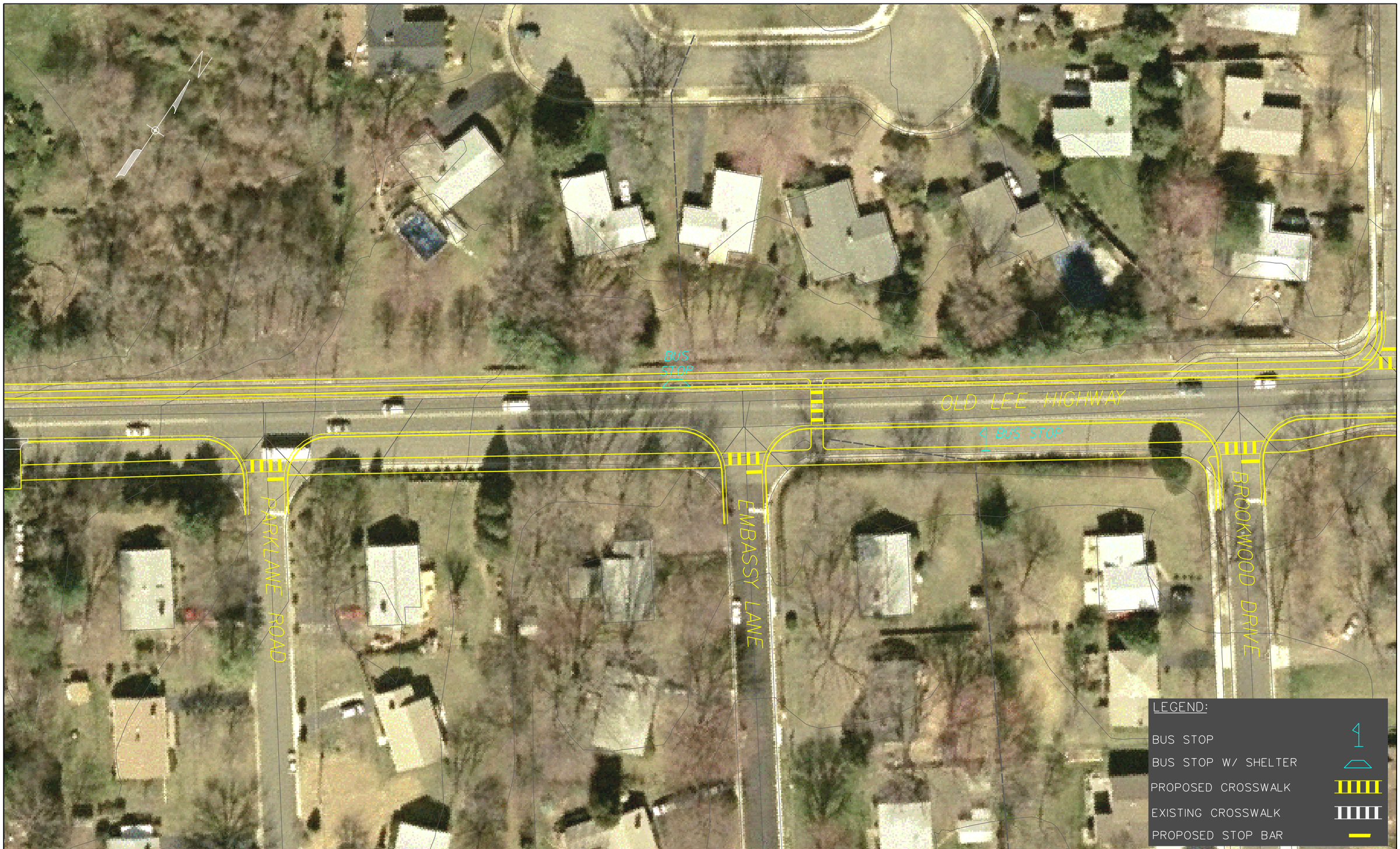
Alexandria, VA 22314

OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

RECOMMENDED SCENARIO



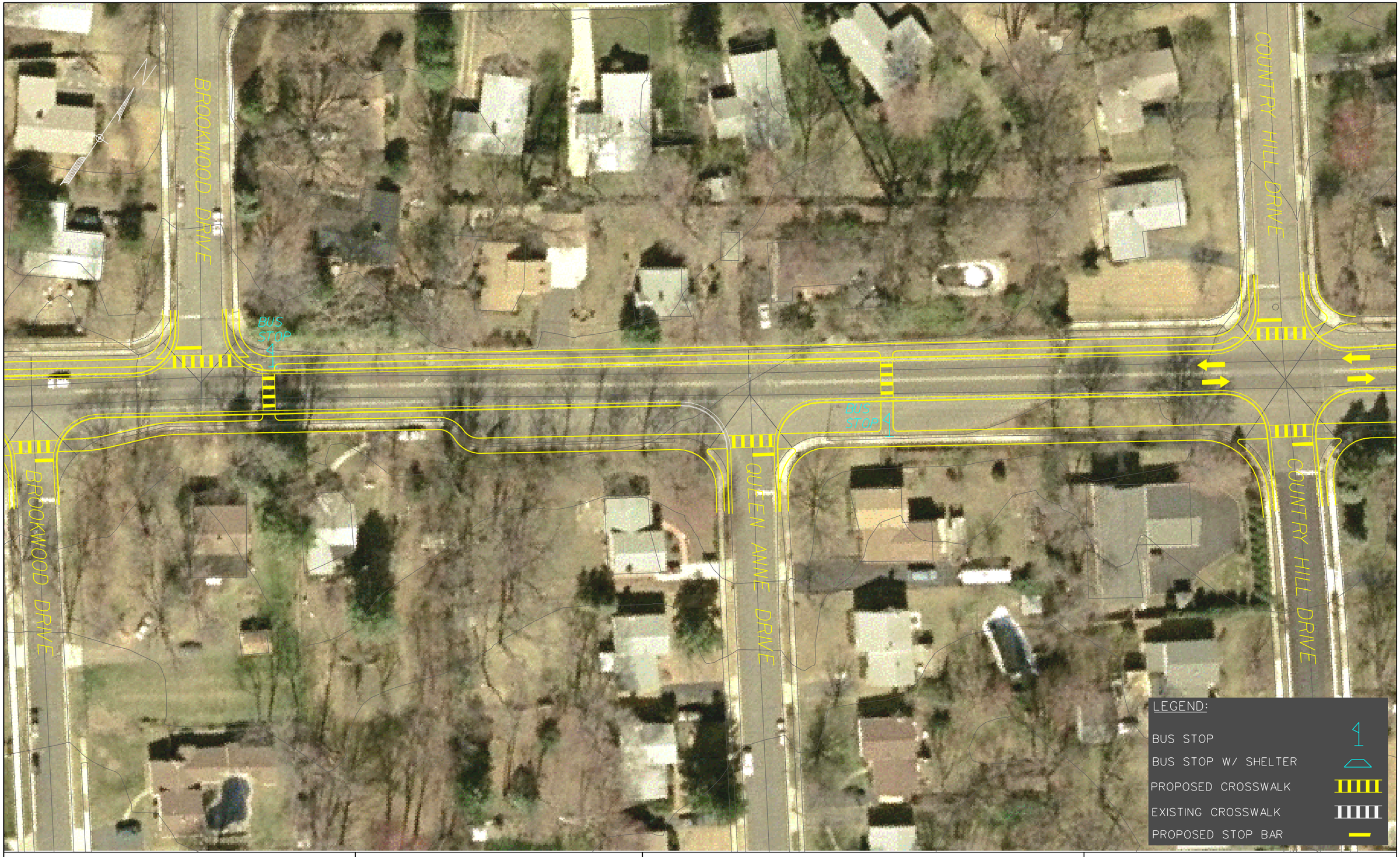
EARTH TECH
675 N. Washington St., Ste. 300
Alexandria, VA 22314

OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

RECOMMENDED SCENARIO



EARTH TECH
675 N. Washington St., Ste. 300
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OLD LEE HIGHWAY TRANSPORTATION STUDY

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OLD LEE HIGHWAY TRANSPORTATION STUDY

Scale: 1" = 60'

April, 2005

RECOMMENDED SCENARIO

APPENDIX E – SUPPORTING INFORMATION

Turning Movement Counts

Morning Turning Movement Counts

Access Street	Northbound			Southbound		
	Left	**Through**	**Right**	**Left**	**Through**	**Right**
Colony Road	N/A	823	4	1	489	N/A
Old Post Road	28	837	0	3	397	7
Heritage Lane	0	861	2	1	404	0
Parklane Road	N/A	885	3	2	396	N/A
Embassy Lane	N/A	880	2	1	383	N/A
Brookwood Drive	11	884	2	3	385	7
Queen Anne Drive	N/A	926	9	6	394	N/A
Country Hill Drive	4	907	4	4	400	4
Cornell Road	169	803	7	11	383	15
Rebel Run	167	747	N/A	N/A	330	76
Great Oaks Drive	5	770	N/A	N/A	341	3
Ridge Avenue	0	786	N/A	N/A	367	0

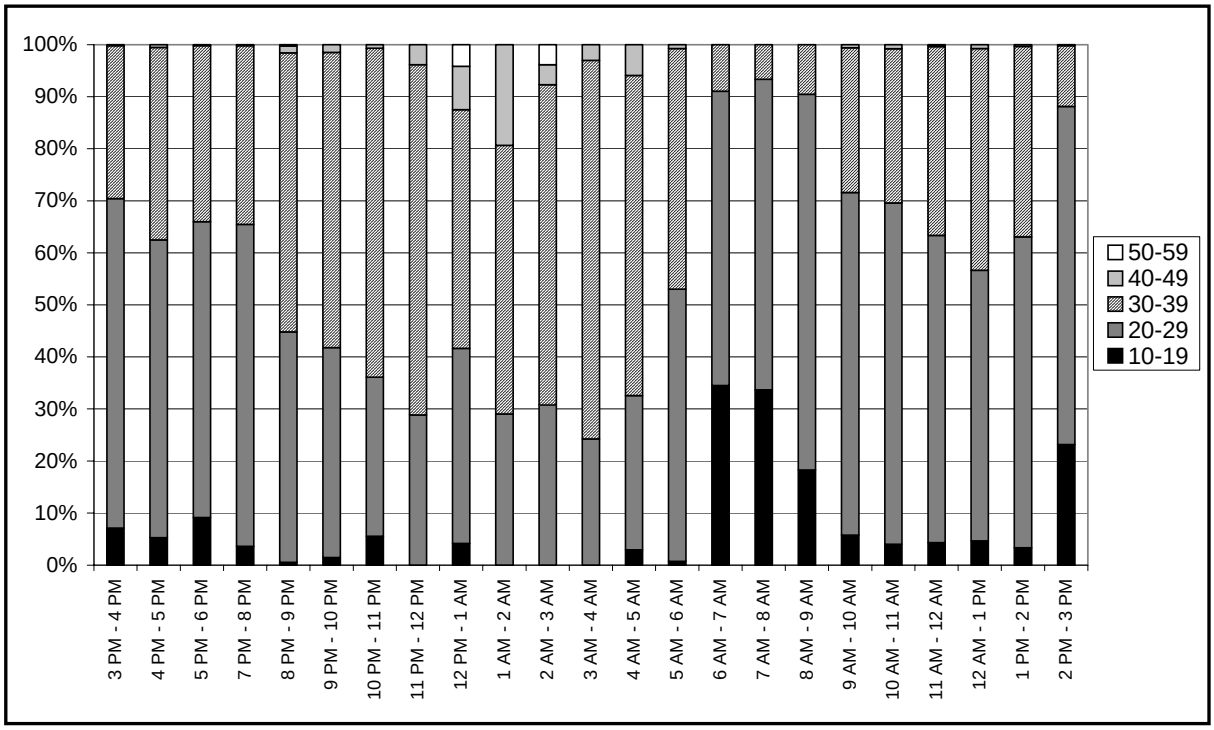
Note: Layton Hall Drive is not shown due to no plans to redevelop this new intersection.

Evening Turning Movement Counts

Access Street	Northbound			Southbound		
	Left	**Through**	**Right**	**Left**	**Through**	**Right**
Colony Road	N/A	577	26	4	908	N/A
Old Post Road	55	524	6	5	873	24
Heritage Lane	0	550	7	0	906	0
Parklane Road	N/A	550	6	11	903	N/A
Embassy Lane	N/A	551	6	12	908	N/A
Brookwood Drive	13	533	7	11	914	38
Queen Anne Drive	N/A	543	25	15	949	N/A
Country Hill Drive	4	562	9	20	1013	21
Cornell Road	29	546	11	23	1029	4
Rebel Run	81	486	N/A	N/A	853	38
Great Oaks Drive	28	480	N/A	N/A	882	29
Ridge Avenue	0	495	N/A	N/A	903	1

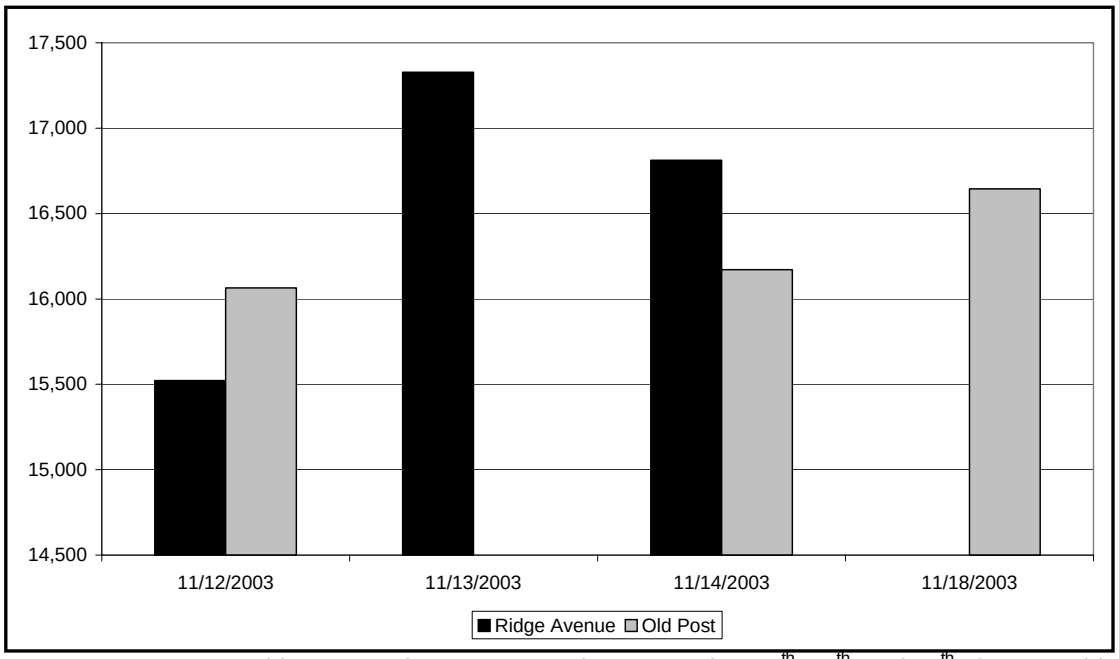
Note: Layton Hall Drive is not shown due to no plans to redevelop this new intersection.

Observed Operating Speeds by Time of Day



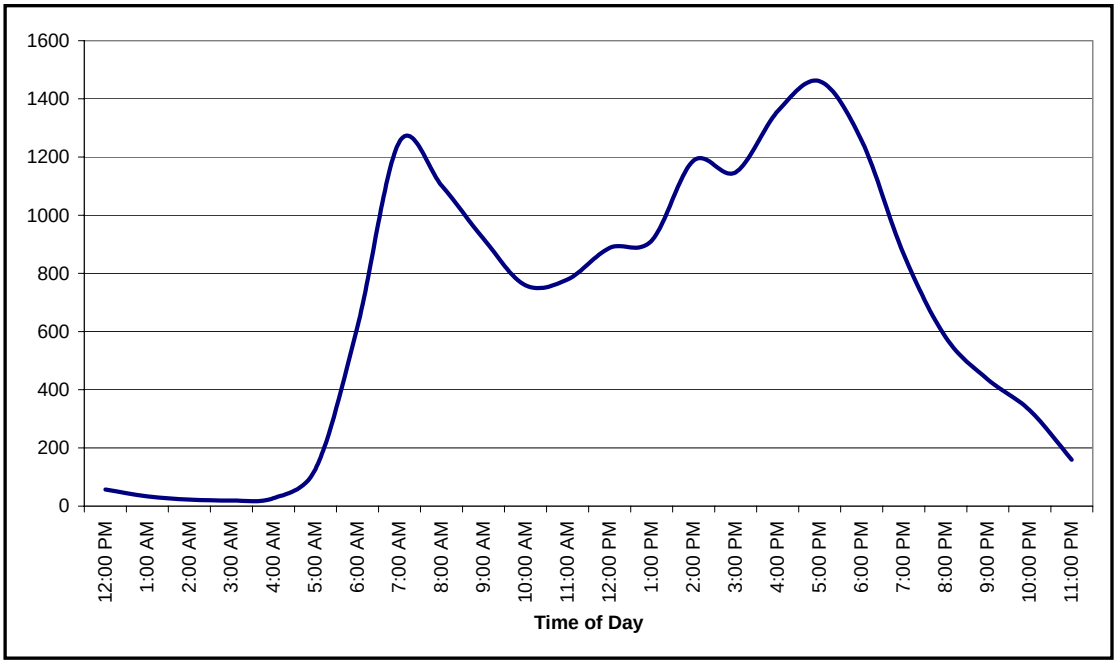
Source: City of Fairfax Police Department; 10/6/2003-10/7/2003.

Average Daily Traffic

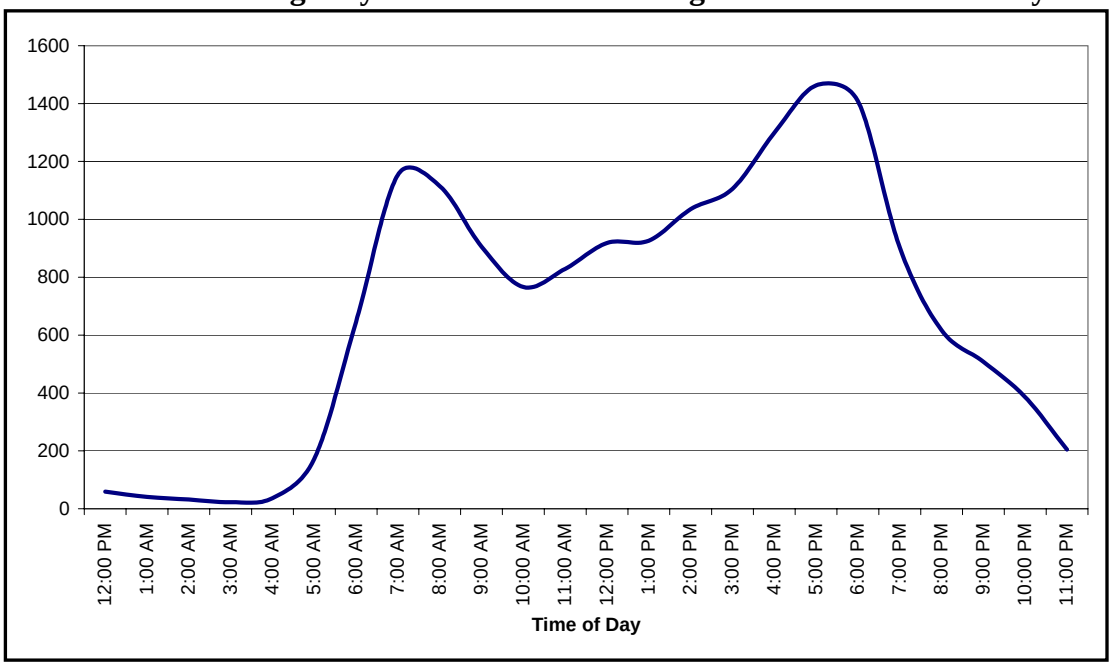


Source: Old Post Road counts were taken November 12th, 14th, and 18th of 2003. Ridge Avenue counts were taken from November 12th, 13th, and 14th

Old Lee Highway Vehicle Volumes at Old Post Road Per Time of Day

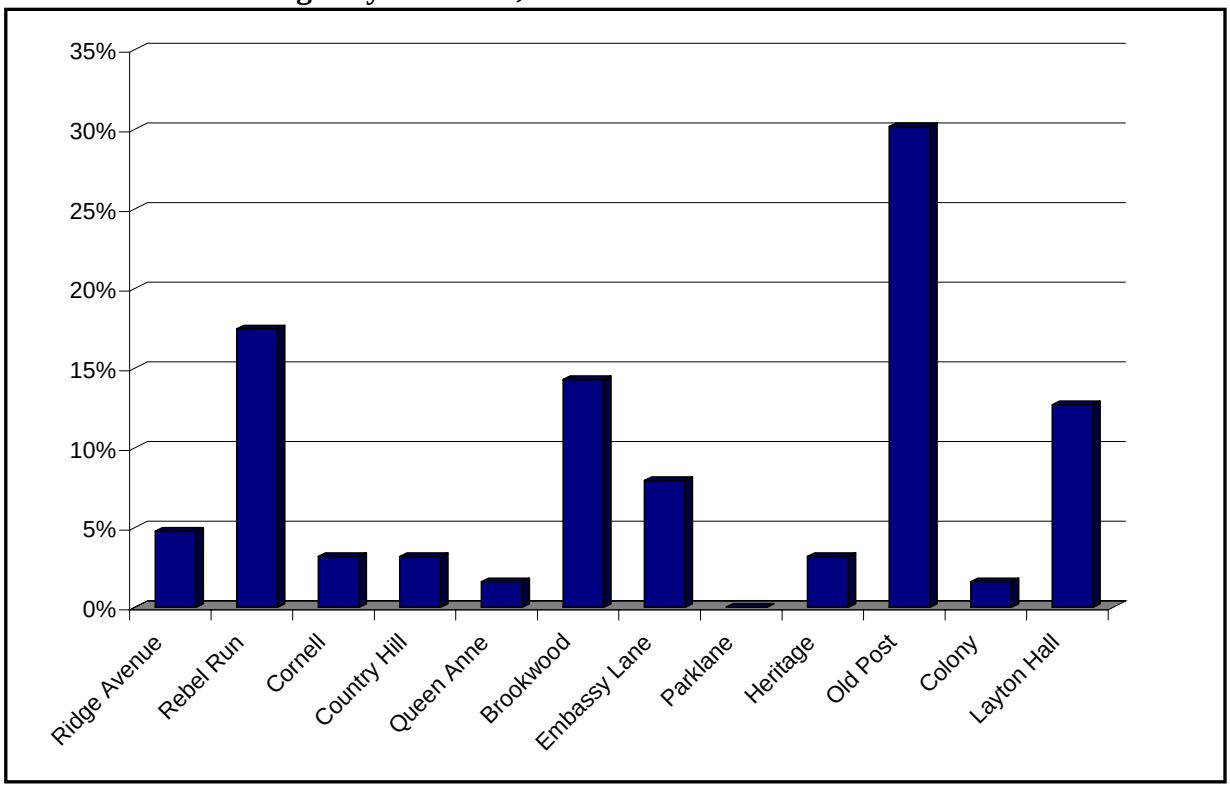


Old Lee Highway Vehicle Volumes at Ridge Avenue Per Time of Day

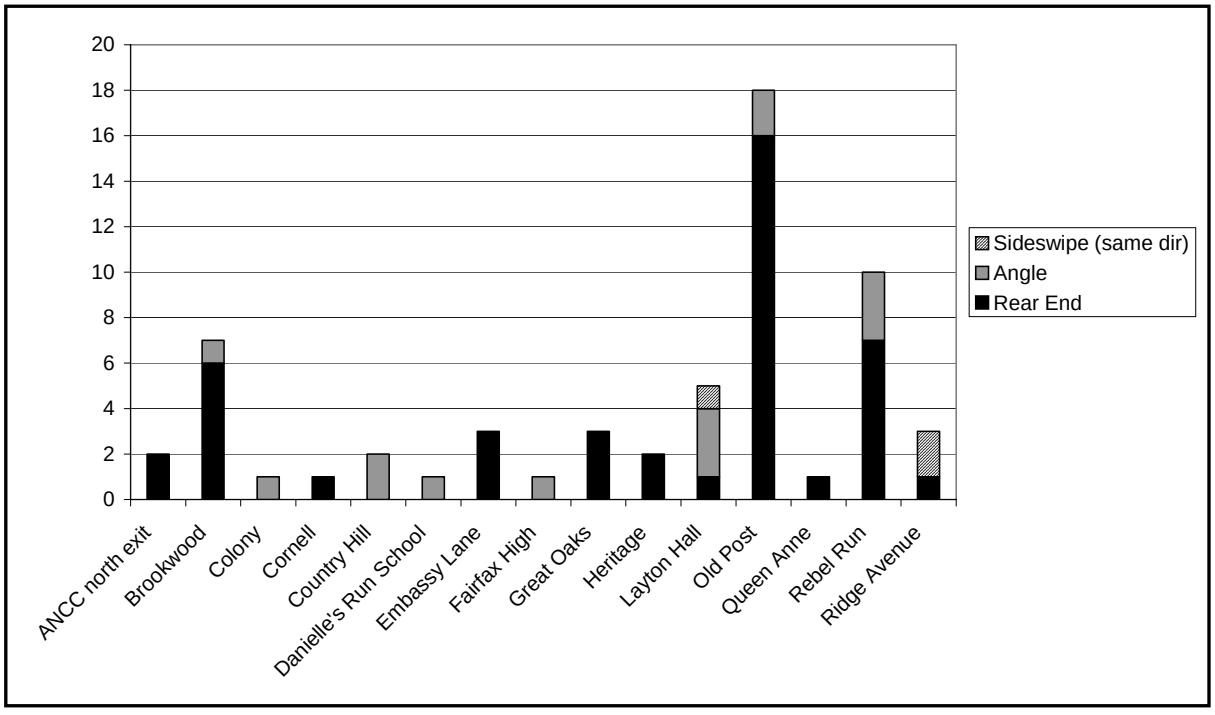


Figures show the number of vehicles in 15-minute increments. The peak hour averaged about 1,300 vehicles, or about 8% of the total daily volume.

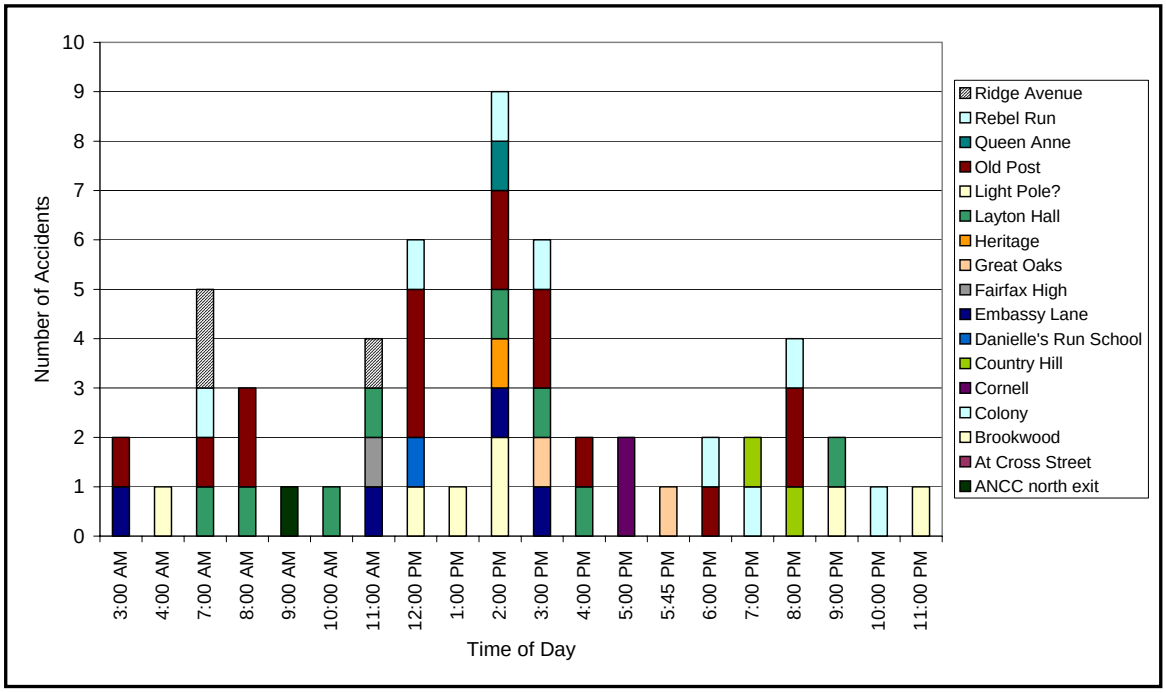
Old Lee Highway Accidents, since November 1998



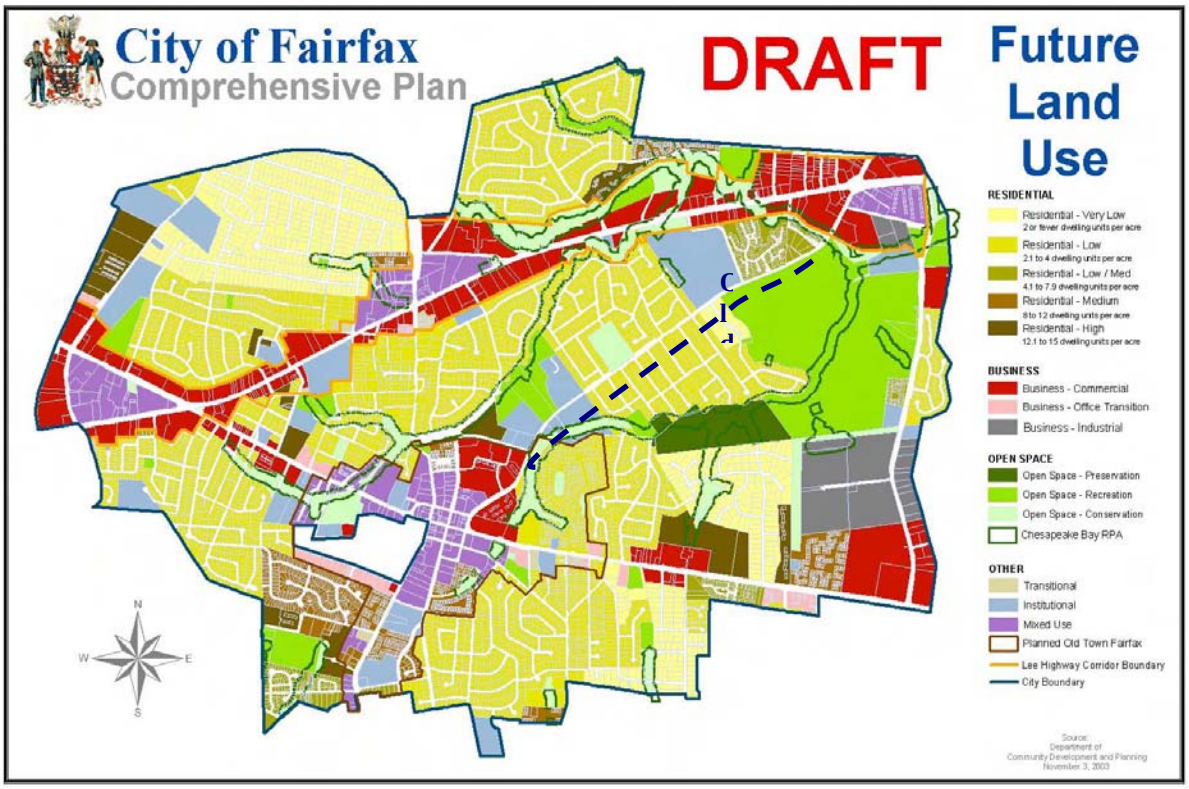
Share of Accident Reasons Per Intersection



Accidents By Time of Day

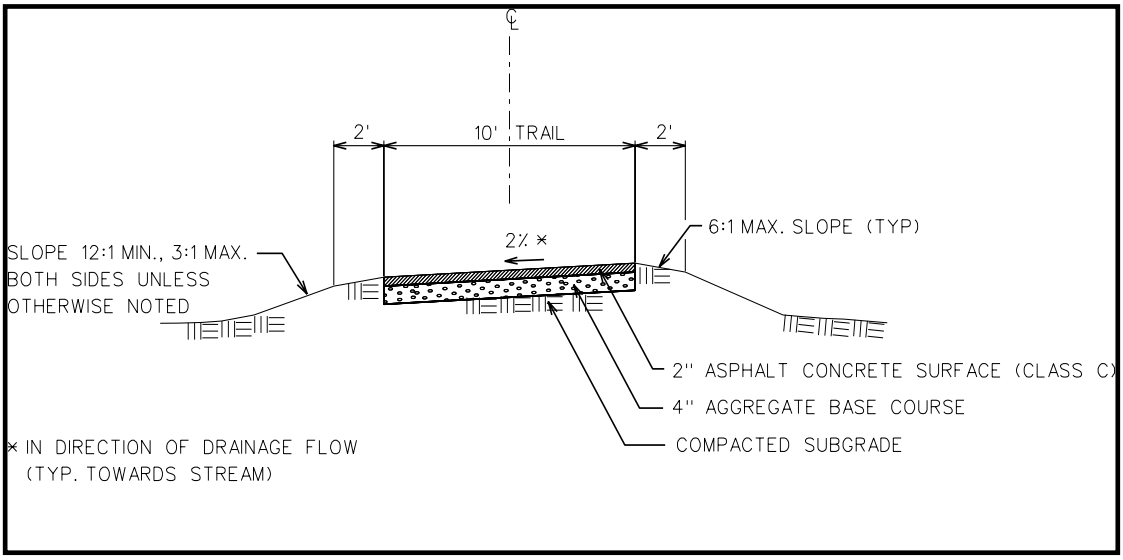


City of Fairfax Future Land Use Map (Draft)



Note: At the time of this report's publication, this was the currently available land use map.

Typical Section - 10-foot wide Bike Path



Bus Stops in Study Area

CITY OF FAIRFAX, VIRGINIA April 2005

Old Lee Highway Transportation Study

Construction Cost Estimate
Short Term Improvements

1	**Site Clearing**	**Unit**	**Unit Cost**	**Quantity**	**Extended**	**Item Cost**
	Clearing and grubbing	Acres	$ 2,500.00	1	$ 2,500.00	
	Asphalt pavement removal	SY	$ 12.00	11,527	$ 138,330.00	**$ 140,830.00**
2	**Earth Work**	**Unit**	**Unit Cost**	**Quantity**	**Extended**	**Item Cost**
	Excavation and embankment	CY	$ 15.00	4,800	$ 72,000.00	**$ 72,000.00**
3	**Pavement**	**Unit**	**Unit Cost**	**Quantity**	**Extended**	**Item Cost**
	PCC Sidewalk - 4"	SY	$ 38.00	2,880	$ 109,440.00	
	Roadway - aggregate base	TONS	$ 30.00	730	$ 21,900.00	
	Roadway - asphalt surface course (2")	TONS	$ 100.00	230	$ 23,000.00	
	Roadway - asphalt binder course (4")	TONS	$ 85.00	410	$ 34,850.00	**$ 189,190.00**
4	**Pavement Marking**	**Unit**	**Unit Cost**	**Quantity**	**Extended**	**Item Cost**
	Crosswalk striping	EA	$ 200.00	14	$ 2,800.00	
	Median striping	SF	$ 0.25	11,800	$ 2,950.00	
	"SCHOOL" pavement markings	EA	$ 50.00	6	$ 300.00	**$ 6,050.00**
5	**Restoration and Landscaping**	**Unit**	**Unit Cost**	**Quantity**	**Extended**	**Item Cost**
	Sodding	SY	$ 5.00	15,900	$ 79,500.00	
	Restoration	LS	$ 5,000.00	1	$ 5,000.00	**$ 84,500.00**
	Total Items 1 through 5					**$ 492,570**
	Mobilization @ 10%					**$ 49,260**
*	**Engineering Design contingency @ 20%**					**$ 108,370**
	Construction engineering contingency @ 15%					**$ 97,530**
**	**Construction contingency @ 25%**					**$ 186,940**
	Total					**$ 934,670**
*	Includes topographical survey					

** Includes Maintenance of Traffic, erosion and sediment contol, permits, and other construction contingencies

CITY OF FAIRFAX, VIRGINIA

Old Lee Highway Transportation Study

Construction Cost Estimate
Long Term Improvements

1	**Site Clearing**		**Unit**	**Unit Cost**	**Quantity**	**Extended**	**Item Cost**
		Clearing and grubbing	Acres	$ 2,500.00	2	$ 6,180.00	**$ 6,180.00**
2	**Earth Work**		**Unit**	**Unit Cost**	**Quantity**	**Extended**	**Item Cost**
		Excavation and embankment	CY	$ 15.00	4,600	$ 69,000.00	**$ 69,000.00**
3	**Drainage**		**Unit**	**Unit Cost**	**Quantity**	**Extended**	**Item Cost**
		Drain pipe	LF	$ 65.00	14,000	$ 910,000.00	
		Curb inlet	EA	$ 5,000.00	51	$ 255,000.00	
		Outfall	EA	$ 2,000.00	4	$ 8,000.00	**$ 1,173,000.00**
4	**Pavement**		**Unit**	**Unit Cost**	**Quantity**	**Extended**	**Item Cost**
		Aggregate base - curb and gutter	TONS	$ 30.00	1,400		
		Bicycle path/walkway - aggregate base	TONS	$ 30.00	2,130	$ 63,900.00	
		Bicycle path/walkway - 4" asphalt	TONS	$ 85.00	1,590	$ 135,150.00	
		Concrete curb and gutter: CG- 6	LF	$ 18.00	15,044	$ 270,800.00	
		Concrete curb ramp: CG-12	EA	$ 400.00	86	$ 34,400.00	**$ 504,250.00**
5	**Pavement Striping/Signage**		**Unit**	**Unit Cost**	**Quantity**	**Extended**	**Item Cost**
		Crosswalk striping	EA	$ 200.00	26	$ 5,200.00	**$ 5,200.00**
6	**Restoration and Landscaping**		**Unit**	**Unit Cost**	**Quantity**	**Extended**	**Item Cost**
		Trees and shrubs - allowance	LS	$ 37,500.00	1	$ 37,500.00	
		Restoration	LS	$ 10,000.00	1	$ 10,000.00	**$ 47,500.00**
		Total Items 1 through 6					**$ 1,805,130**
		Mobilization @ 10%					**$ 180,520**
		Engineering (Design) contingency @ 10%					**$ 198,570**
		Construction engineering contingency @ 15%					**$ 327,640**
	**	**Construction contingency @ 25%**					**$ 627,970**
		Total					**$ 3,139,830**

** Includes Maintenance of Traffic, erosion and sediment contol, permits, and other construction contingencies